CHAPTER 32

Animal bone

by Andrew Bates

32 Animal bones

Andrew Bates

A total of 31,889 animal bone fragments, or number of individual specimens (NISP), were recovered from phased contexts from four sites dating from the Bronze Age to the post-medieval period (Table 32.1).

Methodology

The vast majority of the material was recovered by hand collection only; no programme of sieving was employed on site for the explicit purpose of the recovery of animal bone and other small finds. The material was identified using the reference collection held at Oxford Archaeology North and the Natural History Collection held at Liverpool Museum. All parts of the skeleton were identified where possible, including long bone shafts, skull fragments, all teeth and fairly complete vertebrae. Sheep/goat distinctions were made using reference material and published work by Boessneck *et al.* (1969).

Records were entered onto computer using a Microsoft Access application. For each bone the following information was recorded where appropriate: Small Find Number, species or species group, element, number of bones, side, the diagnostic zone as either more than or less than half present, fusion state, preservation (eg burning), butchery, measurements, tooth wear development, and other comments. Pathology and other developmental or congenital anomalies were also noted.

The diagnostic zones used followed those described in Dobney and Reilly (1988), which are used to achieve minimum number of elements (MNE). Measurements followed those set out in von den Driesch's (1976). Tooth wear development for mandibular teeth was recorded following Payne (1973) and (1987) for sheep, Grant (1982) and Halstead (1992) for pigs and cattle. Skull and horncores were described following Grigson (1976), Armitage (1982) and Armitage and Clutton-Brock (1976). Horse mandibles were aged using data presented in Levine (1982).

Relative contribution to the diet of animals by an estimation of average meat weight uses figures for live meat weights presented in Boessneck *et al.* (1971). The percentage of live meat weights of principal domestic stock animals derives from the ratio of the weight of sheep to cattle and pig (O'Conner 2003, 140) multiplied by the total MNE. This method assumes that the relative values for live weight and dead weight increase to the same degree between species. This system is somewhat flawed, in that the dead weight of pig, compared to its live weight, will increase significantly more than that of sheep (Dobney *et al.* 1996, 22). It is also true that the MNE only gives relative proportions within the archaeological assemblage, rather than the death assemblage. The suggested relative meat weights are therefore subject to some biases, but go some way towards correcting the fallacies suggested in counts of NISP taken at face value. Analysis of the anatomical parts of species represented at individual sites was undertaken following O'Conner (2000), using MNE; maxilla being treated as a diagnostic zone of the skull, being absent from the Dobney and Reilly (1988).

Taphonomy

The general condition of the material in all phases is broadly consistent (Table 32.2). The figures presented for the post-medieval material are greatly affected by a smaller number of deposits, reflected in the smaller overall sample size. The material is reasonably robust, but with generally over half of its surface eroded. The majority of the assemblage is represented by material less than 25 mm in length, including those from larger mammals. Canine gnawing was attested to on a number of specimens, although only a fraction of the total assemblage. Similarly butchery marks were present on a small number of specimens. The condition of the assemblage is relatively good, due to the generally alkaline background conditions of the underlying London Clays, although it has evidently suffered a high degree of fragmentation in all periods. 35% of the material is represented by minute unidentifiable fragments weighing a small fraction of a gram recovered from soil samples, which were excluded from the figures in Table 32.2.

Inevitably a bias is caused within the assemblage. Larger mammals may have survived to a greater extent due to their higher bone density values (Lyman 1994, 146-7). Conversely, in a highly fragmented assemblage, bone splinters from sheep sized animals may have a greater chance of displaying a diagnostic characteristic (Maltby 1996, 19).

Middle and Late Bronze Age

Quantifications

A total of 821 animal bones identified to a species level were recovered from this phase (Table 33.3), 45% of which were identified as loose teeth. The useful sample is of such a small size that counts of the NISP are presented in Table 32.3. Sheep and cattle dominate the assemblage, although goat is also attested to at the site. It is thought unlikely that goat form much of the sheep/goat category, as in larger prehistoric assemblages in Britain where sheep and goat can be separated in any numbers goat form only a small part of the total (Maltby 1981, 159-160). The relative meat weights of cattle over sheep clearly establish cattle as the larger contributor to the diet, not reflected in counts of NISP (Table 32.3).

MTCP

A total of 44% of this material was derived from a single waterhole, 309075, and a further 43% from numerous pits located on the western and south-western sides of the settlement. There is little significant difference in the distribution of species, except with perhaps a greater number of sheep/goat bones located in the waterhole (Table 32.4). These figures based on counts of NISP are likely to suffer greatly from the problems of interdependence of fragments. Table 32.5 gives figures for minimum number of elements (MNE's) suggests a similar bias towards sheep/goat in the waterhole, although the total sample size is such that only a small number of extra fragments greatly affects the percentage values.

Waterhole SG309075 contained 15 episodes of deposition. Elements of cattle and sheep/goat occur in almost all phases of deposition, with occasional fragments of pig and horse. No bias towards any part of the body is visible, although mandibles and loose teeth make up a high proportion of the total assemblage, 11% and 49% respectively. It is clear that much of the material has suffered a high degree of fragmentation, quite possibly prior to its incorporation within the feature. A small number of cut marks associated with the dismemberment and skinning of cattle and the dismemberment and filleting of sheep/goat were noted, as well as a single chop mark and a skinning mark on pig bones. Scorched, charred and calcined material was also recovered. This is perhaps unsurprising, as deposits of burnt material were noted by the excavator in all but the primary and some of the final tertiary deposits, often with reference to the deliberate deposition of domestic debris or midden material which this bone appears to have been associated with.

A number of animal bones were recovered from pit 334059, located some distance from the area of the Bronze Age settlement, including 17 fragments of pig, seven of cattle, two of dog and one of sheep/goat and red deer. The elements represented almost exclusively relate to the heads and feet of animals, with the exception of a single sheep/goat scapula, and stratigraphically predate the cremation itself. None of this material shows evidence of having been burnt. The lack of major joints, particularly with reference to pig which is the most numerous species, suggests that they were removed elsewhere. From the deposit around the pit a small fragment of a single, very poorly preserved, cattle radius was recovered. A second pit, 316085, in close proximity to the first, produced three sheep/goat teeth.

Other Sites

Only very small numbers of animal bone were recorded from other sites, of which the majority were not identifiable to a species level. The material does little more than attest to the deposition of remains of domestic animals in these areas (Table 32.3).

Domesticates: Cattle/Sheep/Goat and Pig

Cattle

18 mandibles were recovered from which age stages could be determined. One of these fell within the range of 1-8 months; two within 8-18 months; six were from juveniles less than 3 years of age; and nine were adult mandibles of which at least one was considered old to senile. Twenty-six specimens produced epiphysial fusion data, which again attests to the slaughter of both older and younger animals (Fig. 32.1).

Butchery marks were scarce, present in only 10 specimens. These included a chop mark from the removal of the horn for working; cut marks associated with the dismemberment of the humerus and tibia to separate the upper from the lower limb; dismemberment of the mandible; filleting of the scapula and metatarsal; and the skinning of the animal.

Few measurements were taken, but when they recorded were comparable to other domestic cattle of this period in Britain.

Sheep and Goat

Animals within the sheep/goat category are thought most likely to predominantly represent sheep, although goat is also evidently present (see above). A goat horn core had been chopped where the horn had been removed for working. 32 loose teeth and mandibles produced data from which an age of death could be estimated, although few could be aged to within a small age range due to their incompleteness (Fig. 32.2). Most animals appear to have been slaughtered around mandible wear scores 20 to 35, or 1 to 3-4 years, suggestive of an emphasis on using sheep for meat. The epiphysial fusion (Fig. 32.3) data also tentatively supports this suggestion, with a greater number of unfused specimens appearing in the final fusion stage, although the sample sizes within each fusion stage is small.

Butchery marks were noted on seven bones. These included cut marks associated with the dismemberment of the humerus from the lower limb, and with the filleting of the femur, radius, metacarpal and mandible. A goat horn core had been chopped to remove the horn from the skull of the animal. Biometrical information was provided by 32 specimens, which were comparable in size to other material dated to this period.

Pig

Only six pig mandibles or loose teeth could be used to suggest an age of death, two aged as 6 months to 2 years, three as over 1 year and one as over two years. 11 examples produced information on epiphysial fusion, 6 fused and one unfused in stage A (by 12 months), one fused and one unfused at stage B (2-2.5 years) and two unfused at stage C (by 3.5 years). The presence of four young and one newborn shaft fragments attest to the presence of younger animals. Three mandibles were identified as from sows, and one from a male. Only seven specimens were measured; these proved to be comparable in size to other material of this period.

Other Species

Deer species include both red and roe deer in small numbers, including of red deer a dismembered mandible and a dismembered and filleted radius. The single occurrence of aurochs distal tibia derives from the barrow ditch, SG 324078, the measurements of which compare well to aurochs recovered from Star Carr (Legge and Rowley-Conwy 1988). The frog/toad bones were recovered from three pits and the waterhole.

One of the deposits from waterhole SG309075 contained bones from at least two polecats. Polecat has been noted at other prehistoric and Romano-British sites, such as Gussage All Saints, Dorset (Harcourt 1979), Oakridge, Basingstoke (Maltby 1993), and Watchfield, Oxfordshire (Hamilton-Dyer 2001). Although possibly killed as vermin, it

may also have been exploited for its pelt (*ibid*). The single find of a rabbit or hare tooth is most likely to be from an intrusive rabbit.

Late Bronze Age/Early Iron Age

A total of 84 animal bone fragments were recovered from Late Bronze Age/Early Iron Age deposits, of which only nine fragments were identified to a species level. Of the MTCP features, pit SG 340004 produced the six cattle fragments and a sheep/goat metatarsal; all from a deposit of burnt material although none of the animal bone was burnt. Posthole SG 330068 produced a single sheep/goat loose tooth. Ditch SG 444010 produced a cattle tibia fragment, on the LBR site.

Iron Age to Early Romano-British

Quantifications

A total of 1506 animal bones identifiable to a species level were recovered from Iron Age and early Romano-British deposits (Table 32.6), 28% represented by loose teeth being the result of a high degree of fragmentation (Table 32.2). As with the Bronze Age assemblage, the total NISP presented in Table 32.6 indicates that fragments of cattle and sheep dominate the archaeological assemblage, cattle bones in slightly greater numbers. As with the Bronze Age assemblage, sheep are thought to predominate the sheep/goat category (see above), although goat was evidently present. Although cattle and sheep were found in similar quantities, the estimate of the meat weights clearly demonstrates the greater contribution of beef to the diet (Table 32.7).

LTCP

The LTCP site is formed by two areas of settlement, one to the east and one to the west. The eastern settlement forms the majority of the material (Table 32.8), with all but 42 identifiable fragments phased as either Late Iron Age or Late Iron Age to early Romano-British. The western settlement has only eight identifiable fragments in the later phase, the remainder dating to either the middle or Late Iron Age.

Separation of material produced very similar results. Cattle and sheep appear in roughly equal proportions in figures presented as NISP (Table 32.8) or MNE (Tables 32.9 and 10), possibly with a greater emphasis on cattle at the western settlement, with pig and other species in smaller quantities. However, the MNE presented for the western settlement are in such small numbers that their usefulness is questionable (Table 32.10 and Fig. 32.1).

There is a clear emphasis on the deposition of all species within ditches, with smaller quantities of material deposited in other feature types. Only four pits of this period across the excavations produced between 10 and 20 identifiable fragments, all other features

having less than 10 NISP. Similarly only four ring gullies produced more than 10 identifiable fragments, the most coming from ring gullies SG 110036, SG 129068 and SG 137022, although predominantly comprised loose teeth fragments..

For the eastern settlement much of this material derives from the two ditches. 21% of the identifiable material recovered was from the late iron-age to early Romano-British phase of the large rectangular enclosure to the south of the settlement, and 37% of the identifiable material was recovered from the boundary ditch surrounding ring gullies 123162/129160 and 129088/129090. Although the ditches are evidently different in character, in their sizes form and purpose, both contain similar proportions of species (Fig. 32.4). Similarly much of the identifiable material from the western settlement (27%) was recovered from its surrounding boundary ditch (Fig.32.4).

Other Sites

The assemblage from the M11 sites is predominantly late Iron Age to early Romano-British in date, 59% of the identifiable fragments, with 25% of identifiable fragments recovered from late Iron Age deposits, and smaller quantities of material from other Iron Age contexts. Similarly 87% of the material from the MTCP site is Late Iron Age to early Romano-British in date, with a further 11% phased as Late Iron Age and the remainder Mid- to Late Iron Age.

Domesticates: Cattle, Sheep/Goat and Pig

Due to the small sample of material from most of the sites, only material from the eastern settlement on the LTCP site was included in the analysis of body part representations.

Cattle

Figure 32.5 presents the anatomical parts present at the eastern settlement in rank order. There is a clear bias towards elements of a more robust or dense nature, and against those that are less dense and smaller. This matches well data presented in Brain (1981, 23) for material which has been highly affected by the gnawing of dogs, which is evident on 9.7% of the cattle bones, although it is likely that this is only one of the destructive agents which has affected the material. It is also likely that the material has been influenced by recovery biases resulting in the loss of some smaller elements (Payne 1972). It is therefore implied that whole carcasses are represented, with cattle slaughtered at the site.

Butchery marks were recorded on 60 specimens (Table 32.11). The most common of these was the mandible, also one of the most common elements, which had cut marks associated with its dismemberment from the skull. There are also filleting marks where the tongue had been removed. Dismemberment marks occur at each joint of the forelimb, with filleting marks on all of the long bones as well as the scapula. Similarly the joints of the hind limb showed evidence of dismemberment, with filleting marks on the both the tibia and metatarsals. Lack of filleting marks on the femur may be due to the relatively poor survival of this element (Fig.. 32.5). A chop mark located on the occipital condyle

of a skull shows where the animal was decapitated. Skinning of cattle was attested to by cut marks on a skull fragment and first phalanges.

Sheep and Goat

Figure 32.6 considers the presence of each anatomical part at the eastern settlement for sheep. Many of the elements show a similar pattern to that of cattle, with dense more robust parts in greater abundance than those less resistant to attritional processes. However, there is a clear bias towards distal tibias which can not be explained by purely taphonomic arguments. Neither does this imply an emphasis on prime cuts of meat brought to the site, as there is no suggested supra-abundance of femur or humerus, the upper parts of the limb which are of higher meat value.

This bias was also noted in the Essex County Council SC site at Stansted, in Late Bronze Age to Early Iron Age contexts, where a number of worked sheep bones were also recovered. Here it was suggested that this material was deliberately retained for working as a raw material (Hutton 2004, 60). No worked bone was recovered from deposits of this period at the eastern settlement site, although a worked sheep/goat tibia was recovered from a Bronze Age feature. However, it is unlikely that animal bone was not used as a raw material, and these straighter elements may have been opportunistically retained for this purpose. Whether the material here represents bone retained and not worked, or fragmented or failed worked material is unresolved.

Butchery marks on specimens in the sheep/goat and sheep categories were scarce, present on a total of nine specimens. These included cut marks associated with the dismemberment of two scapula from the humerus, filleting of the radius, femur and tibia. Cut marks on a goat femur showed where the hip had been disarticulated.

Pig

Numbers of pig bones were too few to provide an analysis of the anatomical parts in any one site. A general overview is given in Figure 32.7, combining data from all sites, showing a general trend towards the more robust elements. It is surprising that the mandible is so low in the rank order, although conversely maxilla are well represented and this anomaly is considered most likely the result of the small sample.

Butchery marks were only noted on eleven specimens. These included the dismemberment marks on the mandible where it was removed from the skull; dismemberment of the scapula and humerus; and disarticulation of the ankle. Filleting marks were also noted on the humerus. Chop marks on two proximal tibias are associated with the dismemberment of the knee joint.

Age at Death and Sexing Data

Cattle

Estimates of the age of death of cattle from mandible wear scores (MWS) and epiphysial fusion can be deduced from Figures 32.8 and 32.9. Figure 32.8 and 32.9 present data for all excavated areas, due to the small number of mandibles from each site, although inevitably this is dominated by material from the LTCP site. The general trend is towards a number of deaths before three years of age (up to MWS 36), but with a slightly greater number of animals surviving into adulthood, including old and senile animals (Fig. 32.8).

A total of 117 specimens with epiphysial fusion states was recorded (Fig. 32.9). Each fusion category where any quantity of material is present gives an emphasis on fused animals older than the relevant fusion age range. Although some cattle were slaughtered at an early age, like the mandible wear scores, the implication is that many cattle reached adulthood. A single radius was recovered from the MTCP site from a newborn individual.

Sexing data was scarce, but eight female and a further two possible female pelves were identified, and only two male and one possible male pelvis. This is suggestive of female as opposed to male animals surviving further into adulthood for their pelves to show sexual morphism.

Preservation and recovery factors have evidently affected this material, and a higher number of natural fatalities in first year is almost certainly absent from the archaeological material due to the fragile nature of bones from younger animals. The implication of this data is for a mixed slaughtering strategy. A number of animals, speculatively predominately males, were culled at or before the prime age for their meat, retaining a large percentage of older animals for breeding stock and milk production. In comparison to the models provided by Payne (1973), this data best fits his model for milk production.

Sheep

Estimates of the age of death of sheep from mandible wear scores and epiphysial fusion can be deduced from Figures 32.10-11, with the data combined for all excavated areas. No sheep/goat pelves were sexed.

The mandible wear scores indicate a number of deaths within the first year, up to MWS 19, a peak in slaughter between one and three years of age, up to MWS 32, followed by a reduced older population. Only 32 bones had useful epiphysial fusion states. The sample is only small and any interpretive statements must be tentative, but in general the fusion data agrees with the MWS. A noticeable loss to the flock is implied before 1.5-2.5/3 years (Fig. 32.9). However, 16 specimens were described as young and two described as from newborn animals, recorded from all the sites.

A significant percentage of sheep, therefore, appear to have been slaughtered at an early age for their meat. This would have left a surviving breeding population from which wool and milk could be taken.

Pig

Only 16 mandibles were recorded with useful mandible wear stages, of which five were from individuals under one year on age; a further three between one and two years; seven over one year; and two over two years of age. Similarly pig bones with epiphysial fusion states were too scarce to be overly useful (Fig. 32.12), although they were suggestive of an emphasis on younger deaths, as might be expected in a species primarily bred for its meat. Six canines were sexed, two as female and four as male.

Other Species

Horse

Horse was present in small numbers from each of the sites of this phase (Table 32.6). Six specimens had butchery marks, including dismemberment marks on the radius and metacarpal, the result of the disarticulation of the ankle joint; and filleting marks on the pelvis and femur. Two mandibles recovered from the M11/A120 Link Road site were aged as older animals, between 8 to 13 and 9 to 13 years respectively.

Dog

Fragments of dog were found at each of the sites in small quantities. Nine fragments from the LTCP were recovered from pit SG 102011, including a mandible, thoracic vertebra, rib, scapula, humerus, metacarpal, two first phalanges, and a third phalanx. Two of the phalanges were articulated, and it is possible that all of this material comes from the same individual. Butchery marks on dog bones were scarce, but were present on two femurs which had evidently been filleted.

Deer

Small quantities of deer bones were recovered from each of the sites. Although none had any signs of butchery they almost certainly represent part of the wild species used as a food resource. No antler was recovered, although this is likely to have been utilised as raw material along with the bone and hides.

Pathologies

Two pathological specimens were recorded of this phase. A Late Iron Age/early Romano-British proximal cattle or red deer femoral head had small areas of eburnation on their articular surface - a degenerative problem where the articular cartilage has failed and the subchondral bone has been exposed to wear. A Middle Iron Age cattle metatarsal had exostosis forming a raised area mid-shaft, most likely additional bone growth resulting from a small fracture which had long since healed before the death of the animal.

Romano-British

Romano-British animal bone was recovered from the MTCP site, where settlement of this period is located, with a smaller quantity from the LTCP site. It has been suggested that the MTCP site forms a satellite settlement within a larger estate or *latifundia*. A very small number of bone was recovered from other sites.

Quantification

A total of 1511 NISP were identifiable to a species level, of which 17% were represented by loose teeth. There is a clear indication of greater numbers of cattle in proportion to other species at the MTCP settlement, in comparison with settlements of earlier periods (Table 32.12 and 32.13). Beef evidently formed a high percentage of the overall meat diet (Table 32.13).

LTCP

Much of the Romano-British assemblage derives from just four features, the large rectangular enclosure, SG 136001/138030/140022/143007; ring gully SG 110036; boundary ditch SG 107022/147010; and pit SG 115020 within the aforementioned rectangular enclosure. These features account for 80% of the identifiable assemblage.

The material from the first two features may well be contaminated with material from earlier phases. The rectangular enclosure has an Iron Age phase to it, but was evidently re-excavated and used in this later period. The ring gully mentioned above is phased as Iron Age in date, with a quantity of animal bone from where this feature was disturbed by later activity. Re-worked material may account for the greater proportion of sheep/goat bones at this site in comparison with the MTCP site.

The lower fill of pit 115020, deposit 115121, contained only a few animal bones of domestic species, predominantly loose teeth, as well as at least one frog and one toad, and two bird skull fragments, a second phalanx, and a swallow/martin (*Hirundinidae*) leg bone, possibly all from the same bird (Fig. 32.12). The last two secondary fills contained larger quantities of material. The lower, 115023, contained three cattle fragments of the lower fore and hind leg; a sheep/goat mandible, radius and third phalanx; an antler fragment; and five elements of horse including two mandibles, a radius, femur and tibia. The final fill, 115022, contained seven fragments of cattle from the fore and hind limb; five fragments of sheep/goat from the fore and hind limb as well as a loose tooth; a horse humerus and femur; a pig scapula and femur; and a fox/dog tibia. The fox/dog tibia was incomplete, but was considered a very good match for fox.

Both meat-bearing limbs and sesamoids of lower utility are represented, and only the horse radius and tibia are complete with all other elements having suffered a high degree of fragmentation. The material represents a mix of body parts and species, with no indication of an emphasis on either primary or secondary butchery waste or complete carcasses.

MTCP

Similar quantities of sheep/goat and pig bones were found, predominantly in the pits and ditches excavated at the site. Sheep/goat was only found in small numbers in each feature excavated, typically less than 10 fragments. Larger quantities of cattle were recovered from two features, 118 NISP from pit 350020 and 41 NISP from pit 321226. It is the material collected from these two pits which somewhat affect the percentage of cattle in Table 32.14.

The first two fills of pit 350020 are described as deliberate backfilling of the feature. The first contained only two horse metapodial fragments. The second deposit contained 96 cattle bones, of possibly four individuals which were slaughtered and butchered. Within this assemblage, limbs, feet and mandibles are represented. One horncore/cranial fragment was recorded, of a small or short-horned animal, with two other skull fragments in the unidentifiable categories. Nine loose teeth were also recovered, four of which are maxillary.

The mandibles suggest that at least three animals are represented, one at 1.5 to 2 years, one at 2.5 to 3 years and one young adult or adult over three years of age. The fusion states of the long bones suggest that at least one additional individual aged between 1.5 and 2 years is also present. Only three rib fragments and no vertebrae were recovered, presumably removed with the meat attached. Filleting marks were noted on fragments of femur and scapula, with skinning marks on the cranial fragment. Other species represented included five fragments of horse, two of sheep/goat and a single fragment of red deer. The final tertiary fill of this feature continued to accumulate material, including cattle, horse, sheep/goat and pig, but in small quantities and with no suggestion of large collections of material from processed carcasses.

Pit 321226 contains two episodes of deliberate backfilling. In the first of these the NISP of 29 cattle skull fragments and loose teeth is considered to have over-represented the number of cattle, due to a deposit of highly fragmented cattle skulls. Only four skulls are thought to be present, including a short-horned female and a medium-horned bull. Only one mandible fragment was present. Two distal tibia fragments, a calcaneum and an astragalus were also present, as well as a single pig tarsal. The second episode of backfilling contained 12 cattle bones, including five elements of the feet, two mandibles, tibia, humerus, radius and two horncore fragments. The first deposit would appear to suggest material from primary butchery waste of cattle. The second deposit represents a more mixed assemblage, possibly included as part of midden material backfilled into this feature.

Domesticates: Cattle, Sheep/Goat and Pig

Cattle

Figure 32.13 gives the animal part representation of cattle across the MTCP settlement. Those elements lying below one standard deviation from the mean are most likely absent due to preservation and recovery factors. It is surprising that proximal and distal metatarsal are well represented. The proximal metatarsal is a dense bone and would normally survive well, although it would not normally be found as the most abundant bone. Distal metatarsal is not as dense, and would usually suffer from attritional processes to a greater degree than suggested here. Similarly distal tibia appears in greater abundance, although this element would be expected to survive well where whole carcasses are present. Comparison to the proximal end of the tibia is unhelpful, as this part is of low bone density and is usually poorly represented. The astragalus and first phalanges are well represented, but conversely the calcaneum and other phalanges less well. Each of these elements is prone to under-representation due to problems of preservation and recovery.

This supra-abundance of the metatarsal and distal tibia cannot be tied down to any specific features, but appears to be in the background of the cattle assemblage as a whole. It could be suggested that a greater abundance of rear feet and possibly heads is present at the site, with some beef removed on the bone. The distal end of the tibia may be separated from the proximal end during butchery and left with the feet. Similarly the forelimb may be separated between the distal humerus and proximal radius, the latter being well represented at the site, the lower part of the limb being disposed of as butchery waste. The same abundance, however, cannot be suggested for metacarpals of the fore limb.

Interpretation of Figure 32.13 is not unambiguous, probably because the beef of cattle was not always distributed in the same manner. Some of the meat may have been removed on the bone, and most likely in other cases whole carcasses disposed of at the site, resulting in a mixed picture.

A total of 78 bones with butchery marks was recorded (Table 32.15). These demonstrate the separation of the mandible from the skull, and the dismemberment of all the joints of both the fore and hind limbs. This was completed more frequently with chop marks, possibly from the use of a heavier blade and method than indicated in the earlier periods where finer cut marks predominate in the butchery record. Filleting of the scapula, humerus, radius, metacarpal, femur, tibia and metatarsal was also evident, as well as the removal of the hide.

Sheep/Goat

The number of fragments were too few to produce a reliable study into the anatomical parts of sheep/goat represented at the site. Only nine fragments in this category had butchery marks. Filleting marks were present on one mandible, three radii and one tibia, a cut mark on a calcaneus showed where the ankle had been dismembered, and chop marks were noted on two tibias and one sheep horn core, the latter where the horn had been removed from the skull.

Pig

As with sheep/goat, the number of fragments of pig were too few to produce a reliable study into the anatomical parts represented at the site. Only four bones were recovered with butchery marks, which comprised dismemberment marks on a mandible, distal humerus and astragalus, and filleting marks on a tibia.

Age at Death and Sexing Data

Cattle

Two peaks in slaughter can be seen in Figure 32.14. The first is at or just before three years of age, MWS 31 to 36. Including younger fatalities, this accounts for 46% of the herd, possibly predominantly male animals. The remaining 54% of the animals survived onto adulthood, including a number of old and senile animals. The epiphysial fusion data (Fig. 32.15) at 3.5-4 years give similar figures, with 47% of the animals culled before and 53% after this age range. Sexing data was scarce, with three pelves identified as female and three as possibly female, and a further three pelves as male and one as possibly male. As with the previous period the majority of animals would appear to survive into adulthood for their milk and most likely for traction.

Sheep/Goat

Twenty three mandibles or loose teeth were aged from this phase, considered too small a sample to give a reliable impression of the age of slaughter. No pelves were recovered from which the sex of the animal could be determined. Eight mandibles were recovered from the MTCP, including one from an animal of less than six months and a second at two to three years. A further two specimens were aged between one and four years, one between two and four years, and one between two and eight years. Only two mandibles were definitely from an animal over three years of age.

The LTCP site produced the remaining 15 mandibles, but which may possibly be residual material as previously discussed. Of these two was aged between two months and one year, three between one and two years, one between 6 months and two years, and one at between one and three years. A further two mandibles were aged at two to four years and one at three to six years. One adult recorded at four to eight years and four at four to ten years of age.

The fusion data was also scarce, with a sample of only 27 (Table 32.16), although hinting at the survival of most animals into adulthood. One bone was also recovered from a newborn individual.

Pig

Only seven mandibles for which an age of death could be estimated were recovered. From the MTCP site one was aged at six to 12 months, two at 6 months to two years and one at over one year. From the LTCP site, two were aged at less than one year, one at six months to two years, and one at over one year. Fusion data was considered too scarce to be useful. Four canines were identified as being from sows.

Other Species

Horse

Horse was evidently also utilised after death or slaughter. Seven occurrences of butchery showed where the upper spinal column had been chopped through, one humerus and two radii filleted, a cut mark on a pelvis from the dismemberment of the hip, and a chop mark on a metacarpal from the dismemberment of the lower forelimb.

Deer

Remains of both red and roe deer bones were found at the site in small numbers (Table 32.12). These included one worked and one naturally shed antler, the latter possibly collected to be worked. Butchery on a single roe deer antler/cranial fragment showed that its hide had been removed.

Cat

A single cat second phalanx was recovered from a boundary ditch at the MTCP settlement, although it is unclear if this is from a wild or domestic species.

Dog/Fox

What is recorded as a dog/fox tibia is considered a good match for a fox, but its incompleteness prevented a positive identification. It may well represent the killing of a pest to domestic fowl.

Birds

Domestic fowl, including bantam, and domestic/greylag goose were recovered from the MTCP, but only in very small numbers. A single domestic/greylag goose ulna had butchery marks, where it was separated from the rest of the lower wing. The single

occurrence of a swallow/martin bone from the LTCP site may represent the chance inclusion of a wild species.

Pathologies

Two pathological specimens were recorded from this phase. Loose mandibular second and third molars of the same cattle jaw had abnormal root development, thought to be either associated with chronic infection (abscess) within the jaw of an unknown origin, or old age. Secondly, a cattle pelvis acetabulum had small areas of eburnation on its articular surfaces. A degenerative problem in the hip joint where the articular cartilage has failed and the subchondral bone has been exposed to wear.

Medieval

A total of 1511 fragments were recorded from medieval contexts, excluding the late medieval contexts of the hunting lodge. 284 were identifiable to a species level, of which 31% were loose teeth fragments. Three areas of settlement were identified, a Saxo-Norman building with associated pits and an enclosed 13th-14th century settlement, both on the MTCP site, and a settlement at the FLB site which was possibly associated with industrial activity (Table 32.17).

Each area only produced small numbers of animal bones within individual features. No contexts from the FLB were identified as the waste products of curing hides or working horns. The material at each settlement does little but attest the disposal of the remains of domestic animals at each site.

One feature that was not directly associated with the settlements produced larger quantities of animal bone.

Pit 310136 lay in the northern area of the MTCP site, within the medieval field systems. It contained 49 of the cattle bones listed in Table 32.17, an overview of which is presented in Figure 32.16. Parts of at least four individuals are included within the deposit, based on the metacarpals and skull maxilla. In addition to this material two thoracic vertebra, two other vertebrae fragments, 11 rib fragments and one rib end were recorded in the large mammal category, most likely of these cattle. The radius fragments are all end and shaft or shaft splinters of the distal end, possibly separated from the upper meat bearing part of the limb during the butchery of the animals. The two complete femurs and one complete tibia are evidently deposits of meat bearing bones, from which the meat was most likely removed, in what is otherwise a deposit of heads and feet. The other occurrences of femur and tibia are represented by shaft splinters. Butchery marks included a dismemberment mark on the astragalus and a chopped metacarpal.

Only one mandible was suitable for an estimate of the age of the animal, from an old adult. The fusion of the long bones, however, suggests the presence of animals no older than 3.5-4 years, possibly two individuals around 2-2.5/3 years and 3-3.5 years of age. Also included in this deposit were four fragments of sheep/goat, four pig skull fragments and a domestic fowl leg bone.

A deposit of yellow clay was placed over this material, suggested by the excavator to have been used to seal the deposit before further backfilling as though the cattle bones were still fresh when placed in the pit. Whole carcasses are evidently not represented within this material, with most of the meat-bearing limbs as well as the ribs and vertebrae removed elsewhere. Other pits in the vicinity also contained small quantities of animal bone, but none with the same evidence of processing of cattle carcases.

Pond 103027 lay on the eastern side of the LTCP site. Within its upper fill 19 horse bones were deposited, from at least three individuals. The remains comprised mainly leg bones, including radius, ulna, metacarpal, pelvis, femur, tibia and metatarsal. Filleting marks were noted on the femur and metacarpal, with a dismemberment mark on a metatarsal. The animals were unlikely to have been consumed by humans at this time, and may well have been butchered for ease of disposal or possibly as dog meat.

Late Medieval and post-medieval hunting lodge

A total of 2,791 animal bones were recovered from the hunting lodge, of which 696 were identified to a species level (Table 32.18). Pit 134059 lies 350 m to the south-west of the lodge itself, and contained large quantities of fallow deer from at least four individuals including a newborn or neonatal animal. Although beef evidently formed a significant part of the meat consumed at the site (Table 32.19), deer species collectively are also found and evidently consumed in significant numbers, predominately fallow deer (see below).

The apparent number of domestic fowl is over-represented in Table 32.18, due to two deposits of a large number of bird bones from a small number of individual birds. 83 of these 100 domestic fowl bones derive from a minimum of six birds deposited in pit 459019. 398 of the unidentified bird bones were also recovered from this pit, including phalanges, ribs, and vertebrae. A second deposit of 133 bird bones is found in the backfill of a latrine, 447014, including 13 domestic fowl bones from at least three birds, and three pheasant bones from at least one bird. A further 118 bird bones, including rib fragments, shaft splinters and skull fragments, were also recovered from this deposit.

The majority of the sheep/goat category is considered to be sheep rather than goat. Wool had been an important British export since medieval times, and by the sixteenth century made up four-fifths of England's export (Maltby 1979, 47).

Domesticates: Cattle, Sheep/Goat and Pig

Cattle

Figure 32.17 gives the presence of anatomical parts as NISP. The sample size for this analysis is small, but all elements of cattle are represented to some degree. It is noticeable that, despite being usually well represented, mandibles appear in smaller numbers than

limb bones. This is likely to be the result of the small sample size, as there is only a difference of 13 NISP, or seven MNE, between metatarsals and mandibles.

A total of 53 cattle bones had evidence for butchery (Table 32.20). Dismemberment of all the joints of both fore and hind limbs was noted, predominantly with chop marks and occasionally saw marks. Filleting marks were noted on each of the major limb bones, as well as the metapodials and pelves, with skinning marks on a single first phalanx.

Sheep/Goat

As with cattle, the sample is small for a consideration of the body parts represented, but Figure 32.18 gives the NISP present. It is evident that both limbs and skulls are represented; the absence of some of the smaller feet bones is likely to be the result of a recovery bias.

Only ten sheep/goat bones with butchery marks were recorded. Chop marks were noted on a humerus, femur, tibia, and metatarsal. Some of these butchery marks are clearly associated with dismemberment such as the removal of the back feet. Filleting marks were recorded on a humerus, radius and metacarpal; and a skull had evidently had the horn sawn off for use as a raw material.

Pig

As with cattle and sheep/goat, the sample is too small for an analysis of the anatomical parts represented. Figure 32.19 demonstrates that all body parts are represented at the site.

Six pig bones with butchery marks were recorded, including a mandible chopped where it had been removed from the skull. A chop marks were also noted on a femur, associated with the dismemberment of the hip joint. A single calcaneum also had cut marks from the dismemberment of the ankle. Filleting of two humeri and a femur were also noted.

Deer species

Fallow deer is the most abundant deer species represented at the site, with red and roe deer occurring in smaller quantities. Although the sample is small, the apparent biases in terms of anatomical parts can be shown to have been the result of hunting practices associated with the ritual unmaking of the deer. The ritual of the ‘unmaking’ of the deer followed the kill in a hunt, and was normally carried out at the kill site. Hunting manuals explain how the deer were skinned, disemboweled and butchered (Cummins 2001, 41-44). Body parts were gifted to hunt members in a ceremonial fashion according to their social station, which should therefore be apparent in the anatomical parts of deer represented at the consumption sites of those of differing social status (N. Sykes pers. comm.). Specifically, during the unmaking the hunting dogs received much of the offal, the corbyn’s bone (pelvis) was cast away as an offering to the raven, the left upper shoulder was gifted to the forester or parker, and the right upper shoulder went to the best

hunter or breaker of the deer (*ibid*). Only two thirds of the venison would therefore have been transported to the lord's residence or gifted to other members of the social elite (*ibid*).

Anatomical Part Representation of Deer Species

Figures 32.20 to 32.22 give the anatomical parts represented by each deer species at the site, separated by left and right side. It is noticeable in Figure 32.20 that no confirmed identifications of fallow deer femur and tibias were recorded; according to the above described practice these would have been removed to a higher status site. Out of 16 scapula, humerus and radii, there are seven recorded from the right side of the body (Fig. 32.20). The gifting of the forester's portion of the left fore limb would appear to hold true for this species, with the 'best hunter's' portion also found at the lodge. The presence of three metatarsals, potentially butchery waste of the hind limb, may suggest that in some cases this ritual took place within the vicinity of the lodge.

The anatomical parts of other deer species, although less common, clearly indicate the presence of the hind limb at the site. In the case of roe deer, where the tibia is most frequent, these are predominantly from shaft cylinders including both the proximal and distal ends of the bone, not consistent with the discarding of the distal tibia in the butchery waste of this limb. This may suggest differential treatment of red and roe in comparison to fallow deer. These animals may represent the buck and the doe owed to the park keepers on an annual basis as part of their fee. Alternatively, they may represent animals associated with the entertainment of the upper social classes when the lodge was used as a base for their hunting activities.

Butchery of deer

The number of deer antlers is deceptive in suggesting the number of antlers removed from a carcass. Table 32.21 shows that the majority of antlers, where they can be identified, are naturally shed from the live animal and collected, presumably as a source of raw material, and may have formed an additional income for the keepers.

Butchery marks on deer bones were scarce. On fallow deer chop marks were noted on two antlers, one where it had been removed from the skull, and on a scapula associated with the disarticulation of the fore limb. Two jaws had evidently been removed from the skull with a knife. Filleting marks were also noted on a single radius.

Similarly for red deer, a single antler had been sawn off the skull. Knife marks were also recorded on a mandible where it was removed from the skull and the tongue removed. A further antler was recovered with a cut mark and saw marks, and a pelvis had been chopped during dismemberment or the hip. Only a single butchery mark was recorded on roe deer, where a tibia had been filleted.

Three more antlers, not identified to a species level, were recorded with a chop, cut and saw mark respectively. A further deer mandible had knife marks where the tongue had

been removed, and a red or fallow deer humerus was recorded with dismemberment where it was separated form the ulna.

Pit 134059

Pit 134059 was located approximately 350 m south-west of the lodge at the edge of the deer park near the former course of Bury Lodge Lane. It contained at least three adult and one neonatal deer. Table 32.22 gives the minimum number of elements of these remains, at least one of which was a hind as it was evidently pregnant at the time of death. Remains of only one skull are represented and no antlers were found, suggesting that at least two skulls were removed. A number of elements are absent, particularly a number of the hind limbs, with only one butchery mark recorded from the filleting of a humerus. Meat, therefore, appears to have been removed from the kill site both on and off the bone.

Pelves of two individuals appear to be present, suggesting that the practice of leaving the pelvis for the raven, the corbyn's fee in the unmaking of the deer (Cummins 2001, 42), has either been followed with only one individual or not at all. A further 141 rib fragments and 33 vertebra fragments were recorded which may have originated from these animals, although as the pit contains quantities of residual Romano-British pottery some animal bone may also therefore be residual.

It has already been shown that the distribution of body parts for fallow deer consistent with the unmaking of the deer ritual. It is therefore at odds that this example does not follow the same pattern. The explanation of a legitimate hunt, therefore, seems unlikely. An alternative explanation is that the butchered remains are from an illicit hunt within the deer park. Poaching within deer parks is known of since their early days (Birrel 1982). It is unlikely that the pit was excavated for the purposes of disposing of the remains of an illicit hunt, and there is no evidence of deliberate backfilling of the feature, but it may have been a pre-existing hole; possibly a waterhole.

Pond 103027

This lay on the eastern side of the LTCP site, from the same period as the use of the hunting lodge. Within its upper fill 19 horse bones were deposited, from at least three individuals. The remains comprised mainly leg bones, including radius, ulna, metacarpal, pelvis, femur, tibia and metatarsal. Filleting marks were noted on the femur and metacarpal, with a dismemberment mark on a metatarsal. The animals were unlikely to have been consumed by humans at this time, and may well have been butchered for ease of disposal or possibly as dog meat.

Age at Death and Sexing Data

Data concerning the age at which animals were slaughtered, including mandible wear scores and epiphysial fusion, as well as sexing data is scarce for all species. The data presented below demonstrates the presence of both younger and older, as well as male and female, animals; but does not imply a strategy in their husbandry.

Cattle

Only six mandibles or loose teeth were recovered from which an age of death for cattle could be estimated. Two mandibles were recorded at less than one month old, and a further two at one to eight months. Both of these may well represent natural fatalities. A fifth animal died at 2.5-3 years of age, and a further two adults at over three years of age.

Young animals are evidently present at the site, with a further six long bones described as being from young animals, including a newborn individual. Bones showing the fusion states of cattle were scarce, but again demonstrated the presence of younger animals slaughtered before three to four years of age (Fig. 32.23).

Only one pelvis was recorded from which the sex of the animal could be recorded; this was from a female.

Sheep/Goat

Only five mandibles were recovered from which an age of death could be estimated, one each at two to 12 months, one to two years, three to six years, four to eight years, and six to eight years. The younger mandibles attest to the consumption of lamb as well as older animals. The fusion data was too scarce to be useful. Two pelves were recorded from male animals.

Pig

11 mandibles were recorded from which an age of death could be estimated, two at less than one year of age, two at six to 24 months, and three at one to two years. A further four mandibles were recorded, two at over one year old, and one at over two years. 12 mandibles or loose canines were recovered from which the sex could be determined, seven from males and five from female animals. Specimens with epiphysial fusion states were too scarce to be useful.

Other Mammals

Horse

Horse bones are present at the site in small numbers. Although not used for human consumption, butchery marks are evident on the bones. In addition to those bones described in pond SG 103027, filleting marks occur on two humeri, as well as dismemberment marks on a pelvis. Chop marks also occur on an individual humerus, radius and pelvis. These animals could have been dismembered for ease of disposing of the carcasses, but the meat may also have been used for dog food, although there is no evidence of a kennels or large numbers of dogs at the site. The horse bones recovered from a medieval pond which may also relate to the activities at the hunting lodge can potentially also be added to this material.

Horses may have been brought to the lodge for the purposes of hunting, negating the need for a large number of animals to be kept at the lodge all year round or for the disposal of their carcasses at death.

Dog

Despite the fact that the site is a hunting lodge, only two fragments of dog are present in the form of a canine tooth and a humerus. However, canine gnawing was noted on 48 specimens of other species. This may indicate that only a small number of animals were actually kept at the lodge. As with horses, hounds may also have been brought to the lodge for the hunt rather than kept there on a permanent basis. The site of any kennels was not identified during the excavations.

Cat

Cat is represented by the single occurrence of humerus and metatarsal. This was of a domestic animal associated with the lodge.

Fox

A single fox radius suggests this animal was also killed, but is perhaps likely to represent the killing of a pest to domestic fowl rather than the hunting of the fox for sport which became popular in the 17th century (Wilson and Edwards 1993, 53).

Rabbit

Rabbit bones were recorded only in small numbers, but it is considered to have contributed to the diet of the lodge occupants.

Bird Species

Domestic fowl, including some smaller bantam, evidently form the main bird species consumed at the lodge, although these were over-represented in Table 32.16 (see above). Evidently these are predominantly from adults, with only a single unfused element demonstrating the presence of younger birds. Domestic fowl were most likely kept as a source of eggs as well as meat.

A deposit of at least three domestic fowl were recovered from the backfill of latrine 447014; all had spurs on the tarso-metatarsus. Although spurs can be found on hen birds, they are usually rare (Maltby 1979, 68). Of the five tarsus-metatarsus present three were pathological and the other two were normal examples from the same bird. The pathology was in the form of large areas of exostosis, mainly around the proximal end, the spur and shaft, although on one specimen it was also present to a smaller degree on the distal epiphysis. A small amount of exostosis was also present at the distal end of a tibio-tarsus. The cause of the exostosis is unknown, but suggests they represent older birds for this pathology to have developed to such a degree (Baker and Brothwell 1980, 167).

Although they may cocks used for breeding, a deposit of older male birds such as this may represent birds used as fighting cocks.

Domestic/greylag goose and pheasant were only present in small numbers, but included unfused elements of goose suggesting this bird was bred at the site. Only one fragment of grey heron was noted, from a later medieval deposit, but this is likely to have resulted from wildfowling expedition with the bird having been hunted with hawks (Cummins 1988, 204).

Pathologies

Only one pathological specimen was noted, besides the bird bones described above. This was in the form of a widening of the proximal articular surface of a cow second phalanx caused by limited amount of exostosis around the articular surface. This is the result of the ossification of cartilagenous excresences which may be compensating for a degenerative problem in the joint.

Metrical Analysis

The total number of potentially useful measurements within each period was too small to be useful, beyond comparison with the known size ranges of animal bones, noted in the text for each phase above. Below is presented some data for cattle which produced enough of some measurements for further comment between different periods.

Figures 32.25 and 32.26 present the measured breadth of the distal end of cattle tibia. Here an increase in cattle size is suggested by the late Romano-British period. Although the total sample is small, the size range from the Stansted excavations of the late Romano-British material extends beyond that indicated for pre-Romano-British material from 155 specimens in the ADS Animal Bone Metrical Archive (ADS: ABMA). The range of pre-Romano-British examples in this archive, including material dated from the Bronze Age to the Late Iron Age/early Romano-British, ranges between 39.28 and 60.6mm, and for Romano-British examples between 48.1 and 76.0mm (ADS: ABMA). The increase in the size of Romano-British cattle has been noted in other areas of Romanised Britain, suggested to have been the result of imported breeds (Maltby 1981, 185).

Discussion

Prehistoric and Romano British

Prehistoric domestic species

A number of areas of settlement and land use were excavated from which animal bone was recovered from the Bronze Age to the early Romano-British period, although the bones often in limited numbers when considered on a site specific basis. The Bronze Age settlement at the MTCP site comprises much of this material of this period, and two

settlements at the LTCP site the bulk of the Iron Age to early Romano-British material. Cattle and sheep are demonstrably the most numerous domestic species, kept in roughly equal numbers. This conforms to a general pattern found in British Iron Age faunal assemblages, although this is not one without exceptions (Hambledon 1999, 33-60). Beef, however, forms the larger part of the meat diet simply due to the greater size of these animals. Pork was consumed, but as a consistently smaller percentage of the overall meat diet. Each of these species are bred, slaughtered and consumed at the settlement sites.

Cattle from Iron Age to early Romano-British sites were kept to an age likely to reflect their exploitation as milk herds as well as their use for traction. With sheep, although wool and milk would have been a useful resource, Iron Age to early Romano-British data suggests that the majority were killed before three years of age for consumption. Wool and milk would have been available from the remaining breeding stock. The ageing data from the Bronze Age settlement is scarce, but what is present hints at a similar method of sheep husbandry in this earlier period.

As has been noted at other Iron Age settlement sites in the area (Hutton 2004, 60), sheep/goat tibias appear in greater abundance that would normally be expected. Rather than being the result of movement of meat on the bone it has been suggested that this bone was, possibly opportunistically, retained by the inhabitants as a source of raw material for working (*ibid*). Gougers made from sheep/goat tibias, as well as other bones, are well known from prehistoric sites, although only one example was found from these excavations in a Bronze Age context. It is debatable as to whether this material represents fragmented offcuts or simply material that was kept but never required.

Butchery evidence for each species is scarce, although cattle, sheep and pigs were evidently dismembered and filleted, with skinning marks also recorded on cattle bones. One butchery mark was noted associated with the removal of the horn from a Bronze Age cow for working as a raw material. The lack of evidence for the removal of sheep and pig skins and the removal of the horn from cattle and sheep may say more about the paucity of the archaeozoological record that the absence of these practices.

The depositional characteristics of this material typically include small numbers of highly fragmented bone typically in pits or settlement boundary ditches, as well as the large rectangular enclosure ditch on the LTCP site, and thought to represent a number of individuals. There is no indication of the burial of butchery waste from the slaughter of individual animals in pits until the Romano-British period, where two such features are identified. Much of this animal bone may have been deposited in a similar manner to that best seen in the stratigraphic events of the Bronze Age waterhole 309075, which includes a sequence of backfilling episodes with midden material over an extended period of time.

Romano-British domestic species

The majority of the Romano-British material was collected from two areas, a settlement area on the MTCP site and features at the LTCP site. The contribution of material from the LTCP was considered problematic, due to the possible inclusion of residual Iron Age

bone which may account for the larger percentage of Romano-British sheep/goat present at this site.

It has been suggested that the MTCP settlement forms a satellite settlement within a larger estate or *latifundia*. Within this period a higher percentage of cattle bones suggests an increase in this species, possibly to feed the Romano-British urban market or the military (Maltby 1984, 130). The age at which cattle are slaughtered is similar to that of the previous periods, ie older animals, suggesting that milk production was important in their husbandry as well as use for traction. However, beef removed from the site on the hoof would leave no trace of their presence at the site. The use of the cattle herd primarily for the production of beef may not be reflected in these results if significant numbers of the live sample were removed before slaughter. Larger breeds of cattle are suggested in this period, possibly from imported stock (Maltby 1981, 195).

There is some suggestion that beef was removed on the bone from the site, which is not noted in the earlier periods. Speculatively, this may have been to feed a villa or other settlements associated with the larger estate. Two pits were identified, each associated with the butchery waste from four cattle.

The butchery of animals demonstrates the dismemberment and filleting of domestic species, with a greater occurrence of chop marks compared to the earlier periods suggesting greater reliance on the cleaver. Skinning marks also appear on cattle, although sheep and pig skin is also likely to have been utilised.

Other species

Horses are present at the sites in small numbers, and butchery marks on their bones suggest their flesh is also consumed, although there is no evidence that they are bred at the sites during the earlier period. Horses may have been taken from wild stock at three years of age when suitable for use as working animals (Harcourt 1979, 158). Only one bone from a young horse was recovered from the excavations, from a late Romano-British deposit.

Roe and red deer are present in small numbers, occasionally represented by naturally shed antlers collected as a source of raw material. As well as butchery of the animals for their meat, one young roe deer from a Romano-British deposit had evidently been skinned. Domestic fowl, including bantams, and domestic cat are generally Romano-British introductions (Davis 1995, 177) and appear at the MTCP settlement in this period. Similarly, the Romans are thought to have domesticated the greylag goose (Maltby 1979, 71), which is also present at the settlement of this period. Bones from at least two polecats were recovered from a Bronze Age waterhole. These may have been killed as vermin, or possibly for their pelts. A single fragment of aurochs was recovered from the ring ditch of a Bronze Age barrow.

Medieval

Two areas of medieval occupation were noted, but the animal bones were few and do little but attest to the disposal of domestic species at these sites. One pit was identified from which the butchery waste of cattle was deposited, away from the areas of occupation, as well as a deposit of butchered horse bones in the fill of a pond. This latter deposit was thought to possibly relate to the later medieval to early post-medieval hunting lodge.

Late medieval and post-medieval hunting lodge

Cattle, sheep and pig evidently form a significant part of the diet for the lodge occupants, and were bred and slaughtered at the site which is consistent with the documented activities of the park keepers (see Chapter 10). The anatomical parts of fallow deer, the most prevalent species, suggests that the unmaking ritual associated with the hunt was followed closely for this species. The left fore limb, the 'forester's portion' and to a lesser degree the right fore limb, the 'best hunter's/breaker's' portion, are those which are represented at the lodge. The hind limbs appear to be completely absent, except for three metatarsals potentially associated with the butchery waste, suggesting that meat from the hind limb was removed on the bone for consumption at higher status sites. Fallow deer were considered well suited to the enclosed park, and were more closely identified with the bow and stable form of hunting as opposed to *par force* hunting in an open forest (Cummins 2001, 87).

Red and roe deer appear in smaller quantities, but do not show the same pattern of selective body parts. It is suggested that this material represents animals hunted by the lodge occupants as part of their annual fee, or animals consumed at times when the social elite used the lodge as a base for their hunting activities.

Naturally shed deer antler was also evidently collected by the park keepers, possibly as part of their fee, although this is not mentioned in the documentary record (see Chapter 10). This may have formed an additional source of income.

Site Code	NISP	NISP identified to a species level
Neolithic	19	0
Bronze Age	7436	830
Iron Age	8621	1502
Romano-British	9779	1461
Medieval	2788	214
Post-medieval	2632	646
Total	31246	4653

Table 32.1: NISP per period

Category	Bronze Age	Iron Age	Romano-British	Medieval	Post-medieval
Robustness	0.51	0.62	0.61	0.69	0.54
Percentage of surface erosion	0.50	0.51	0.58	0.65	0.46
Absolute length	0.09	0.11	0.13	0.16	0.17
Percentage of the original element when identifiable	0.35	0.36	0.38	0.47	0.39

Table 32.2: Condition of the material, minus loose teeth, presented as a normalised value between 0 and 1; 1 being better preservation or less fragmentation

Species	LTCP	FLB	M11	MTCP	**Total**	**Live Meat Weight**
Horse	2			2 (0.3)	**4 (0.5%)**	
Cattle	5	4	10	285 (37.4%)	**304 (38.2%)**	**75.7%**
Sheep/Goat	3	7	2	380 (49.9%)	**392 (49.2%)**	**14.8%**
Sheep				4 (0.5%)	**4 (0.5%)**	
Goat				6 (0.8%)	**6 (0.8%)**	
Pig		1		85 (11.2%)	**86 (10.8)**	**9.5%**
Dog				8	**8**	
Red Deer			2	7	**9**	
Roe Deer				3	**3**	
Aurochs				1	**1**	
European Polecat/Ferret				4	**4**	
Deer		1	5	3	**9**	
Cattle/Horse	1				**1**	
Cattle/Red Deer	4			64	**68**	
Sheep/Goat/ Roe Deer	2	4		82	**88**	
Sheep/Goat/ Dog/Roe Deer				1	**1**	
Red/Fallow Deer				2	**2**	
Rabbit/Hare				1	**1**	
Medium Mammal	6	59	3	985	**1053**	
Large Mammal	63	11	33	767	**874**	
Small Mammal				41	**41**	
Unidentified Mammal	87	109	45	4124	**4365**	
Goose	1				**1**	
Unidentified Bird				1	**1**	
Frog/Toad				25	**25**	
Total Number	**174**	**196**	**100**	**6881**	**7351**	
Identified to a species level	**10**	**12**	**14**	**785**	**821**	

Table 32.3: Bronze Age NISP by site and percentage of total estimated live meat weight

Species	Cremation	Ditch	Gully	Natural Feature	Pit	Posthole	Ring Ditch	Ring Gully	Water-hole	**Total**
Horse									2	**2**
Cattle	7 (2.5%)		1 (0.4%)		149 (52.3%)	7 (2.5%)	8 (2.8%)		113 (39.6%)	**285**
Sheep/ Goat	5 (1.3%)	1 (0.3%)			150 (39.5%)	9 (2.4%)	1 (0.3%)		214 (56.3%)	**380**
Sheep					2				2	**4**
Goat					6					**6**
Pig	17 (20.0%)			1 (1.2%)	31 (36.5%)	1 (1.2%)	1 (1.2%)		34 (40.0%)	**85**
Dog	2	5							1	**8**
Red Deer	1				5				1	**7**
Roe Deer					1				1	**2**
Aurochs							1			**1**
Polecat/ ferret									4	**4**
Deer		3								**3**
Medium Mammal	58 (5.9%)	37 (3.8%)			417 (42.4%)	31 (3.2%)	31 (3.2%)	2 (0.2%)	408 (41.5%)	**984**
Large Mammal	30 (3.9%)	3 (0.4%)			330 (43.1%)	30 3.9%)	50 (6.5%)	1 (0.1%)	322 (42.0%)	**766**
Small Mammal					15				26	**41**
Total	**120 (4.6%)**	**49 (1.9%)**	**1 (0.04%)**	**1 (0.04%)**	**1106 (42.9%)**	**78 (3.0%)**	**92 (3.57%)**	**3 (0.12%)**	**1128 (43.75%)**	**2578**

Table 32.4: NISP by species and feature type

Species	Pit	Waterhole	**Total**
Cattle	37(38%)	16(27%)	**53**
Sheep/Goat	45(45%)	38(65%)	**82**
Sheep	1	0	**1**
Goat	4	0	**2**
Pig	13	4	**17**
Total	**100**	**58**	**158**

Table 32.5: Percentage of main domestic species (MNE) and feature type

Species	BAACP	BAALR	BAAMP	**Total**
Horse	49 (4.7%)	31 (11.2%)	13 (8.6%)	**93 (6.4%)**
Cattle	424 (41.1%)	133 (48.0%)	55 (36.4%)	**612 (41.9%)**
Sheep/Goat	389 (37.7%)	81 (29.2%)	52 (34.4%)	**522 (35.7%)**
Sheep	5 (0.5%)	1 (0.4%)		**6 (0.4%)**
Goat	2 (0.2%)	1 (0.4%)		**3 (0.2%)**
Pig	163 (15.8%)	30 (10.8%)	31 (20.5%)	**224 (15.3%)**
Dog	23	2	4	**29**
Red Deer	4		2	**6**
Roe Deer	5	2		**7**
Field vole	1	1		**2**
Cattle/Horse	1			**1**
Cattle/Red Deer	149	26	19	**194**
Sheep/Goat/Roe Deer	80	6	3	**89**
Fox/Dog	2		1	**3**
Rodentia sp		1		**1**
Medium Mammal	789	160	82	**1031**
Large Mammal	1282	532	186	**2000**
Small Mammal	4	7		**11**
Unidentified Mammal	3057	541	185	**3783**
Bird	1			**1**
Frog/Toad		1		**1**
Frog		2		**2**
Total	**6430**	**1558**	**633**	**8621**
Identified to a species level	**1065**	**284**	**157**	**1506**

Table 32.6: Iron Age NISP by site

Species	LTCP (n=East 148/West 85)		M11 (n=77)	MTCP (n=44)
	Eastern Settlement	Western Settlement		
Cattle	70.0	86.4	75.1	79.1
Sheep/Goat	15.8	8.1	11.0	9.1
Pig	14.2	5.4	13.9	11.8

Table 32.7: Percentage of estimated live meat weights derived from MNE (n=total MNE)

Species	Eastern Settlement	Western Settlement	**Total**
Horse	37 (5.6%)	8	**46 (4.7%)**
Cattle	262 (39.4%)	125 (2.7%)	**407 (40.3%)**
Sheep/Goat	254 (38.2%)	106 (42.4%)	**379 (37.5%)**
Sheep	5 (0.7%)		**5 (0.5%)**
Goat	1 (0.1%)	1 (0.3%)	**2 (0.2%)**
Pig	106 (15.9%)	55 (18.6%)	**161 (16.7%)**
Dog	18	4	**22**
Red Deer	4		**4**
Roe Deer	2	3	**5**
Field vole	1		**1**
Medium Mammal	585	171	**756**
Large Mammal	757	512	**1269**
Small Mammal	4		**4**
Unidentified bird	1		**1**
Total	**2189**	**1078**	**3291**

Table 32.8: NISP from the eastern and western settlement areas at the LTCP site

Species	**MNE**	Feature type (percentage of total MNE)						
		Cremation	Ditch	Grave	Gully	Pit	Posthole	Ring Gully
Horse	**21 (8.3)**		85.7	4.8		4.8		4.8
Cattle	**104 (40.9%)**		67.3	1.0	12.5	7.7	3.8	7.7
Sheep/Goat	**92 (36.2%)**		75.0		6.5	15.2	2.2	1.1
Sheep	**3 (1.2%)**		100.0					
Pig	**34 (13.4%)**	2.9	85.3			5.9		5.9
Total	**254**	0.4	74.4	0.8	7.5	9.8	2.4	4.7

Table 32.9: Percentage of total MNE of species within each feature type from the eastern settlement

Species	**MNE**	Feature type (percentage of total MNE)				
		Ditch	Gully	Pit	Posthole	Ring Gully
Horse	**6 (5.2%)**	83.3				16.7
Cattle	**61 (52.6%)**	73.8	4.9			21.3
Sheep/Goat	**39 (33.6%)**	51.3	7.7	7.7	2.6	30.8
Goat	**1 (0.9%)**					100.0
Pig	**9 (7.8%)**	100.0	33.3			16.7
Total	**116**	**65.5**	**6.9**	**2.6**	**0.9**	**24.1**

Table 32.10: Percentage of total MNE of species within each feature type from the western settlement

Element	Chopped	Dismembered	Filleted	Skinned	Other Cut Marks
Mandible	2	10	4		2
Skull - occipital condyle	1				
Horncore/Cranium				1	
Axis					1
Scapula		1	3		1
Humerus		4			
Radius		2	3		
Ulna		2			
Metacarpal		2	3		
Pelvis	2				
Femur		3			
Tibia			3		1
Metatarsal		1	1		
Calcaneus	1				
Astragalus		1			
Phalanx 1				5	
Total	**6**	**26**	**17**	**6**	**5**
Percentage	**10.0**	**43.3**	**28.3**	**10.0**	**8.3**

Table 32.11: Butchery marks recorded on mid-Iron Age to early Romano-British cattle bones

Species	LTCP	LBR	M11	MTCP	**Total**
Horse	55 (12.7)	2	1	113 (11.5%)	**171 (12.0%)**
Cattle	172 (39.7%)	2		649 (66.0%)	**823 (57.8%)**
Sheep/Goat	134 (30.9%)	2		160 (16.3%)	**296 (20.8%)**
Sheep	3 (0.7%^			4 (0.4%)	**7 (0.5%)**
Goat				1 (0.1%)	**1 (0.1%)**
Pig	69 (15.9%)		1	56 (5.7%)	**126 (8.8%**
Dog	25			27	**52**
Cat				1	**1**
Rabbit (intrusive)				1	**1**
Red Deer	3	1		9	**13**
Roe Deer	4			3	**7**
Deer	3			2	**5**
Cattle/Horse				1	**1**
Cattle/Red Deer	1				**1**
Sheep/Goat/Roe Deer	78			154	**232**
House Mouse (Intrusive?)	12			19	**31**
Fox/Dog	1			2	**3**
Medium Mammal	253	2		315	**570**
Large Mammal	480	4		2538	**3022**
Small Mammal	2			22	**24**
Unidentified Mammal	1067	22		3962	**5051**
Bantam				2	**2**
Dom. Fowl				2	**2**
Dom. Goose				2	**2**
Dom. Fowl/Pheasant				1	**1**
Gallioforme				2	**2**
Swallow/Martin	1				**1**
Bird	3			10	**13**
Frog	22			2	**24**
Toad	4				**4**
Frog/Toad	1				**1**
Total	**2393**	**35**	**2**	**8060**	**10490**
Total identifiable to a species level	**468**	**7**	**2**	**1033**	**1510**

Table 32.12: Romano-British NISP by site

Species	MNE		Percentage of Live Meat Weight	
	LTCP	MTCP	LTCP	MTCP
Cattle	73 (48.0%)	183 (73.5%)	83.5	93.9
Sheep/Goat	57 (37.5%)	48 (19.3%)	8.9	3.4
Sheep	2 (1.3%)	2 (0.8%)	0.3	0.1
Pig	20 (13.2%)	16 (6.4%)	7.2	2.6

Table 32.13: Percentage of estimated meat weights derived from MNE

Species	n	Ditch	Gully	Pit	Post Hole	Ring Gully	Other Features
Horse	113	60.2	3.5	34.5	0.9		0.9
Cattle	644	50.8	5.3	40.5	0.9	0.5	2.0
Sheep/Goat	160	59.4	7.5	23.8	0.6	2.5	6.3
Sheep	4	100.0					
Goat	1	100.0					
Pig	56	48.2	10.7	30.4	10.7		0.0
Total	978	53.4	5.7	36.3	1.4	0.7	2.5

Table 32.14: Percentage of NISP found within each feature by feature type, in Romano-British deposits on the MTCP settlement

Element	Chopped	Dismembered	Filleted	Skinned
Mandible	6	7	1	
Horncore/ Cranium	1			1
Scapula	3	4	3	
Humerus	4	4	5	
Radius	4	2	7	
Ulna		1		
Metacarpal	1	1	1	
Pelvis	1			
Femur	1	1	5	
Tibia	1	1	2	
Metatarsal		1	3	
Metapodial	1			
Calcaneus	1			
Astragalus	2			
Phalanx 1				2
Total	**26**	**22**	**27**	**3**
Percentage	**33.3**	**28.2**	**34.6**	**3.8**

Table 32.15: Summary of evidence for Romano-British cattle butchery

Fusion Stage Age Ranges	Fused	Unfused	Fusing
6 to 10 months	5		
10 to 16 months	7	1	
1.5 to 2/2.5 years	9	2	
2.5 to 3 years		2	
3 to 3.5 years			1

Table 32.16: Epiphysial fusion states of Romano-British Sheep/Goat; n=27

Species	Saxo-Norman Building	13-14th century Enclosed Settlement	FLB Settlement	Other Features	**Total**
Horse			14	11	**25**
Cattle	11	7	16	101	**135**
Sheep/Goat	14	9	26	17	**66**
Pig	11	5	8	24	**48**
Dog			3	3	**6**
Red Deer			1	0	**1**
Fallow Deer			1	0	**1**
Roe Deer				0	**0**
Deer			4	0	**4**
Cattle/Red Deer				8	**8**
Red/Fallow Deer			9	0	**9**
Sheep/Goat/Roe Deer				3	**3**
Fox/Dog				1	**1**
Rabbit/Hare			1	0	**1**
Medium Mammal	72	23	73	119	**287**
Large Mammal	46	21	55	797	**919**
Small Mammal		17	3	0	**20**
Bantam	1			0	**1**
Dom. Fowl				1	**1**
Bird		2		3	**5**
Toad				1	**1**
Unidentified				1487	**1487**
Total	**155**	**82**		**1274**	**1511**
Identified to a species level	**37**	**21**		**226**	**284**

Table 32.17: NISP in medieval contexts by area

Species	Later medieval	Post-medieval	**Total**	Pit SG 134059
Horse	8 8.2%)	53 (8.7%)	**61 (8.7%)**	
Cattle	23 (23.5%)	167 (27.6%)	**190 (27.0%)**	
Sheep/Goat	16 (16.3%)	104 (17.2%)	**120 (17.0%)**	6
Sheep	1 (1.0%)	3 (0.5%)	**4 (0.6%)**	
Pig	5 (5.1%)	71 (11.7%)	**76 (10.8%)**	
Dog	1	1	**2**	
Fox	1		**1**	
Cat		2	**2**	
Rabbit	2	3	**5**	
Red Deer	3 (3.1%)	26 (4.3%)	**29 (4.1%)**	
Fallow Deer	16 (16.3%)	65 (10.7%)	**81 (11.9%)**	98
Roe Deer	1 (1.0%)	14 (2.3%)	**15 (2.1%)**	
Deer	17 (17.3%)	79 (13.0)	**96 (13.6%)**	67
Cattle/Horse		1	**1**	
Cattle/Red Deer	8	45	**53**	
Sheep/Goat/Roe Deer	7	42	**49**	1
Red/Fallow Deer	8 (8.2%)	24 (4.0%)	**32 (4.5%)**	5
		1	**1**	
		1	**1**	
Medium Mammal	35	206	**241**	648
Large Mammal	56	373	**429**	
Small Mammal	1	8	**9**	
Unidentified Mammal	161	445	**606**	283
Bantam		2	**2**	
Dom. Fowl		100	**100**	
Dom. Goose		4	**4**	
Pheasant		3	**3**	
Heron		1	**1**	
Goose		3	**3**	
Dom. Fowl/Bantam		1	**1**	
Dom. Fowl/Pheasant		1	**1**	
Gallioforme		9	**9**	
Bird	2	529	**531**	
Frog/Toad		32	**32**	
Total	**372**	**2419**	**2791**	**1108**
Total Identified to a Species Level	**77**	**619**	**696**	**104**
Total Number of Deer	**45 (45.9%)**	**208 (34.3%)**	**253 (35.9%)**	**165**

Table 32.18: NISP associated with the hunting lodge

Species	MNE	Percentage of Live Meat Weight Ratios
Cattle	88 (49.4%)	83.7
Sheep/Goat	61 (34.3%)	7.9
Sheep	2 (1.1%)	0.3
Pig	27 (15.2%)	8.1

Table 32.19: MNE and percentage of live meat weight of the main domestic species from the hunting lodge

Element	Chopped	Dismembering	Filleting	Sawn	Skinning	Other Cut Marks
Mandible	1					
Scapula	1					
Humerus	1	1	2	1		
Radius	2	2	5	3		1
Radius/Ulna			1			1
Ulna	1					
Metacarpal	2		5			
Pelvis	2		1	1		
Femur	1	1	4	1		1
Tibia	3		1			
Metatarsal	4		1			
Phalanx 1					1	
Phalanx 2						1
Total	**18**	**4**	**20**	**6**	**1**	**4**

Table 32.20: Summary of evidence for cattle butchery at the hunting lodge

Species	Antler/Cranium	Shed Antler	Antler Chopped or Sawn off Skull	Total
Fallow Deer	2	3	1	6
Red Deer	6	9	1	16
Roe Deer		1		1
Total	8	13	2	23

Table 32.21: Antler from the hunting lodge

Element	Left	Right	Other
Maxilla	1	1	
Mandible	1		
Axis			2
Cervical Vertebra			6
Thoracic Vertebra			7
Scapula	2	2	
Humerus	3	3	
Radius	3	2	
Ulna	3	2	
Metacarpal	1	2	
Pelvis	2	2	
Femur	1	2	
Tibia	1	1	
Metatarsal	1	1	1
Metapodial	1		
Calcaneus	2	1	
Phalanx 1			13
Phalanx 2			10
Phalanx 3			6

Table 32.22: MNE of fallow deer divided by side, excluding neonatal remains

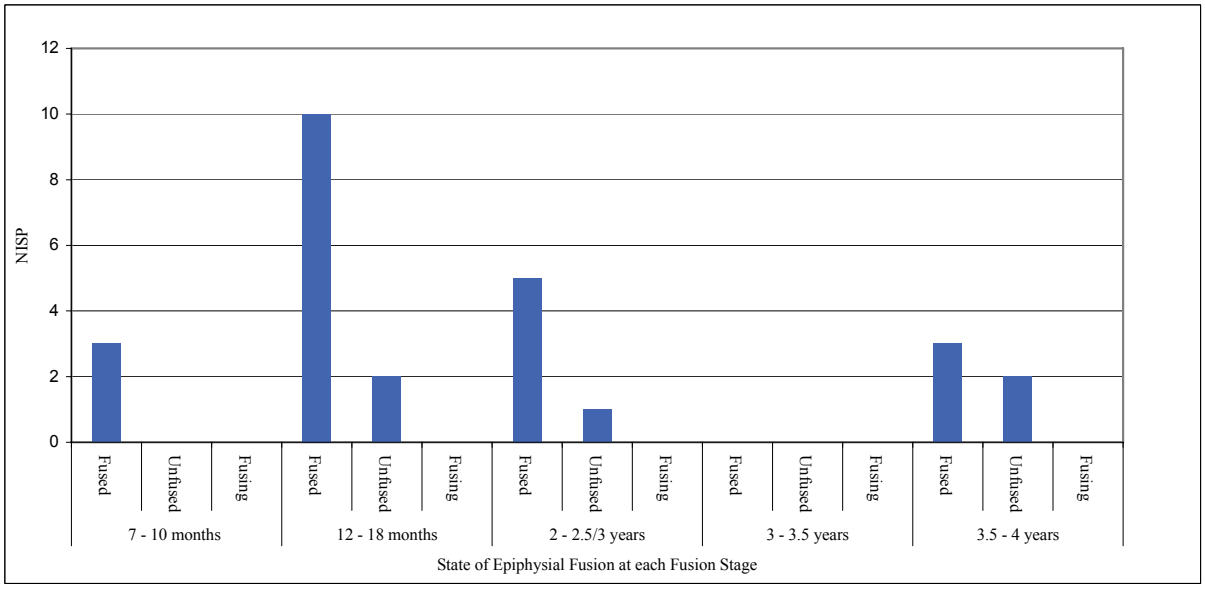


Figure 32.1: Epiphysial fusion of Bronze Age cattle; n=26

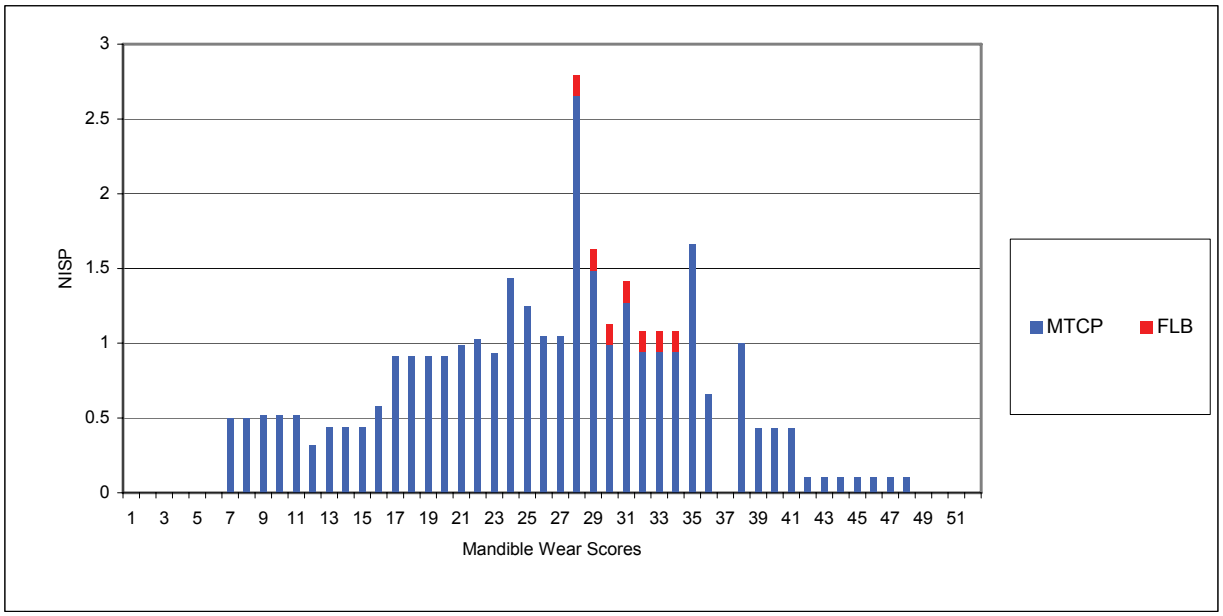


Figure 32.2: Sheep/goat and sheep mandible wear scores from Bronze Age phases, n=32

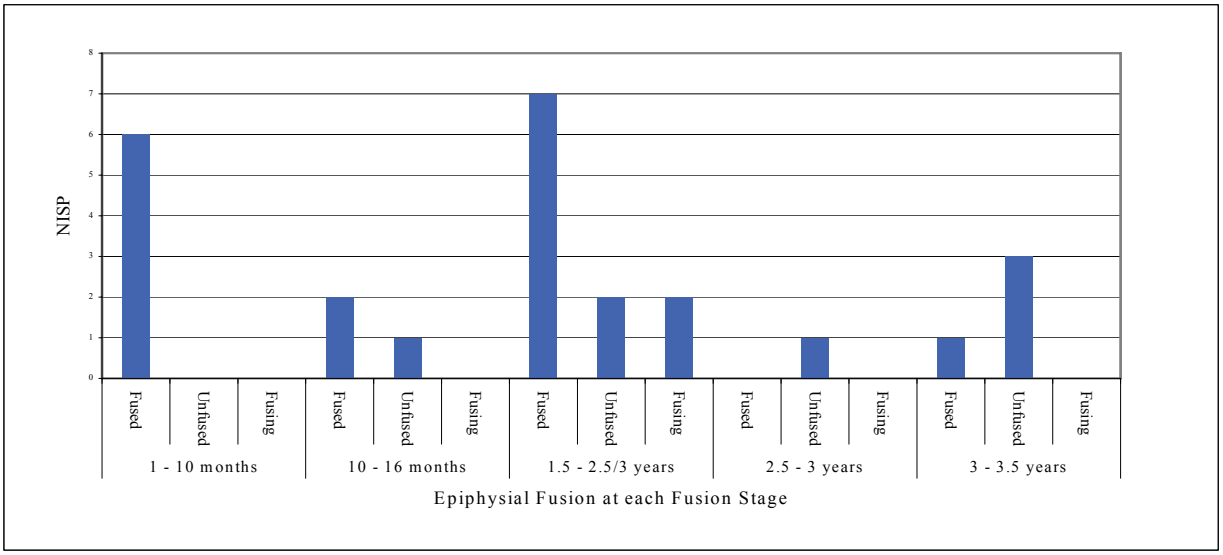


Figure 32.3: Epiphysial fusion of Bronze Age sheep and sheep/goat; n=25

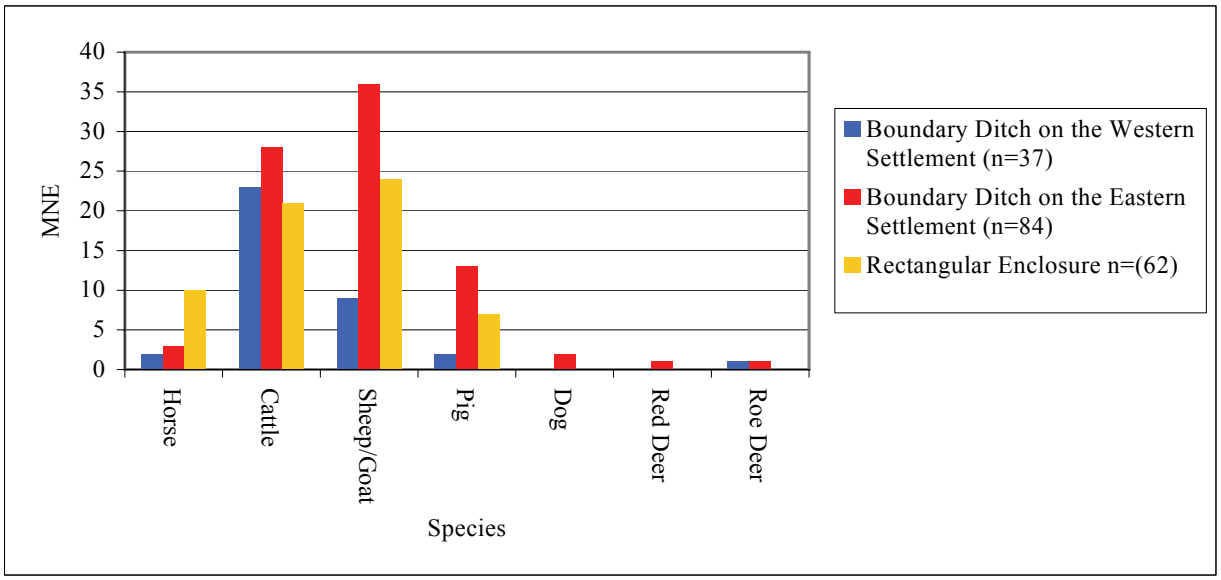


Figure 32.4: MNE recovered from the two boundary ditches and a large rectangular ditch on the LTCP site

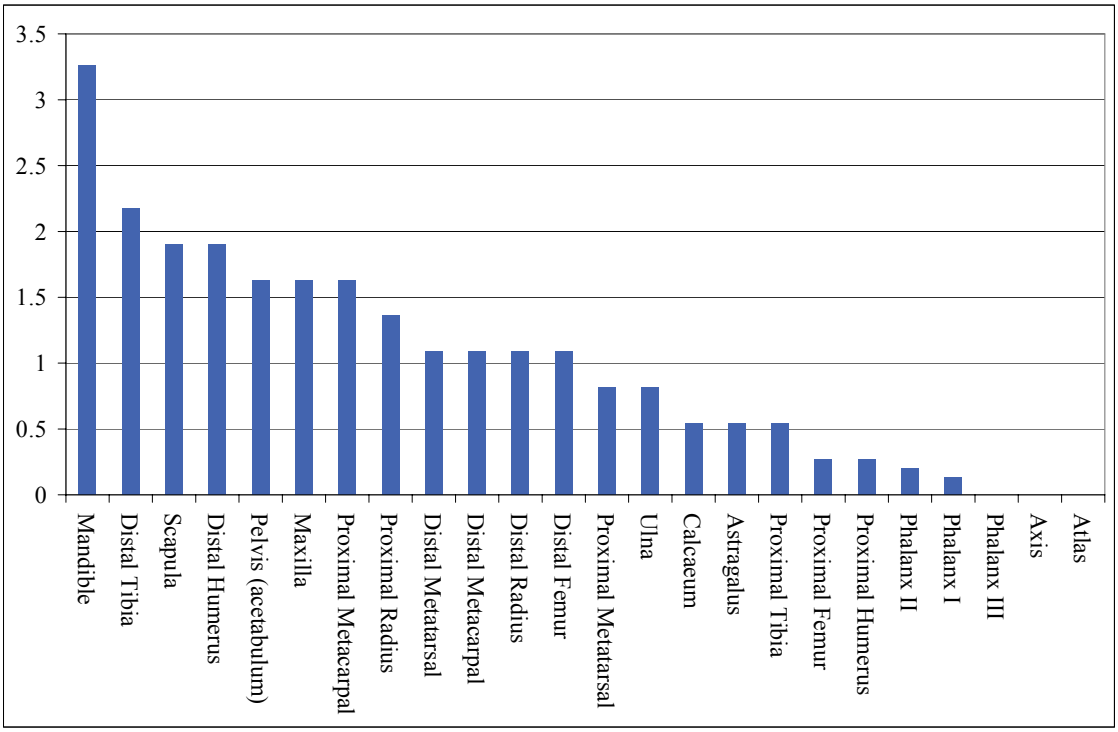


Figure 32.5: Anatomical part representation of cattle from the eastern settlement in rank order. Values to the left and including distal humerus lie above one standard deviation from the mean, and values to the right and including phalanx 1 lie below one standard deviation from the mean (n=86; SD=0.81)

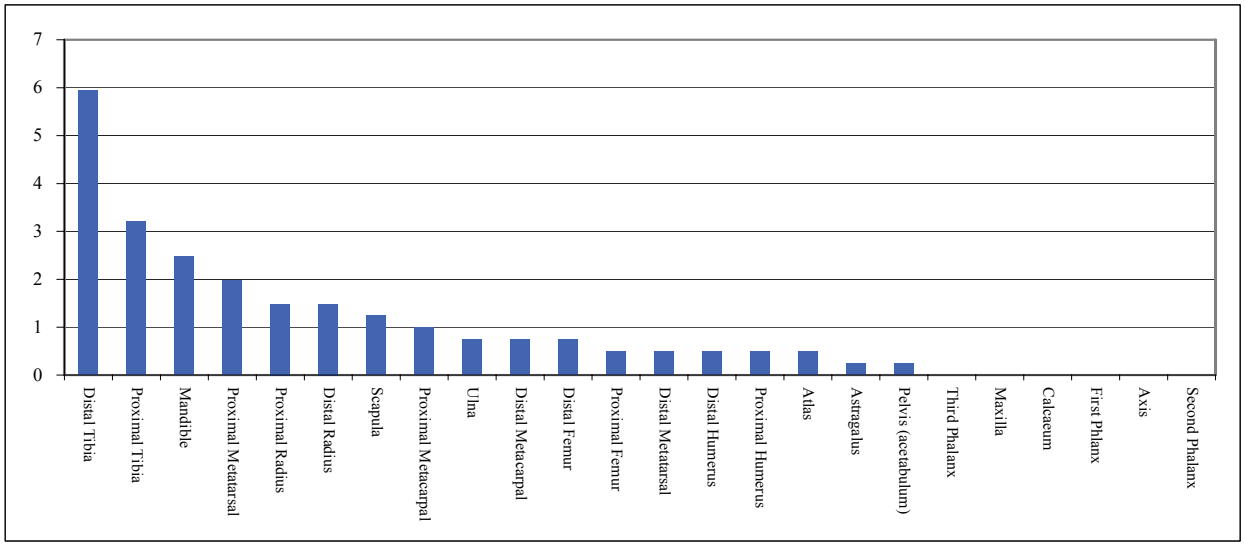


Figure 32.6: Anatomical part representation of sheep and sheep/goat from the eastern settlement in rank order. Distal tibia lies above one standard deviation from the mean (n=96; SD=1.34)

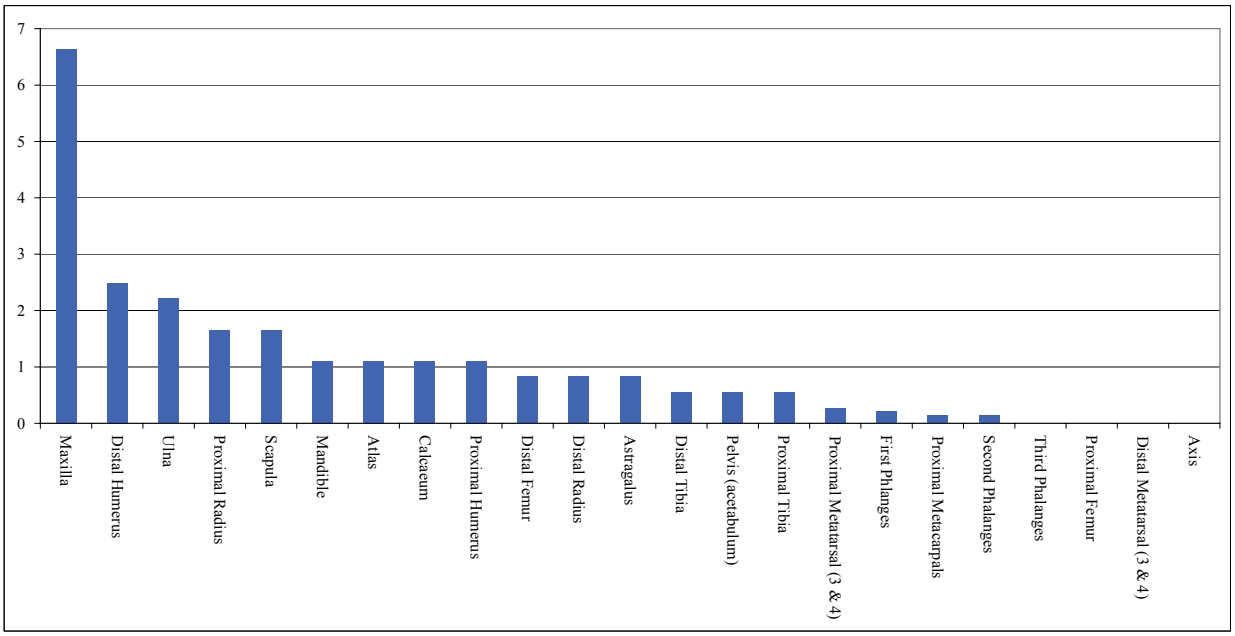


Figure 32.7: Anatomical part representation of pig including all sites in rank order. Values to the right and including distal humerus lie one SD above the mean. (n=90; SD=1.39)

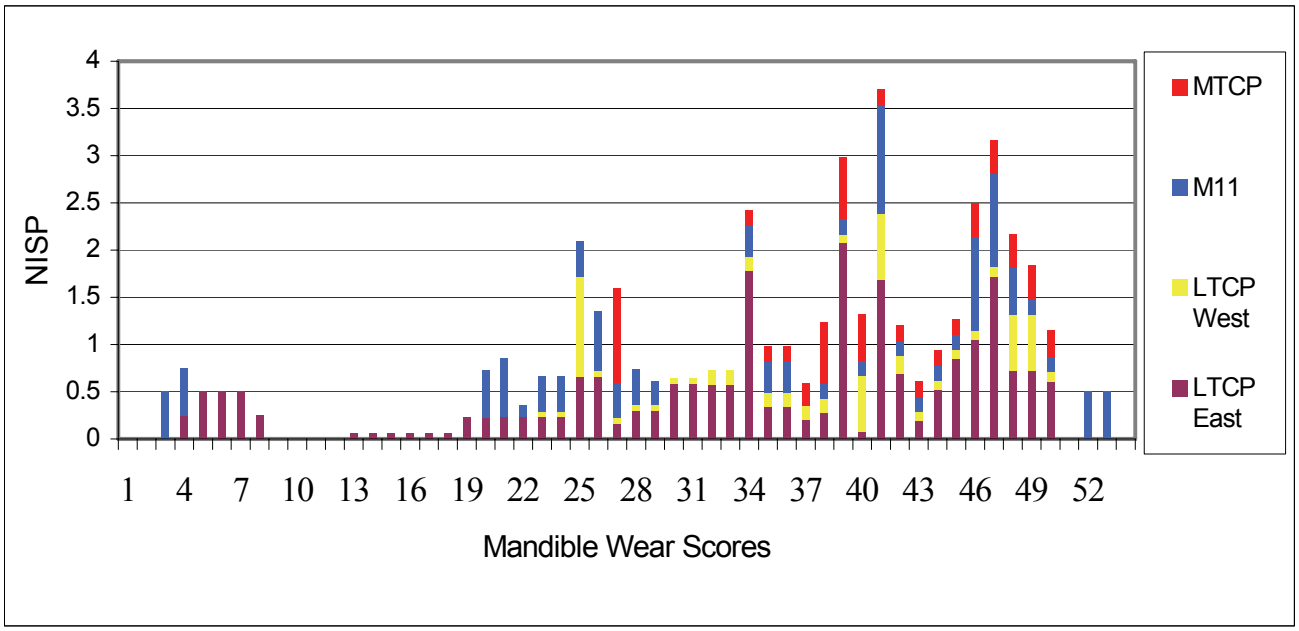


Figure 32.8: Cattle mandible wear scores from Iron Age and early Romano-British phases; n=46

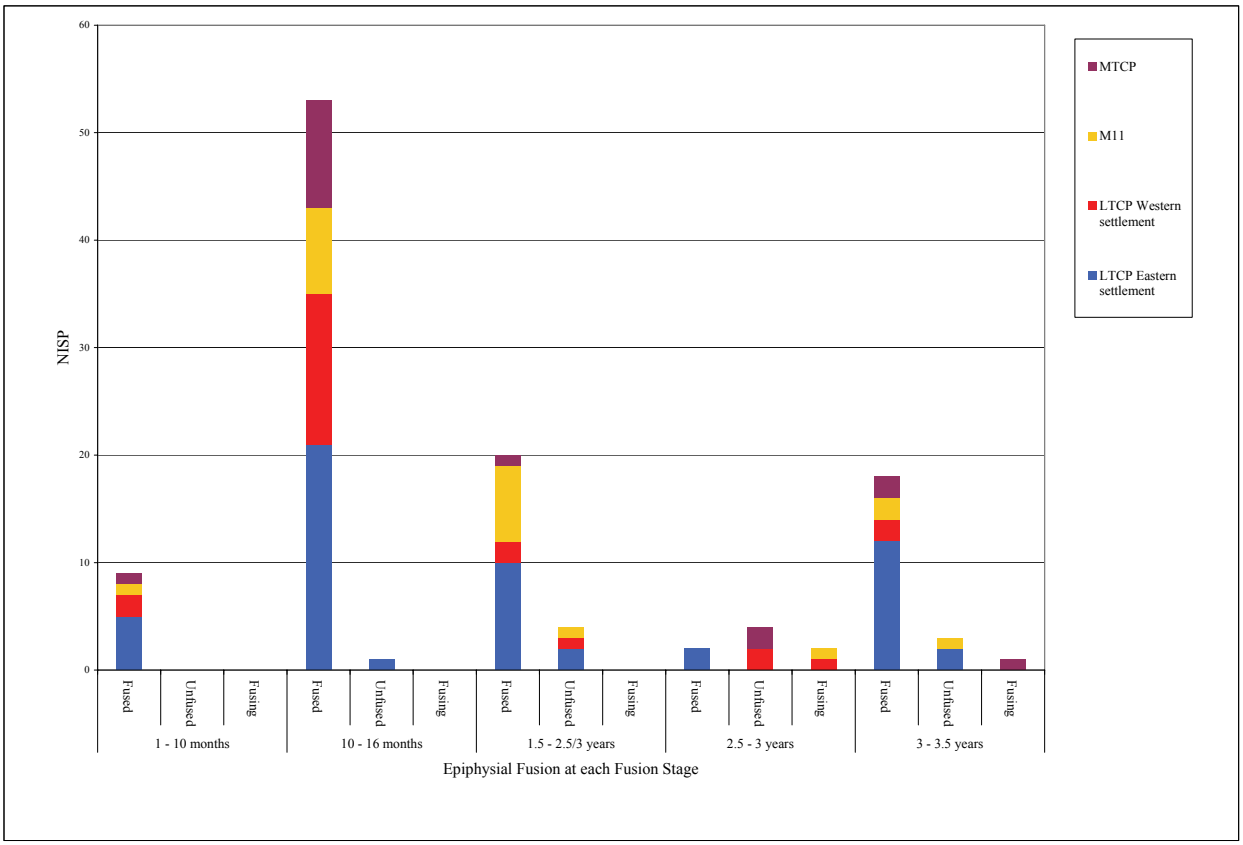


Figure 32.9: Epiphysial fusion of Iron Age to early Romano-British Cattle; n=117

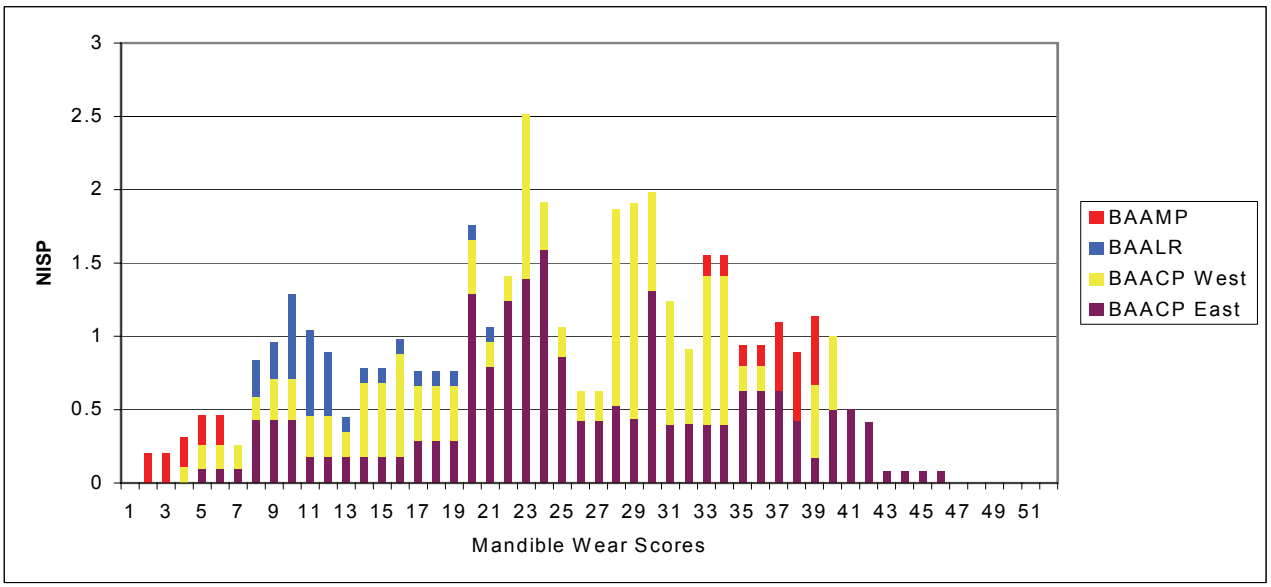


Figure 32.10: Sheep/Goat and sheep mandible wear scores from mid-Iron Age and early Romano-British phases; n=42

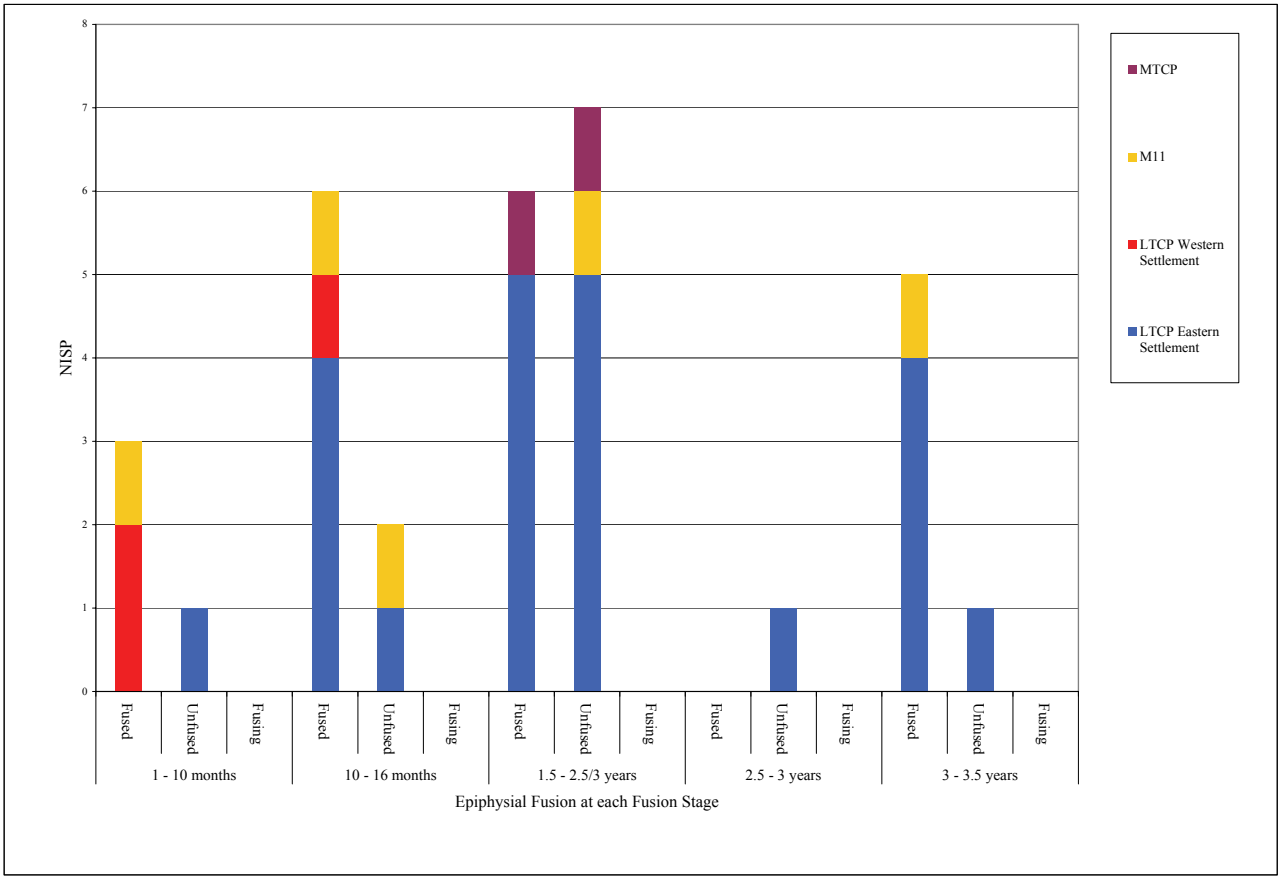


Figure 32.11: Epiphysial fusion of Iron Age to early Romano-British sheep/goat and sheep; n=32

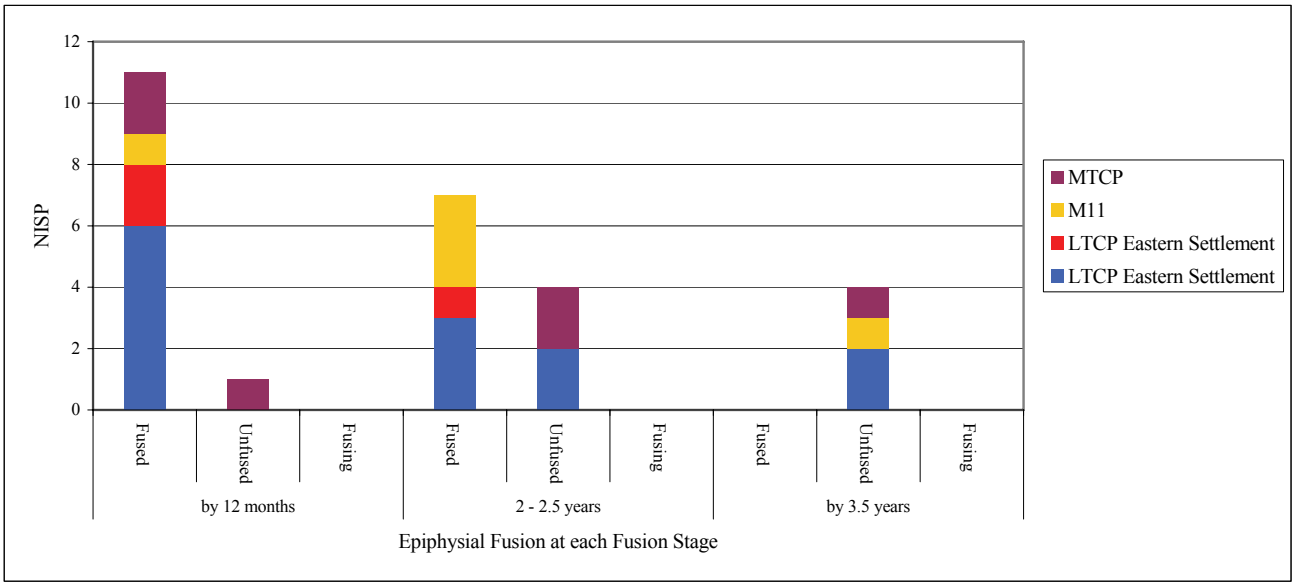


Figure 32.12: Epiphysial fusion of Iron Age to early Romano-British pig; n=27

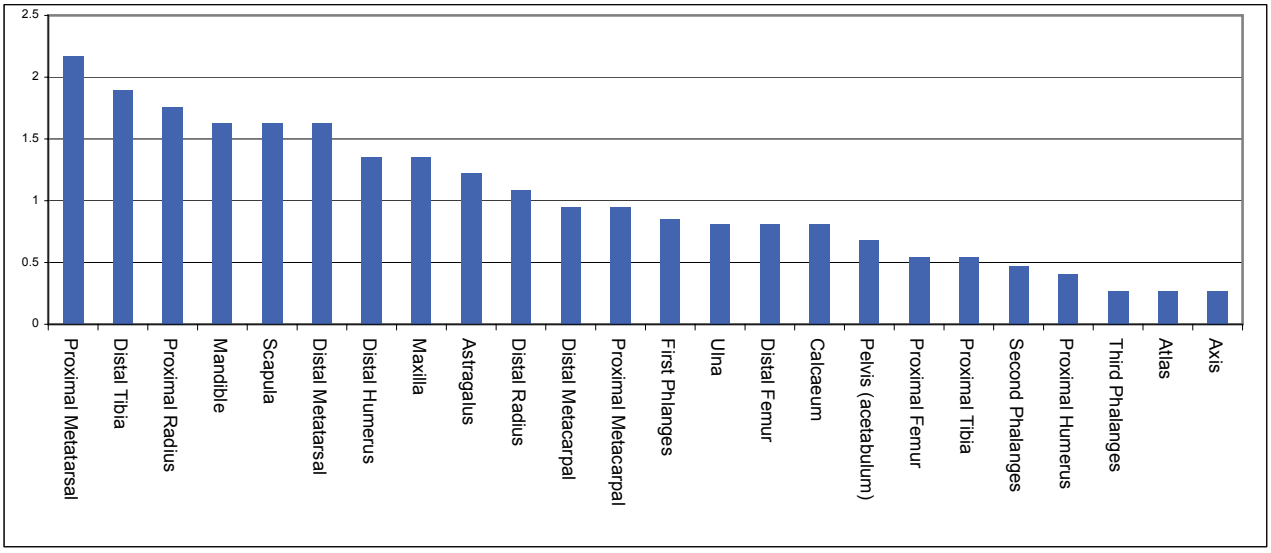


Figure 32.13: Animal part representation of cattle at the MTCP settlement in rank order. Values to the left of, and including, distal metatarsal lie above one standard deviation from the mean, and values to the right and including proximal humerus lie below one standard deviation from the mean. (SD=0.55)

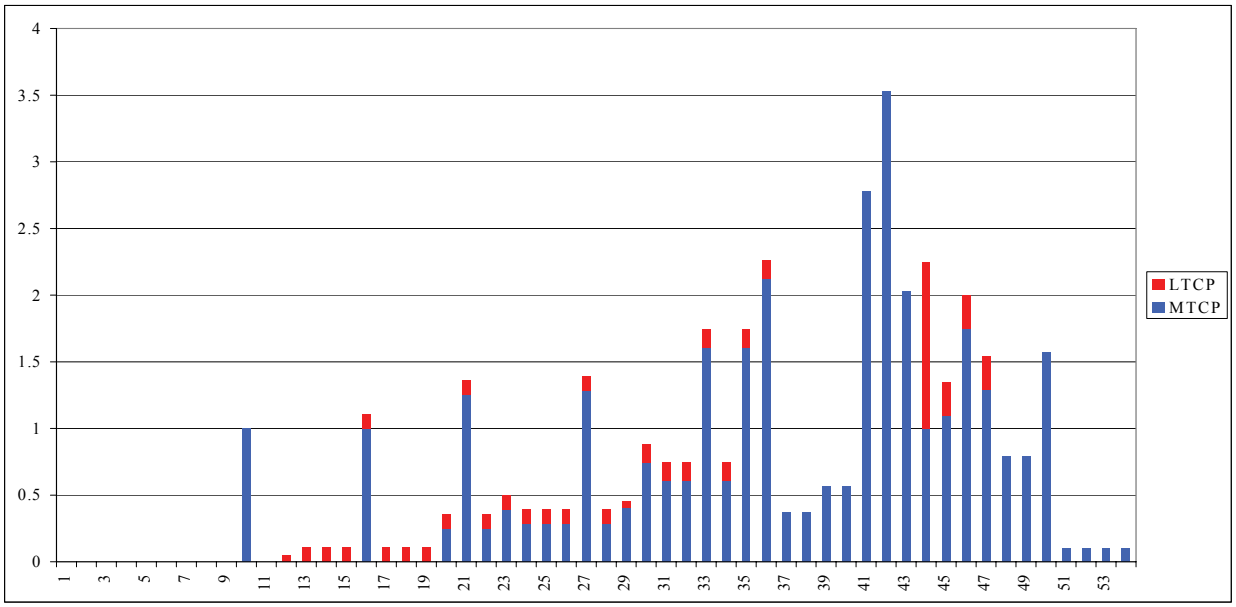


Figure 32.14: Cattle mandible wear scores from Romano-British deposits; n=37

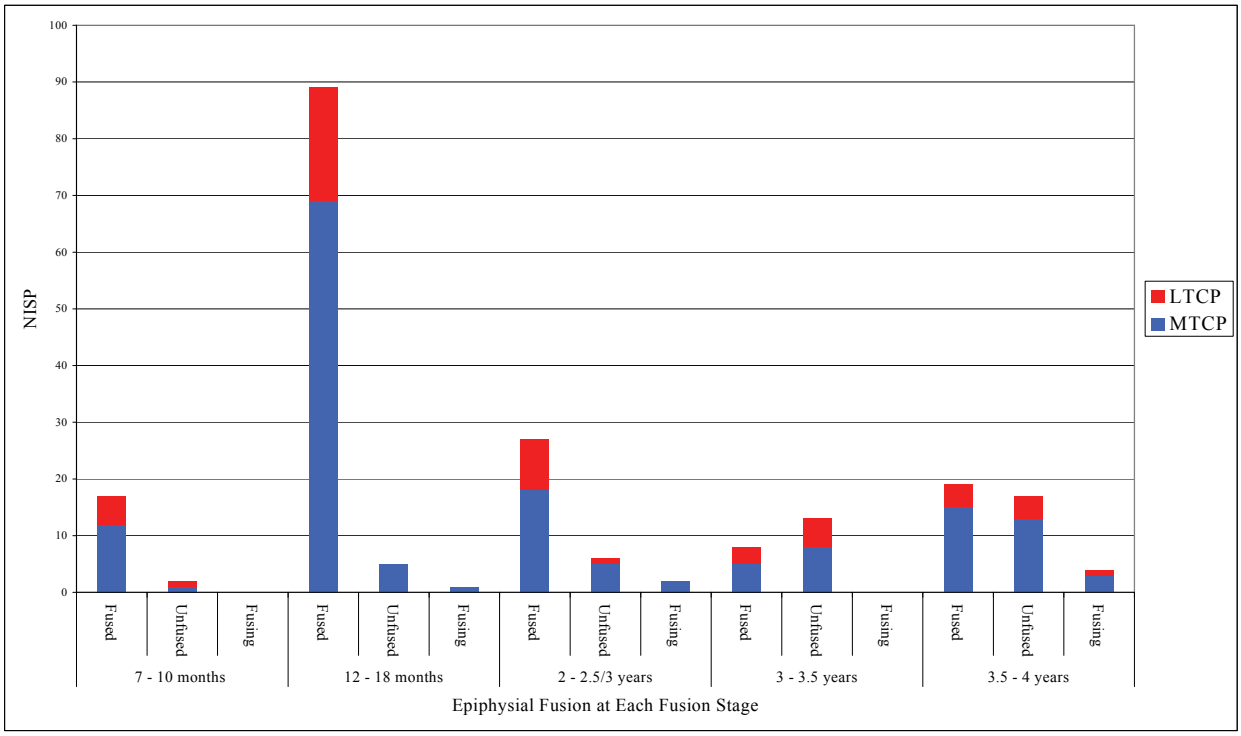


Figure 32.15: Epiphysial fusion states of Romano-British Cattle; n=210

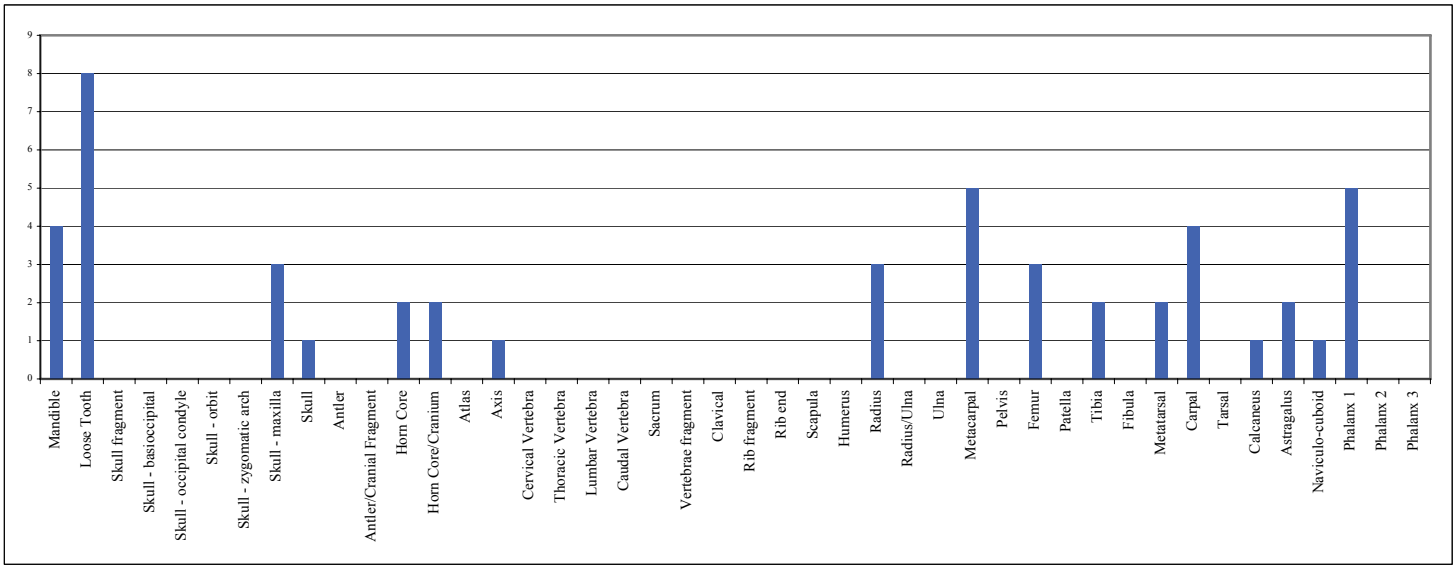


Figure 32.16: Cattle bones from medieval pit SG 310136, deposit 310139

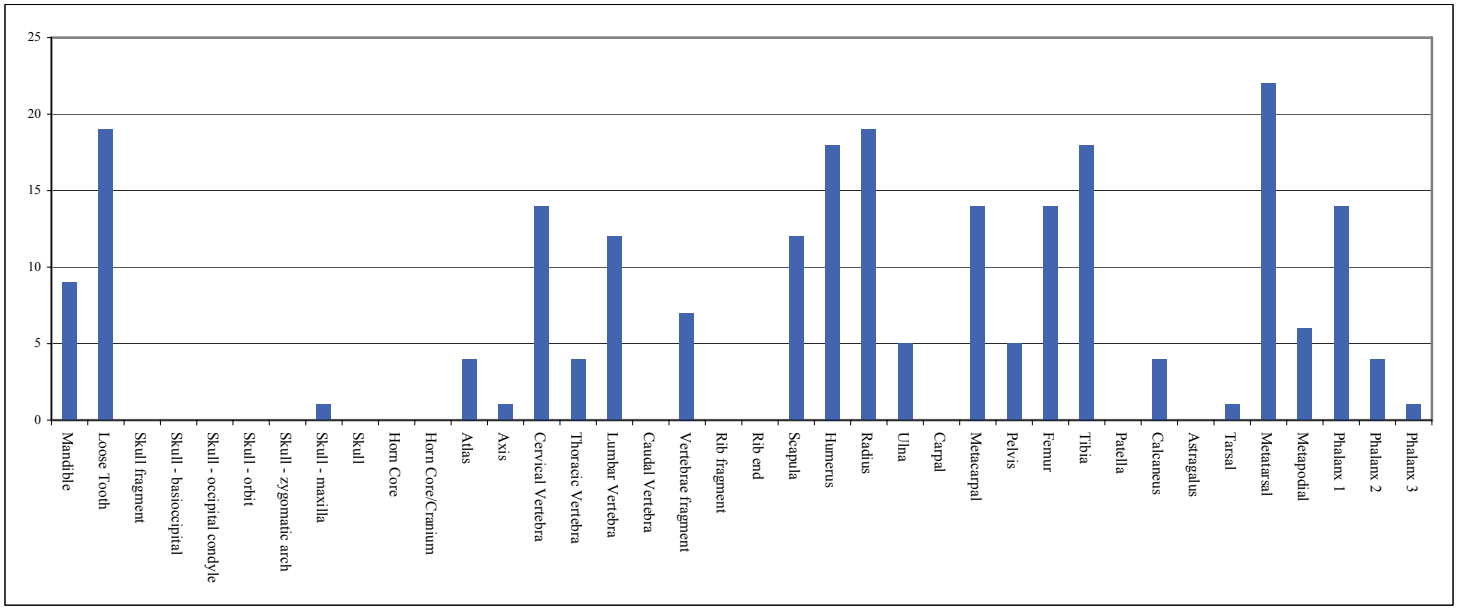


Figure 32.17: Anatomical part representation of cattle from the hunting lodge; n=187

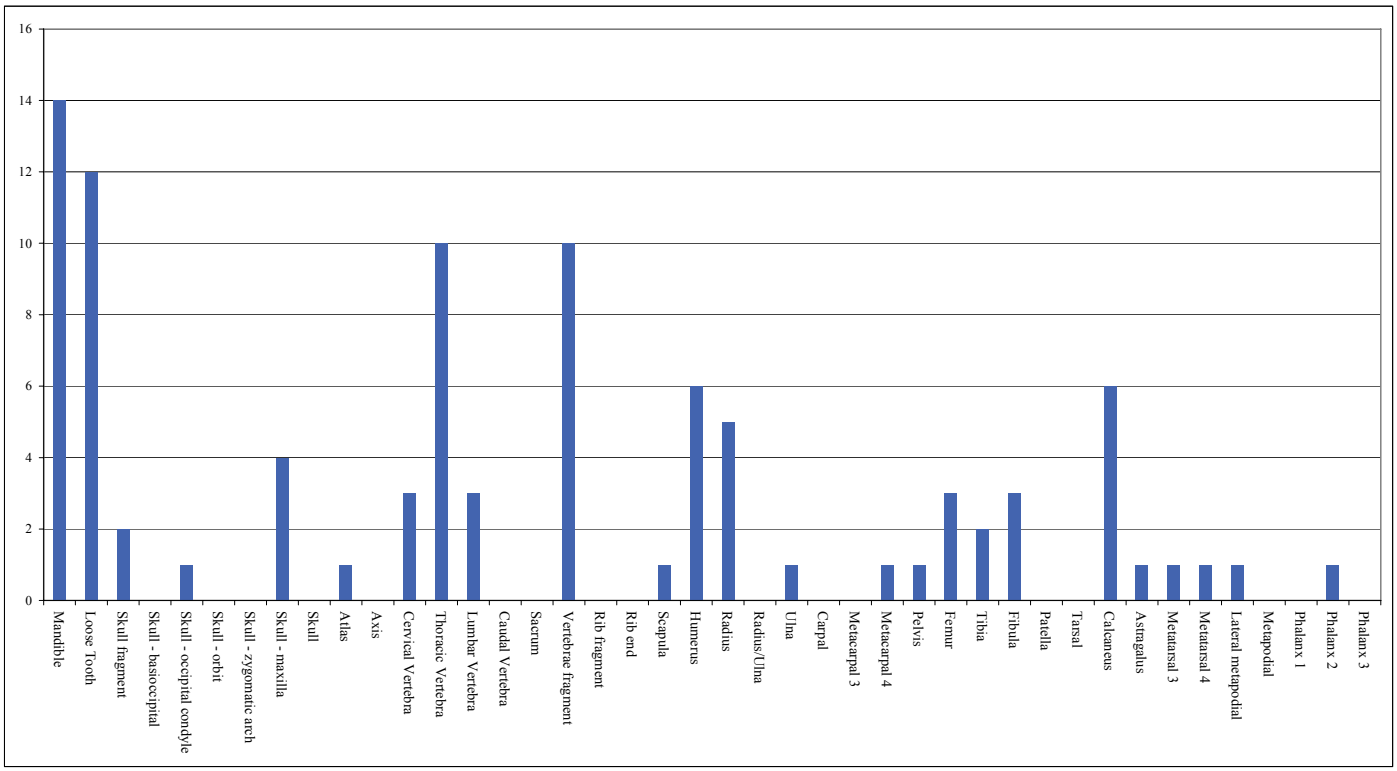


Figure 32.18: Anatomical part representation of sheep and sheep/goat bones at the hunting lodge; n=159 NISP (vertebra includes the unidentified large mammal categories which may belong to other species)

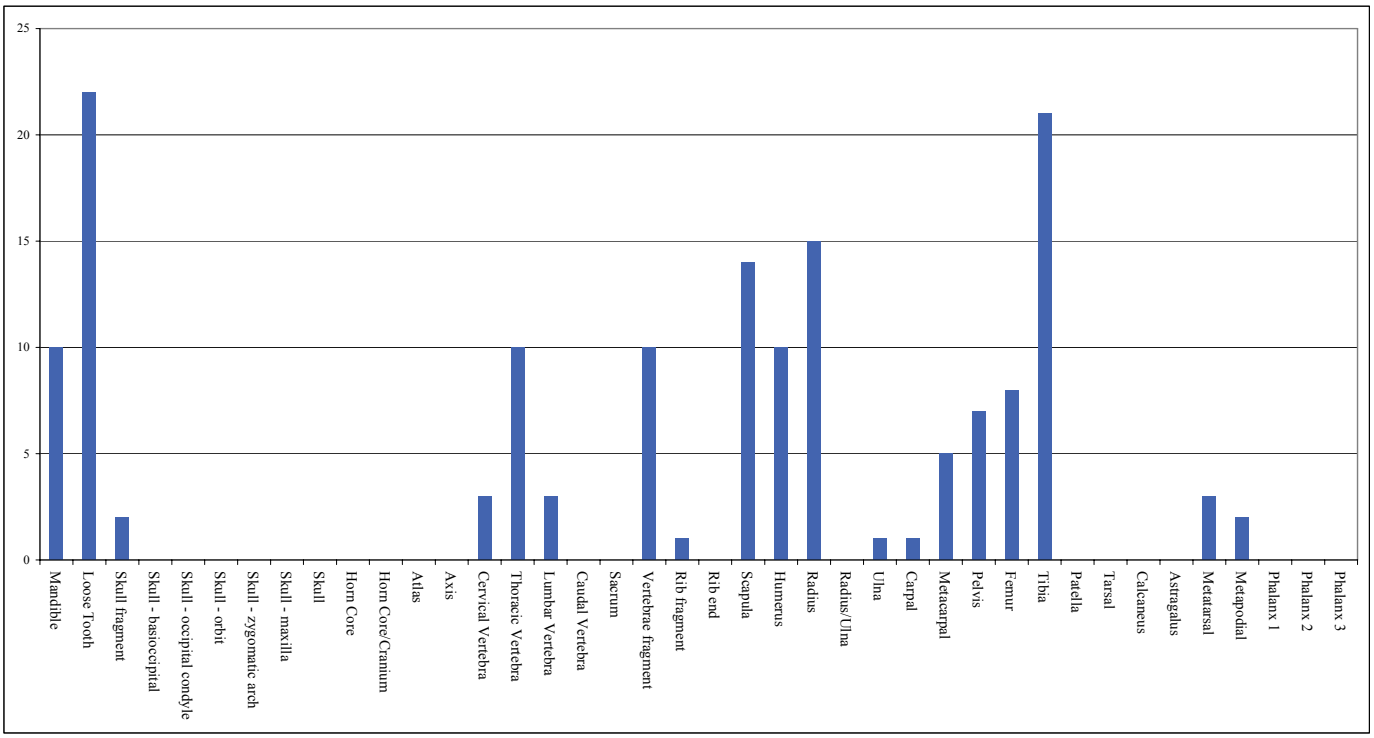


Figure 32.19: Anatomical part representation of pig bones at the hunting lodge; n=94 NISP (vertebra includes the unidentified large mammal categories which may belong to other species)

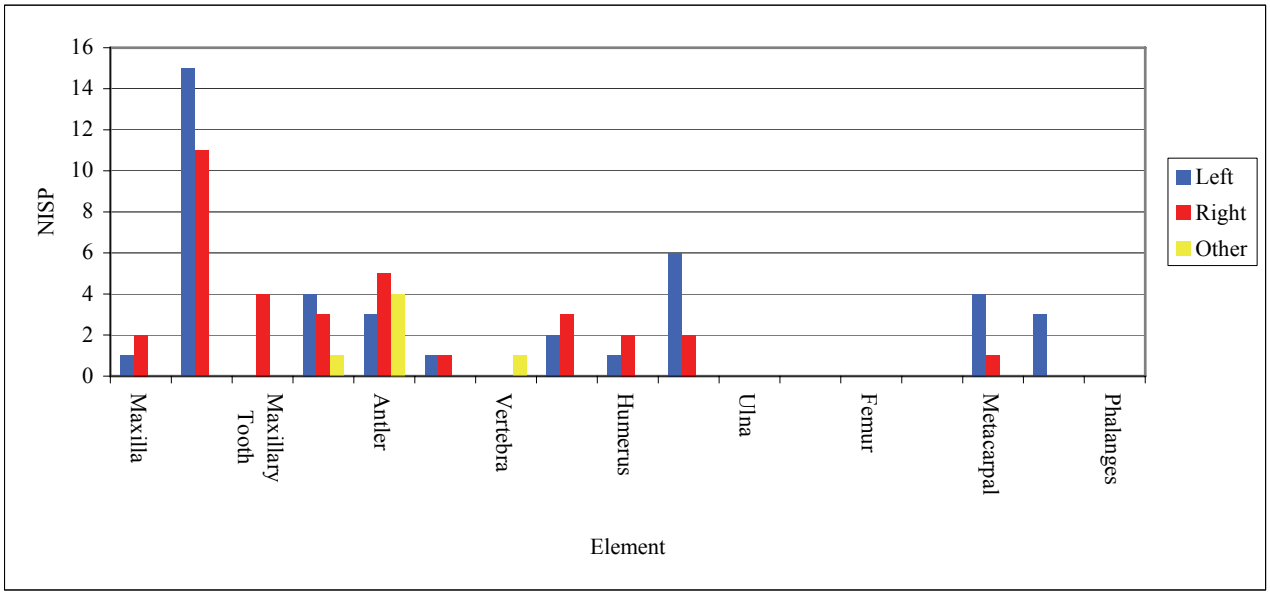


Figure 32.20: Anatomical part representation by side of fallow deer n=77

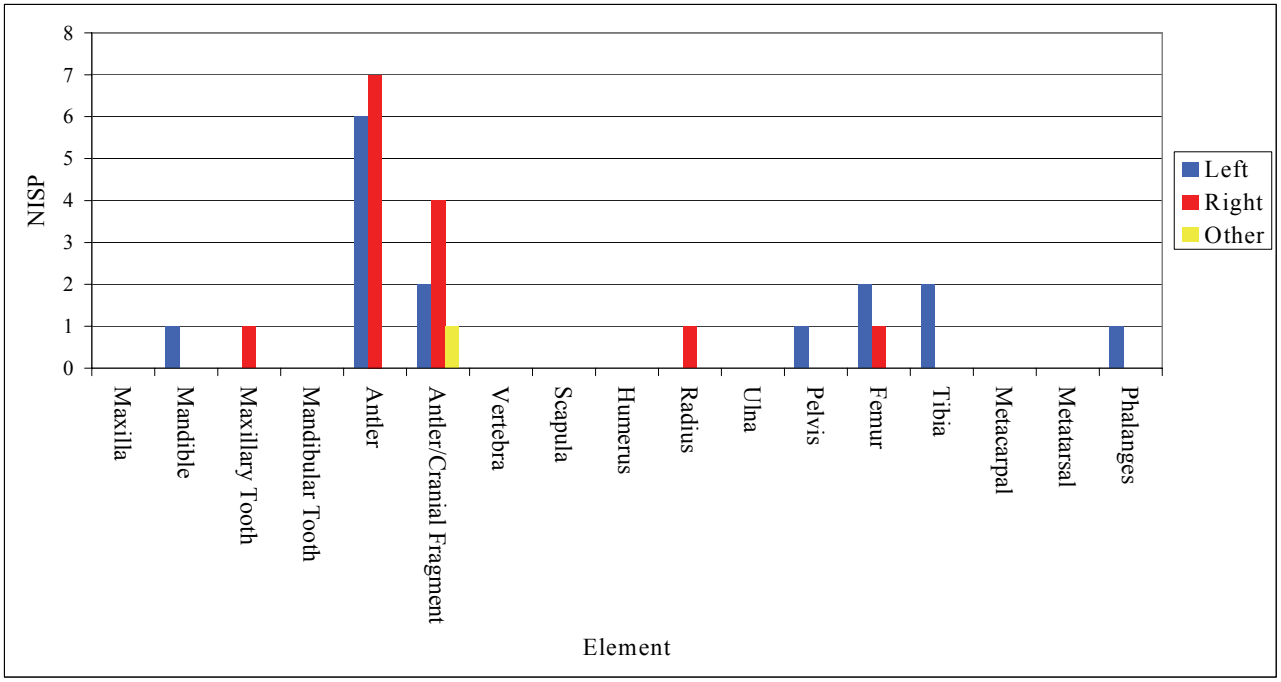


Figure 32.21: Anatomical part representation by side of red deer n=29

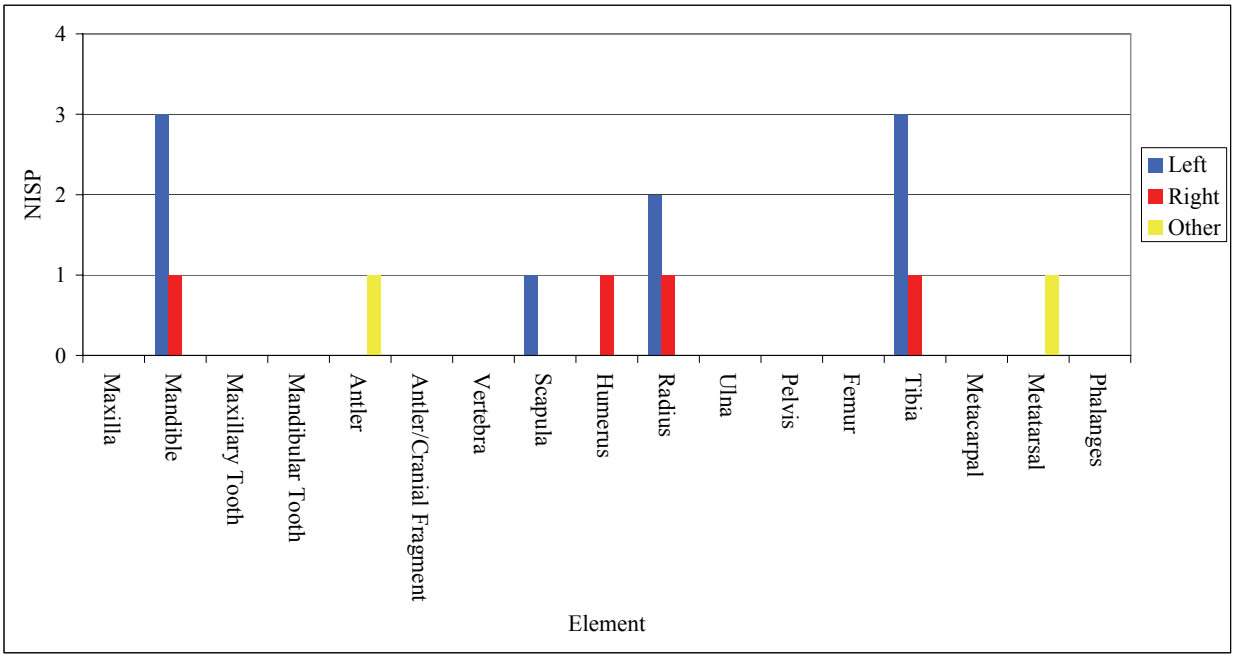


Figure 32.22: Anatomical part representation by side of roe deer n=15

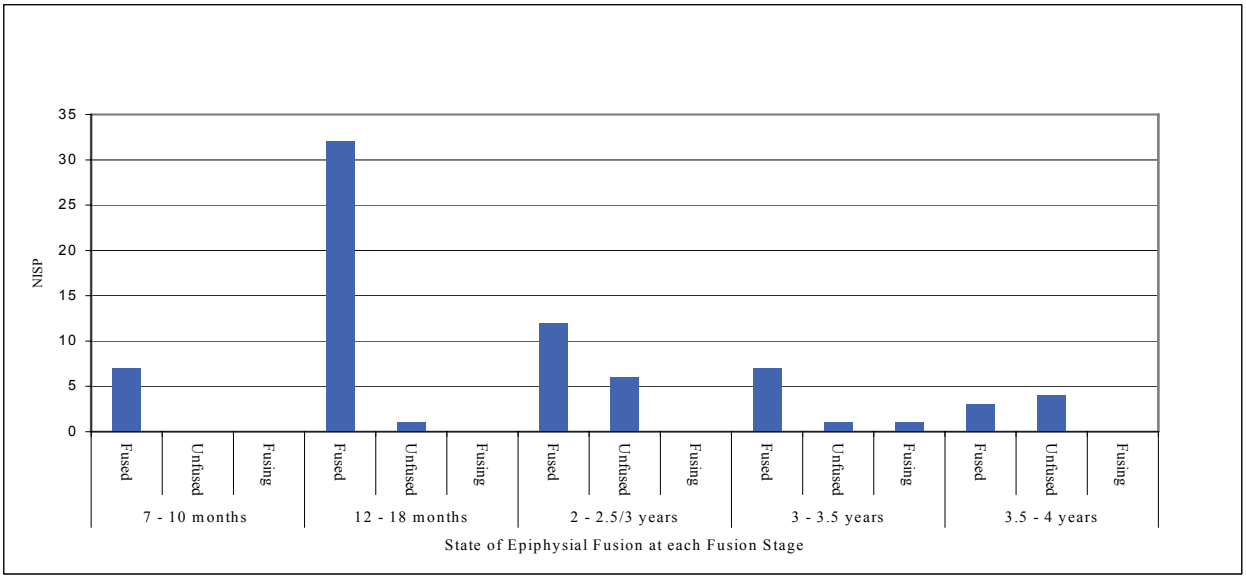


Figure 32.23: Epiphysisal fusion of cattle at the hunting lodge n=74

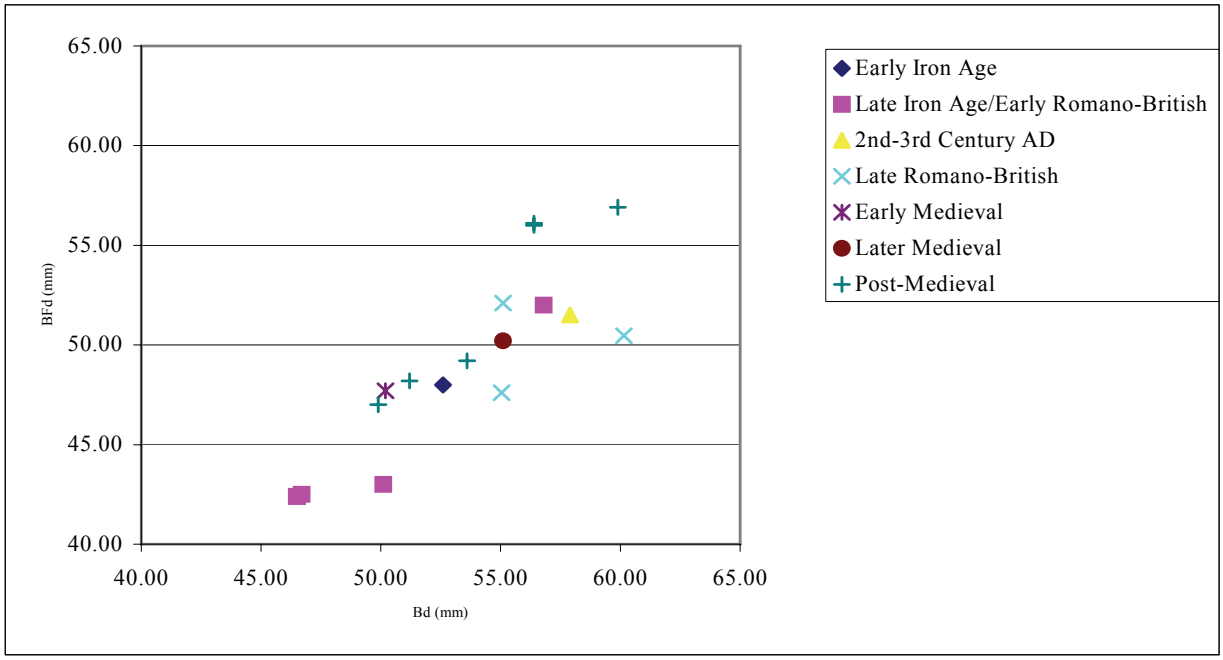


Figure 32.24: Cattle distal metatarsal, breadth of distal Bd against breadth of distal fusion (BFd) n=18

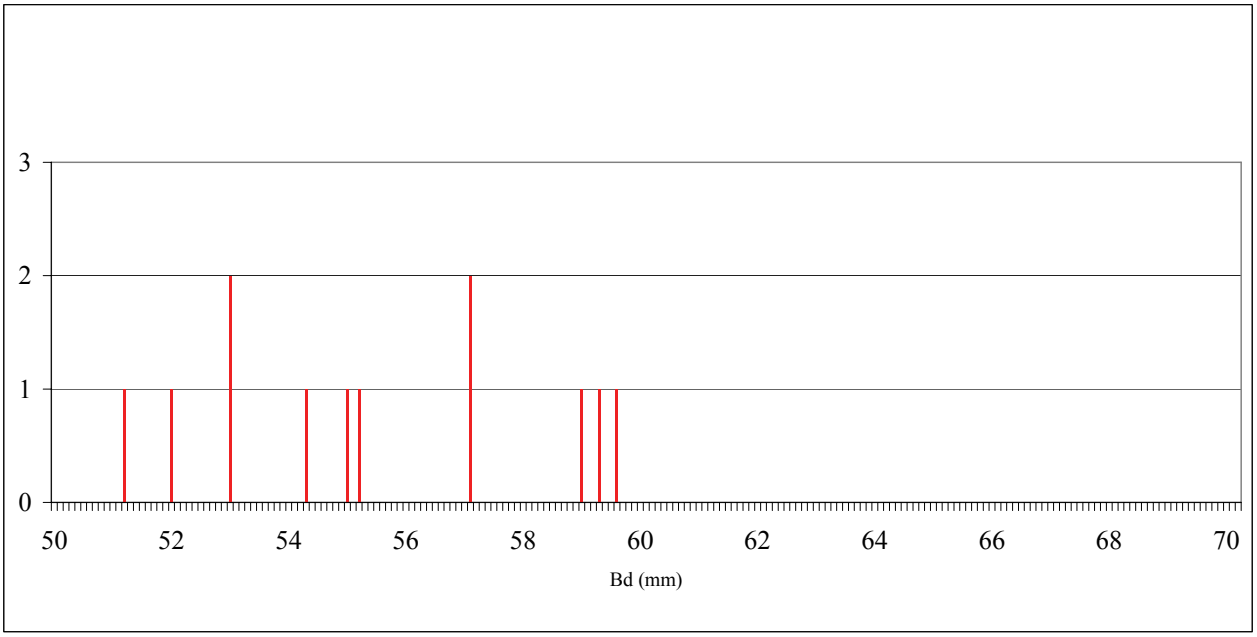


Figure 32.25: Breadth of distal tibia (Bd) of Bronze Age-Late Iron Age to early Romano-British cattle; n=11

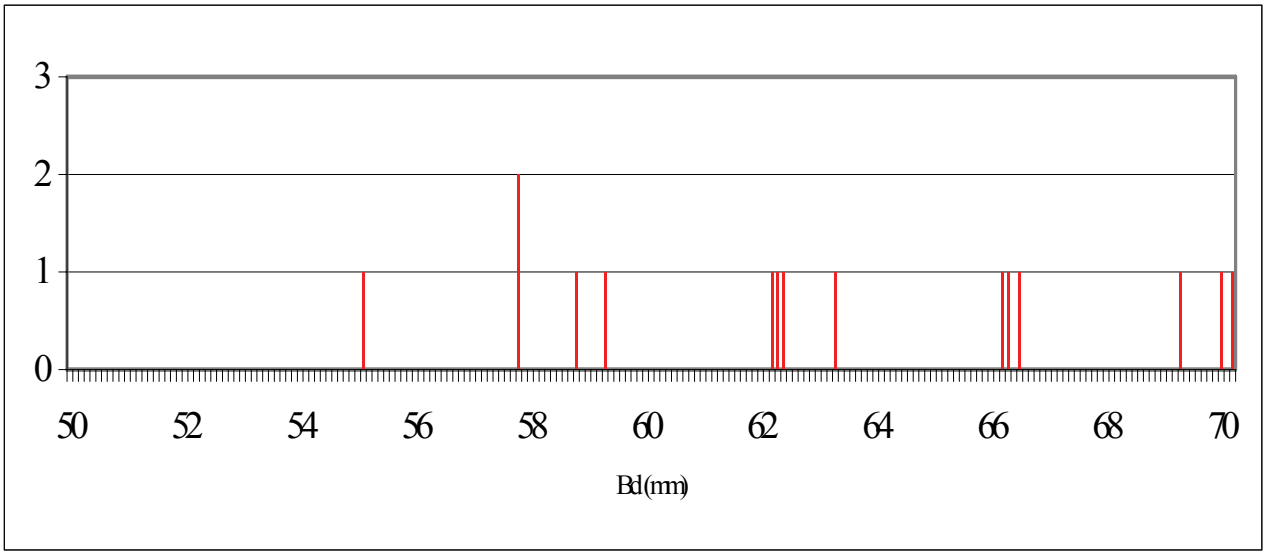
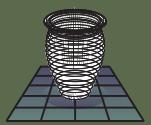


Figure 32.26: Breadth of distal tibia (Bd) of Late Romano-British cattle; n=13



Framework Archaeology

London BAA Stansted