Animal Bones from Land off NIAB Huntingdon Road, Cambridge (Albion Archaeology NBC1942)

Mark Maltby
Faculty of Science and Technology, Bournemouth University

Methods of Animal Bone Analysis

All the bones and teeth recovered from the excavations from both hand-collected and sieved samples were recorded individually onto a relational database (Microsoft Access), which forms part of the site archive. In the main database table the following information was recorded where appropriate for each specimen: species; anatomical element; zones of bone present; approximate percentage of bone present; gnawing damage; erosion; weathering; burning (charring and calcification); fusion data; associated bone group (ABG) number; sample number; other comments including observations of pathology and boneworking. Separate tables linked to the main table by an individual identification number were created for metrical, butchery and tooth ageing data. Tooth eruption and wear descriptions for cattle, sheep/goat and pig follow the method of Grant (1982). Most measurements are those described by von den Driesch (1976).

Bone Preservation and Overall Sample Size

Animal bones were retrieved from 421 contexts. The assemblages from each context were assigned to one of five preservation grades (Table 1). Only one assemblage was assigned to the highest grade. Ninety-four were designated as having quite good preservation but with evidence of gnawing or other damage on some of the bones. Most assemblages (211) were graded as moderate. Bones in such assemblages generally had fair surface preservation but also include significant numbers of gnawed and weathered specimens. Ninety assemblages were assigned to the quite poorly preserved category. These typically contained higher proportions of eroded and weathered specimens, and were generally more fragmented than the higher-graded assemblages. Twenty-five contexts were assigned to the very poorly preserved category. These were assemblages dominated by heavily eroded bones. Table 2 shows the number of fragments found in the assemblages of different grades. This shows that the majority of the bones were associated with assemblages that had been assigned to quite good or moderate preservation categories. Gnawing damage was observed on 220 (14%) of the identified domestic mammal elements. A total of 145 (9%) of the identified mammal fragments were described as eroded and 236 (15%) as weathered. Ninety-nine fragments were recorded as burnt. Most (88) of these were unidentified mammal fragments, many of which were retrieved from sieved samples.

Altogether, 3,012 animal bone fragments were recorded (Table 3). Only 11 of these were from deposits assigned to Phase 3 (Middle-Late Bronze Age). Phase 4 deposits (Early-Middle Iron Age) provided 1,200 fragments, of which 554 were identified. Romano-British features (Phase 5) produced the largest assemblage of 1,744 fragments, which included 1,039 identified specimens and most of the ABGs. Only 26 fragments came from Medieval (Phase 6) contexts. A sheep/goat tooth was the only element recorded from Post-medieval contexts (Phase 7). Sieved samples produced 501 fragments, the vast majority of which were unidentified mammal elements. Most of the 45 identified fragments from sieved samples

belonged to sheep/goat but they also produced small numbers of bones of other domestic mammals, birds and frog (Table 3).

Phase 3 - Middle-Late Bronze Age

Sieved samples from the cremations of L1 and L2 (SL1) produced four unidentified mammal bone fragments. The associated enclosure ditches (L21) produced seven animal bone fragments, including fragments of mandible, pelvis and metacarpal of cattle. The assemblage was quite poorly preserved. No animal bones were recovered from SL2.

Phase 4 - Early-Middle Iron Age

SL3 – Farmstead

A total of 820 animal bone fragments were recovered including 342 identified elements (Table 4). The majority of these were associated with enclosure L7, from where 541 fragments were obtained, and of which 227 were identified. Cattle provided 47% of these, followed by sheep/goat (40%) and pig (10%). Horse, red deer and roe deer were represented in small numbers (Table 5). Four hundred of the bones from L7 were obtained from pit cluster G9. This assemblage was well preserved, although gnawing damage was quite commonly observed. It included 84 cattle, 69 sheep/goat and 14 pig elements plus a single tooth of horse and a sawn red deer antler fragment. Cattle from G9 included 11 fragments from at least six different mandibles, five maxillae and ten other skull fragments and two complete horn cores. Other substantially complete cattle bones included four metacarpals, two metatarsals, a scapula, humerus, radius, femur and tibia. Most of the nine cattle scapulae were fragmentary, although at least five different bones are represented. Sheep/goat from G9 included nine mandible fragments from at least seven jaws, most of which belonged to immature lambs. Ten metacarpal and ten metatarsal fragments were also recovered and seven radii and six humeri were also represented. The pig assemblage from G9 included five scapulae fragments, three of which bore butchery marks. Other assemblages from L7 included 33 fragments from internal ditch G13, which provided nine fragments each of cattle and sheep/goat and four each of horse and pig. One of the sheep/goat bones was a metatarsal of an immature goat. The horse bones included a complete radius from a sub-adult animal and substantial parts of a foal's skull. Most of the 56 fragments from ditch G14 were unidentified mammal fragments from sieved samples. The assemblage did include a roe deer mandible along with five cattle, four sheep/goat and three pig elements. Another internal ditch G19 produced 26 bone fragments including six cattle and five sheep/goat fragments and one pig element. Cattle included an axis and third cervical vertebra from the same animal. A horn core of a female goat was also found.

Enclosure L8 produced 36 animal bone fragments, of which 24 were identified. Only cattle, sheep/goat and pig were recorded (Table 5). Enclosure L9 produced a further 91 animal bone fragments, of which 43 were identified. Most fragments (81) were obtained from roundhouse G35. Sheep/goat, cattle, horse and pig were identified (Table 5). Three of the sheep/goat bones (femur, tibia and metacarpal) could have belonged to the same immature lamb. Part of the skull of a horned male sheep was also recovered.

Although Enclosure L10 provided 152 animal bone fragments, only 48 were identified. Most of the unidentified mammal fragments came from sieved samples. The identified elements were dominated by cattle and sheep/goat. Pig, horse and rook/crow were each represented by a single element (Table 5).

SL4 – Activity Focus (possible rectilinear enclosure)

All but one of the 99 animal bone fragments from the non-domestic enclosure L11 were obtained from pit G48. Forty-eight of the 63 identified fragments belonged to the skeleton of an adult dog (Table 5). Although incomplete and suffering from modern fragmentation, all parts of the skeleton were represented. Although many of the foot bones and some vertebrae and ribs were not recovered, it is likely that the complete carcass was deposited. There is no evidence of butchery or weathering and it seems that this was a primary deposition. Many of the other identified elements from the pit were weathered and probably redeposited when the pit was infilled. These mainly consisted of cattle, but sheep/goat, pig and horse are also represented (Table 5).

SL18 – D-shaped Domestic Enclosure and Landscape Boundary

Seven landscapes produced a total of 155 animal bone fragments, of which 90 were identified. These were dominated by cattle (61%), followed by sheep/goat (18%). Horse elements were unusually well represented (17%). Pig was the only other species identified (Table 4).

The only bone from Boundary L51 was a cattle tibia. Landscape boundary L52 provided a total of 41 animal bone fragments, of which 27 were identified to the four domestic species listed above (Table 5). Preservation was generally quite poor with many bones damaged by weathering or erosion. Only three fragments were recovered from the roundhouse and adjacent features of L53. A fragment of cattle tibia and a sheep/goat tooth were identified.

D-shaped domestic enclosure L54 produced 90 animal bones, half of which were identified. Cattle elements dominated these with those of sheep/goat and horse also present (Table 5). A pair of calf pelves, probably associated with the sacrum and a lumbar vertebrae, were recovered from pit G234. Two tibiae of immature horses were also recovered from L54. Only one horse and three cattle elements came from the NW antenna ditch (L55) of enclosure L54. The SE antenna (L56) produced a further 15 fragments of cattle and horse (Table 5). Preservation was again quite poor with most bones damaged by erosion. The activity focus L59, to the SW of boundary L52, produced a single eroded cattle mandible fragment.

SL19 – Unenclosed Settlement and Landscape Boundary

Features from SL19 produced a total of 126 animal bone fragments, all but six of which came from roundhouse G242 (L57). Landscape boundary L58 provided the other six fragments. Altogether, only 49 fragments were identified, with cattle again providing the bulk of the identifications. Sheep/goat was also quite well represented and there were small numbers of pig, horse and dog elements (Tables 4-5).

Phase 5 – Roman

SL5 – Farmstead

This produced a large assemblage of 633 animal bone fragments from eight landscapes. The overall assemblage included 398 identified elements. Including bones in ABGs, cattle provided 54% of the identified fragments, followed by sheep/goat (25%), horse (13%) and pig (4%). Small numbers of dog, red deer, badger, mole and cat were also represented. Four species of bird were also identified (Table 6).

Domestic enclosure L13 provided 81 fragments, 70 of which were identified. Sheep/goat provided 53% of these (Table 7). However, 31 of their 37 fragments were found together in the fills of ditch G52. This assemblage has been assigned as an ABG. All the bones belonged to juvenile or immature individuals and at least three sheep were represented but it was not possible to assign all the bones to specific individuals. Apart from three mandibles, the group consisted entirely of larger limb bones, scapulae and pelves. No ribs, vertebrae, or small bones of the lower limbs were recovered. Butchery marks were observed on one pelvis and it is possible that the group represents bones from partially processed carcasses that were deposited together in the ditch. There is no record that any of the bones were found in articulation. The absence of the smaller bones could be the result of retrieval bias. However, it is also feasible that the largest bones were selected for deposition. The bones are in good condition with no signs of weathering or gnawing, indicating that they were buried soon after death.

Twenty-nine cattle elements were recovered from L13. These included 11 vertebrae and eight ribs from the fills of ditch G62. There was no evidence of butchery or gnawing on any bones in this group, which appears to represent a primary deposition of the trunk of a sub-adult or young adult animal. Pig and horse were each represented by two elements.

Enclosure L14 produced 231 animal bone fragments, of which 113 were identified (Table 7). Seven species of mammal were recorded with cattle (51%) dominant and horse (22%) unusually well represented, outnumbering sheep/goat (19%). Pig (3%) was poorly represented. Most (159) of the elements came from the large pit G70. Ninety-six of these were unidentified mammal fragments, about half of which were large mammal rib shafts. The identified portion of the G70 assemblage was dominated by cattle (37) and horse (16). The cattle assemblage from G70 was unusual in that most of the bones were largely complete and showed no evidence of butchery, although four had suffered minor canid gnawing damage. Some of the bones were definitely associated. These include a pair of complete mandibles and a right calcaneus, centroquartal and metatarsal formed a second group. It is feasible that other bones could have belonged to the same animal(s), although no clearly articulated groups were observed during excavation. At least two cattle were represented by left mandibles and tibiae, by right humeri and by scapulae of different sizes.

The horse assemblage from pit G70 included substantial parts of two skulls including the maxillae, the teeth within which indicating that one skull was from an adult and the other from a foal. Other bones from at least two immature or sub-adult horses included two left tibiae, a right astragalus, a left radius and a lumbar vertebra. Three of the horse bones were slightly damaged by gnawing but no butchery marks were observed and all the bones were wholly or substantially complete. Generally the bone assemblage from G70 does not appear

to be derived from normal domestic refuse. Large bones from large mammal carcasses were selected for deposition, seemingly without being butchered. The skull, including the maxillae, of an adult badger and a cat humerus were also found. These were the only occurrences of bones of these species from the excavations.

Other faunal assemblages from L14 included 44 fragments (28 identified) from settlement boundary recuts G67. Horse (9) and cattle (9) were also well represented in this feature. However, apart from two complete cattle metatarsals, the assemblage was much more fragmentary than the one from pit G70, and more typical of other assemblages from the site. An ulna of a miniature dog was also recovered from this feature.

Features associated with enclosure L15 produced 111 animal bone fragments, of which 80 were identified to cattle (55%), sheep/goat (25%), horse (13%), dog (5%) and pig (3%) (Table 7). Sixty of the elements came from boundary recuts G71. These included an ABG of 14 cattle bones. This group consisted of the left pelvis, the sacrum, three lumbar vertebrae, three thoracic vertebrae, a rib and five cervical vertebrae, including the atlas, which bore an incision made during decapitation. Although it cannot definitely be determined that all these bones belonged to the same animal, the fusion evidence, which showed that most of the vertebrae were just fusing, indicated that the bones came from cattle at the same stage of development (adult but not elderly), and in all likelihood they are all from the same carcass.

Enclosure L16 provided only 35 animal bone fragments, of which 25 were identified. Cattle provided 15 of these and sheep/goat, horse and pig were also represented (Table 7). Enclosure L17 produced 56 animal bone fragments, including 37 identified mammal elements. Cattle (27) dominated these and small number of horse, sheep/goat, red deer and pig were also identified (Table 7). Cattle elements included five vertebrae and two complete metatarsals. A sawn red deer antler tine was also recovered.

Cemetery L19 produced a further 30 animal bone fragments, of which 13 were identified as cattle, sheep/goat and horse (Table 7). Most of the bones were fragmentary and associated with the grave fills rather than the inhumations themselves.

Cemetery L20 produced 53 animal bone fragments from a more diverse assemblage than L19. At least nine species were represented amongst the 30 identified elements, although a mole radius was probably intrusive (Table 7). Again, most, if not all, of the animal bones may have been deposited with the grave fills rather than with the burials. However, it is worth noting that some unusual finds were associated with some of the graves. Part of a mandible of a fox or, more likely, a small dog was found in SG188 (G73), which also produced two bracelets and a pot. A pair of domestic fowl carpometacarpi and a sternum were found in grave SG197 (G75). A duck carpometacarpus and the coracoid of a rook/crow were found in SG192 (G74). Finally, SG196 (G75) produced parts of four unusually large sheep/goat bones (a radius, two tibiae and a metatarsal).

Enclosure L28 (G141) produced 36 animal bones, 30 of which were identified. Cattle (24) dominated the assemblage. Their numbers were inflated, however, by the recovery of an ABG of eight vertebrae and four ribs in the ditch. Most of these bones probably belonged to a single animal but the presence of two axes indicated that more than one animal was represented. Five other cattle vertebrae found in other contexts may also have belonged to this or similar groups. The fusion evidence indicated that all the vertebrae belonged to sub-

adult or young adult animals. No butchery marks were observed on any of these bones. The humerus of a female sparrowhawk was also found.

SL6 – Activity focus to the NE and outside of main settlement boundary

Activity focus L18 produced 113 animal bone fragments, of which only 24 were identified (Tables 6 and 8). Eighteen of the identified bones belonged to sheep/goat including nine phalanges and other lower limb bones of an adult sheep found in the small pit G95. An astragalus in this group bore cut marks indicating that the feet had been disarticulated. Two ribs and a thoracic vertebra were found in the same context and may have formed an ABG from the same sheep. Most of the 75 unidentified mammal fragments from G95, many recovered in sieved samples, consisted of rib shafts and other medium-sized mammal fragments that conceivably came from the same animal. A few unidentified mammal fragments in this feature were charred. The pit also produced a shaft of a sheep metatarsal showing evidence of working. The shaft had been shaved and it had been partially perforated. It does not appear, however, to be a finished article. A femur of a neonatal puppy was also found in the pit.

SL8 – Trackway

A total of 58 animal bone fragments were recovered. Forty-two elements were identified to five domestic mammal species (Table 6). Bones were recovered from five landscapes but identified elements were found in only three of these (Table 8). Preservation in most deposits was quite poor, which probably partially explains why cattle (21) and horse (8) bones were found in greater quantities than the less robust bones of smaller species. Six bones (right mandible, humerus, radius, ulna, femur and rib) in G351 (L75) probably belonged to the same adult dog. A tibia of a much smaller miniature dog was found in L23.

SL9 – Quarrying

Only 11 animal bone fragments were recovered (L26), of which only six were identified as cattle or horse (Tables 6 and 8).

SL10 - Cemetery

The cemetery produced a total of 208 animal bone fragments including 169 identified to species (Table 6). These include a number of ABGs found with some of the inhumations.

Ditch L25 produced just three fragments, two of which belonged to cattle (Table 8). The cemetery enclosure ditch L27 produced 69 fragments. The SW ditch (G124) produced 30 fragments and the NE ditch (G126) provided 31. Only five were found in the NW ditch (G125). A total of 39 elements were identified, most (32) of which belonged to cattle, but small numbers of horse, sheep/goat and pig were also present (Table 8). The cattle assemblage included 12 loose teeth and six vertebrae but there were no clearly associated groups.

The inhumation graves in the cemetery (L72) produced a total of 136 animal bones, all but eight of which were identified (Table 8). Because of the presence of several ABGs and other unusual aspects of the assemblage, the animal bones from L72 will be described by group and sub-group.

Animal bones were found in three of the eight graves in G127. SG331 only produced an unidentified fragment incorporated in the grave infill. A complete metacarpal of a bull or ox was found in SG329. SG356 produced four large bones of cattle. Three of these were femora, one of which being a complete bone from an adult. The other two femora were from younger cattle and both bones had been damaged by canid gnawing, indicating secondary deposition. A portion of a young adult cattle mandible was also recovered from this grave.

SG328 was the only grave in G128 that produced animal bone. This consisted of part of an immature cattle humerus, which showed signs of weathering also indicative of secondary deposition.

Animal bones were found in two of the six graves in G129. The fill of SG322 included a complete cattle astragalus. SG333 produced five elements. A cattle tooth was probably a residual element in the grave fill. The other bones may be more significant. Three of them were from domestic fowl (coracoid; femur and tibiotarsus), probably from the same bird. The fourth was an unidentified fragment of bird sternum, which could also have been from the same chicken. No medullary bone was observed in the femur and tibiotarsus, indicating that the bird was not in lay.

Three of the eight graves in G131 produced animal bones. The unidentified mammal fragment in SG346 was probably an incidental inclusion amongst the grave fill. Five bones were found in SG325 - a horse first phalanx, parts of two cattle humeri, and two cattle astragali, one of which was complete. Evidence of gnawing, weathering or erosion was found on the cattle bones, suggesting that these bones were redeposited within the grave fill. SG133 produced nine fragments, and very unusually, apart from one unidentified mammal fragment, these were all bird bones. A duck's wing was represented by the scapula, humerus and radius. A left tibiotarsus and right tarsometatarsus could have belonged to the same adult bird. Two tibiotarsi and a left ulna of domestic fowl were also recovered. These could have belonged to the same skeleton. No medullary bone was observed in either tibiotarsi. No evidence of butchery was observed on any of the bird bones. It seems probable that these birds were deliberately deposited within the grave.

Animal bones were recovered from only one of the three inhumations in G132 (SG351). The two small unidentified mammal fragments and the small portion of a sheep/goat tibia are likely to be accidental incorporations in the grave fill.

Both graves in G133 produced animal bones. SG347 included only an unidentified mammal fragment, the distal part of a cattle metacarpal and a cattle first phalanx. These appear to have been incorporated into the grave infill rather than being grave goods.

SG349, however, produced three animal ABGs, two of which were clearly closely associated with the human burial. The skeleton of a piglet was placed in a box near the left foot of the inhumation. Although only 64 bones were recorded, all parts of the body are represented and there seems little doubt that a complete carcass was interred. Most of the missing bones are small elements from the limb extremities that probably have not survived. Tooth eruption

evidence showed that the deciduous teeth had erupted but were not in wear and the first molar had not erupted, indicating that the piglet was only a few weeks old. No evidence of butchery was observed. Also associated with the burial were 25 bones of domestic fowl. At least two birds were represented but it was impossible to assign all the bones to individuals because they were at a similar stage of development and size. All the bones were very porous and belonged to juvenile chickens. Also within the grave were five bones (metatarsal and four phalanges) from the left hind foot of a roe deer. A knife cut was observed on the proximal end of the metatarsal showing where the foot had been dismembered from the rest of the carcass. This ABG could be regarded as carcass processing waste, although foot bones are sometimes attached to skins when they are initially removed.

The empty grave/pit G135 produced seven animal bone fragments. The frog bone was probably from a victim of a fall when the pit lay open. A hare first phalanx was also found in the main fill. The tertiary fill produced parts of a cattle mandible and a maxilla/zygomatic.

SG342 was the only one of the three graves in G139 to produce animal bones. These consisted of the proximal half of a horse third metatarsal and the humerus and femur of sub-adult cattle. Although the cattle bones were substantially complete, evidence of weathering was observed, suggesting these bones were exposed prior to deposition in the grave fill.

SL11 - Non-domestic enclosure system

Ninety animal bone fragments were found in nine landscapes, of which 60 from six species were identified (Table 6). The low density of animal bones adds support to the interpretation that these enclosures were non-domestic.

Enclosure L29 produced just two fragments identified as cattle and sheep/goat. Ten fragments from at least five species were recovered from enclosure L30 (Table 9). These included a complete sheep metatarsal and the proximal half of a metatarsal of a large goat. A pig astragalus was large enough to have been from a wild boar. Enclosure L31 produced 15 animal bone fragments from the upper fills of water pit G155. The assemblage was generally quite poorly preserved. Eleven of the 14 identified elements came from cattle. These included an astragalus and the distal end of an associated tibia. Two sheep/goat mandibles and a horse ulna were also identified

Enclosure L32 provided only three cattle and one horse bone from ditch deposits. The bones were quite poorly preserved. Features associated with enclosure L33 produced a further 20 quite poorly preserved fragments, of which 17 were identified (Table 9). Cattle provided nine of these including three fragments of different scapulae. The primary fill of ditch G165 produced parts of a pair of horse pelves and a pair of dog tibiae. A pelvis fragment could have belonged to the same dog. Enclosure L34 provided 26 fragments, half of which were unidentified. Sheep/goat, cattle and horse were identified (Table 9). Enclosure L35 only provided three unidentified mammal fragments. Enclosure L37 produced parts of a poorly preserved horse femur and sheep/goat metacarpal. A more unusual find was the humerus of a red kite recovered from ditch G184. Only eight unidentified mammal fragments were found in enclosure L38.

SL12 – Peripheral activity

The fill of water pit G190 (L40) produced 24 animal bone fragments, 20 of which were identified to four domestic species (Tables 6 and 9). Many of the bones were weathered.

SL21 – Ladder enclosure system

The enclosures provided a faunal assemblage of 297 fragments, of which 152 were identified. These were dominated by cattle (57%), followed by sheep/goat (19%) and horse (16% including a small ABG). Bones of domestic fowl, pig, dog, red deer and frog were also present in small numbers (Table 6).

Enclosure L60 produced only 14 fragments with only seven identified to cattle, sheep/goat or horse. Enclosure L61 provided a further 21 fragments, of which 13 were identified as cattle, horse, sheep/goat or domestic fowl (Table 10). Preservation was generally quite poor. Only two horse bones were retrieved from enclosure L62, both from tertiary fills of water pit G260. Enclosure L63 produced 19 animal bone fragments, of which 16 were identified as cattle, horse or sheep/goat (Table 10). Bone preservation was slightly better in L63 than in L60-L62. Bones were generally less fragmentary and included a complete horse humerus and substantial parts of a cattle radius and metacarpal.

Only 16 fragments were found within enclosure L64. Seven of the eight identified elements belonged to cattle, the other to horse. The only noteworthy finds were a pair of cattle mandibles from the primary fill of water pit G277. These were complete but had suffered minor carnivore damage before deposition. Enclosure L65 produced the largest faunal assemblage from SL21. This was comprised of 108 fragments. However, 68 of these were unidentified. Most of the identified elements belonged to cattle and sheep/goat along with small number of pig. Domestic fowl and horse also present (Table 10). The domestic fowl bones included a complete tarsometatarsus from a large cockerel from ditch G291. A horse third metatarsal from ditch G293 bore evidence of shaving with a heavy blade, perhaps indicative of boneworking.

Enclosure L66 produced only 31 animal bone fragments. Fourteen of the 20 identified elements belonged to cattle and horse, sheep/goat and red deer were also present (Table 10). Cattle elements included five fragments from at least three different mandibles. The assemblage from enclosure L67 was very similar to that from L66. Twenty-seven fragments were recovered, of which 24 were identified. Cattle (13) were the most common species identified and horse, sheep/goat and dog were also represented. Six of the seven horse elements came from ditch G327 and these (right femur and tibia, both metatarsals and possibly two teeth) probably came from the same adult animal. Enclosure L68 produced 51 bone fragments, of which 22 were identified. Again, cattle elements (13) were the most commonly represented with sheep/goat, dog and frog also identified (Table 10). Preservation of bones was variable with several burnt fragments coming from pit group G333.

SL23 – Domestic enclosures

Only 50 animal bones were recovered, of which 26 were identified to cattle, dog, horse and sheep/goat (Table 6). Enclosure L77 provided 28 of the fragments including most (20) of the

identified elements. Both cattle and dog contributed nine fragments (Table 11). Seven bones from the tertiary fill of water pit G357 probably belonged to the same adult dog (both radii and ulnae, a metacarpal, pelvis and femur). The radius and ulna of a second dog was found in the backfill of the same pit. Four cattle and two horse elements were the only identified elements from enclosure L78. Bone preservation was quite poor.

SL24 Domestic activity focus

This complex produced a total of 264 animal bone fragments, of which 133 were identified. Cattle (51%) were again dominant with horse (28%) unusually well represented. Sheep/goat elements were moderately represented (16%). Small numbers of pig, roe deer and dog were also found (Table 6).

Activity area L79 produced 102 fragments, of which 42 were identified as cattle, horse and sheep/goat (Table 11). Most of the unidentified mammal fragments were retrieved from sieved samples. Three associated horse cervical vertebrae were recovered from one of the pits in G368. Activity area L80 provided a further 42 fragments including 20 identified as cattle, sheep/goat, horse or pig (Table 11). Fifty-two bone fragments were found in L88, all but one from water pit G362. Horse (18) provided most of the 34 identified elements, followed by cattle (15) and a single element of sheep/goat. Most of the horse bones were cracked, indicative of weathering. Fragments of three different metacarpals were recovered. The ten fragments from the water pits in activity area L89 included a cast antler of roe deer along with elements of cattle, horse and pig (Table 11). The horse bones included a third metacarpal with shaving marks on the shaft and a very small metatarsal.

Activity focus L90 provided 58 animal bone fragments, including 28 identified elements. Cattle were the most commonly recorded and small numbers of sheep/goat, horse, pig, dog and roe deer were also recovered (Table 11). Sixteen bones were found in the vicinity of inhumation SG964. These included a complete cattle metacarpal and fragments of three cattle tibiae and pelvis. Two fragments of sheep/goat, the distal end of an immature horse tibia and the shaft of a roe deer femur were also recorded. Three bones of foetal cattle were found in pit group G374.

SL25 – Temple complex

Twenty-six animal bone fragments were recovered but only nine were identified. Seven of these belonged to cattle, and horse and sheep/goat were each represented by a single element (Table 6). Seven fragments came from the *cella* L86. Identified elements consisted of a sheep/goat tooth and fragments of two humeri and a metacarpal of cattle. Nineteen fragments were retrieved from the outer enclosure L87, of which only a horse and four cattle elements were identified. All the bones in SL25 were fragmentary and many were eroded or weathered. It is likely that these bones were deposited after the temple was abandoned rather than during its use.

Phase 6 – Medieval

Only 26 animal bone fragments were recovered from medieval deposits. Fourteen were identified as sheep/goat, cattle, dog or horse (Table 3).

Phase 7 – Post-Medieval

A sheep/goat tooth was the only element recorded from post-medieval deposits.

Animal Bone Discussion

The discussion will focus on the assemblages from Phases 4-5 (Iron Age and Roman respectively).

Cattle

Cattle elements were the most commonly identified, providing 55% of the identified mammal fragments (excluding bones in ABGs) in the overall assemblage (Table 3). The cattle percentage increased from 52% in Phase 4 to 57% in Phase 5. Most of the Phase 4 assemblage came from SL3, in which cattle only provided 48% of the identified mammal elements (Table 4). Cattle were the best represented species in nearly all of the site landscapes in both phases (Tables 4 and 6). Fairly poor preservation of assemblages in some landscapes favoured their survival better than the bones of sheep/goat and pig.

Forty-four of the cattle elements were associated with three ABGs. These groups all included several vertebrae (Table 12). Only one of these groups provided evidence for butchery (SL5; L15; G71) but this does not necessarily mean that the other groups came from cattle that were not butchered. Vertebrae can represent primary butchery waste if both flanks are removed. However, the ABG in G141 (SL5 L28) included several ribs, which suggests that this carcass at least was not fully processed.

Evidence for the butchery of cattle was found on all of the settlements represented in both phases and beef would undoubtedly been the most meat consumed by their inhabitants. However, there were no large accumulations of butchery waste that would be indicative of specialist processing areas. Variations in the numbers of cattle elements represented (Tables 12-13) largely reflected their relative robustness. Mandible fragments were particularly common in both phases. However, MNE estimates showed that more humeri than mandibles were present in the Phase 4 deposits, and scapulae and metapodials were also well represented in both phases (Table 13).

Butchery marks were observed on 75 cattle elements including several which had evidence for more than one type of mark. The scapula and mandible produced the most evidence for butchery marks. Most of the marks in both phases consisted of fine incisions, although deeper chop and heavier blade marks became more frequent in the Phase 5 assemblage (Table 14). This pattern is typical of butchery on most British Iron Age and Roman rural sites. The use of metal knives to perform much of the carcass processing is typical of Iron Age assemblages and the persistence in the use of such tools continued into the Roman period on settlements

where specialist butchers did not operate (Maltby 2007). The evidence from these sites does, however, indicate the increased use of cleavers in Phase 5, although evidence for their use is much less marked than in Roman towns and military sites. Heavy blade marks which would have resulted in filleting meat from the bone were only found in Phase 5 specimens. Such marks are prevalent on cattle upper limb bones on military sites and larger settlements where specialist butchers operated but are rarely encountered on small rural settlements where the slaughter of cattle would have been a much more infrequent event. The only clear examples of this type of butchery on upper limb bones were found on a femur from SL21 and a humerus from SL24. However, blade marks were found on six scapulae fragments, particularly around the base of the projecting spine. Some of these marks were associated with the separation of the shoulder blade from the humerus. It is possible that these marks were made by specialist butchers on shoulder joints that were imported from elsewhere, after the meat had been preserved by smoking and/or salting (Maltby 2007). None of the cattle upper limb bones had been split longitudinally to extract marrow. Accumulations of such bones have mainly been found in large Roman towns and their presence is again indicative of specialist processing (Maltby 2010, 284). Two horn cores had evidence of saw marks made when the horns were detached from the skull, probably in preparation for working.

A total of 37 cattle mandibles provided tooth ageing evidence (Table 15). The ten specimens from Phase 4 all came from adult animals (Stages 5-7). A broader range of ages was represented in the Phase 5 assemblage, which included a few mandibles from neonatal and other calves under six months old (Stages 1-2). Several older, but still immature, cattle were slaughtered prior to three years of age (Stages 3-4). There was, however, still a bias towards adult cattle including several specimens with heavy wear on their molars (Stage 7). Most cattle were probably not killed until they were over four years old and substantially older in many cases. Although all would probably have been butchered for meat, many of the cattle would have supplied calves and perhaps milk and traction power. The mandible evidence suggests that there was not a very high peak of slaughter of cattle aged between c.4-7 years old, as has been encountered on many Roman urban sites (Maltby 2015 in press). The fusion data, however, does show that over half of the latest-fusing limb bones were unfused (Table 16) and belonged to cattle under c.4-5 years of age using conventional ageing estimates. However, the ages of fusion are much more variable and less reliable than tooth eruption and wear stages. It is believed that castration often slows down the rate of epiphyseal fusion, so assemblages that include a high proportion of oxen may include more unfused bones than expected. The fusion data do, however, confirm that few very young cattle were represented.

Measurements were taken on 19 cattle metacarpals. These bones show greater sexual dimorphism than most other cattle bones. All but one of the seven specimens from Phase 4 were sufficiently small and slender to have been from cows. In contrast, nine of the 12 metacarpals from Phase 5 were large and robust enough to have been from oxen or bulls (Table 17). This would support the argument that many of the cattle in the Roman settlements were employed as working animals prior to slaughter. Minor pathologies on and around the articular surfaces of three metacarpals, three metatarsals and four phalanges (all from Phase 5) may have developed through stresses associated with working, particularly ploughing.

Measurements taken on other cattle bones indicated that the cattle from Phase 5 were generally substantially larger than the cattle from the Phase 4 deposits. For example, the average withers height, estimated mainly from the lengths of metapodials, increased from 105.1cm in Phase 4 to 113.6cm in Phase 5 (Table 18). Although the presence of more male cattle in the Roman features may partially explain this increase, it is also likely that there was

an overall size improvement in this period, as has been demonstrated in other areas of southern and eastern England (Albarella *et al.* 2008).

Sheep/Goat

Most sheep/goat fragments could not be further identified but some diagnostic elements could be distinguished. In Phase 4, 28 elements, mainly from SL3, were positively identified as sheep. The only identifications of goat were a horn core of an adult female and a metatarsal of a kid. In Phase 5, 20 elements were identified as sheep compared with a single metatarsal of a goat. Sheep dominate nearly all British Iron Age and Roman assemblages.

Sheep/goat provided 25% of the identified mammal assemblage from all phases (excluding ABGs – Table 3). Sheep/goat elements were much better represented in the Phase 4 assemblage (35%) than in the Phase 5 sample (19%). This was largely due to their abundance in SL3, where they provided 41% of the identified mammal elements (Table 4) in a well-preserved assemblage. Sheep/goat elements were heavily outnumbered by those of cattle in nearly all the Phase 5 site landscapes (Table 6). As discussed above, this was partly due to poorer preservation conditions in some landscapes, which favoured the survival of large mammal bones. More of the smaller bones of sheep/goat may also have been overlooked. Most of the identified bones in the sieved samples belonged to sheep/goat (Table 3), implying that these are under-represented in the hand-collected sample.

The poorer preservation of sheep/goat in comparison to cattle is clearly demonstrated in the uneven representation of their identified elements (Tables 19-20). Both the Phase 4 and 5 assemblages were dominated by robust elements such as the tibia, mandible, radius and metapodials. More fragile elements such as the vertebrae, scapula and femur were much less well represented than those of cattle. Small elements such as the phalanges and tarsals were rarely recovered (Table 19). MNE counts both show that mandibles are particularly well represented in Phase 4 whereas the tibia was the most abundant element in Phase 5 (Table 20).

Minimum number (MNI) counts (based on the highest MNE divided by 2) for all species in Phases 4-5 are shown in Table 3. These show that more sheep than cattle were represented in both phases, although the contribution to lamb and mutton to the diet would have been much less than beef when carcass size is taken into consideration.

Sheep ABGs were recorded in two Phase 5 features, contributing a total of 45 elements. Domestic enclosure Thirty-one bones from at least three immature sheep were found in ditch G52 (L13; SL 5). Pit G95 (L18; SL6) produced 16 bones, mainly from the lower limbs of an adult sheep. Butchery marks were observed on bones in both groups indicating that the carcasses had at least been partially processed prior to deposition.

Butchery marks were observed on only eight sheep/goat elements. Two vertebrae from Phase 4 had evidence for the removal of the flanks of the animal. Two atlases (one each from Phase 4 and 5) bore transverse knife cuts made during decapitation. One pelvis from Phase 5 bore knife cuts on the ilium, whereas another ilium shaft from the same phase had been chopped through during dismemberment. Superficial chop marks were found on a tibia shaft and knife cuts were found on the astragalus in the ABG from G95.

Tooth ageing evidence was available from 42 sheep/goat mandibles (Table 15). Most of the 25 jaws in Phase 4 belonged to immature sheep, particularly those with only one molar in wear (Stage 3). Most of these were found in the groups in SL3 and mainly represent sheep killed between six and 12 months old. High kill off of lambs is quite common in British Iron Age assemblages (Hambleton 2008) and is linked to management practices that cull surplus animals not required for breeding, dairy produce or wool in the autumn of their first year.

The 17 mandibles from Phase 5 included much fewer sheep killed at this age. The majority of sheep represented had reached adulthood and several mandibles belonged to old animals (Stage 7). The decline in young mandibles could be a factor of their poorer preservation but the results could also reflect a change in husbandry practices which focused more on the retention of sheep for wool as well as meat production kin the Roman period. This trend has been observed quite commonly in later Romano-British samples in particular (Grant 2004). However, it should be noted that the fusion evidence does not support the mandible evidence. None of the 16 latest-fusing limb bone epiphyses from Phase 5 had fused, indicating that all the sheep involved were probably under four years old (Table 16). The reason for this discrepancy is not clear, although it could imply that many of the sheep were slaughtered between around three and four years of age.

Five of the sheep/goat mandibles showed evidence of periodontal disease, manifested by overcrowding and malocclusion of some of the cheek teeth and minor resorption of the adjacent parts of the mandible. This condition is found quite commonly in sheep from these periods and often reflects poor nutrition.

The lack of fused epiphyses limited the number of sheep goats that could be measured. Several bones from Phase 5, however, belonged to quite large sheep (Table 18), perhaps indicating the presence of some improved breeds introduced during the Roman period.

Pigs

Sixty-four of the pig bones belonged to the young piglet that accompanied the inhumation in SG349 (SL10). There is, however, little evidence that pigs played an important role in the diet of the inhabitants in any of the settlements. Excluding the ABG, pig provided only 5% of the identified mammal NISP counts (Table 3). Pigs were slightly better represented in Phase 4 (7%) than in the Roman deposits (4%). The low percentage of pig bones can be partly explained by their poor preservation in relation to those of the larger mammals, but they were also poorly represented in comparison to sheep/goat. Pig provided only 16% of the total sheep/goat and pig elements. Pigs tend to be less well represented in Romano-British rural settlements in comparison with towns and military sites (King 1999; Maltby 2015 in press).

Pig elements represented again showed a bias towards larger and more robust bones (Tables 21-22). Mandibles fragments were the most commonly identified (Table 21) but scapulae were the best represented by MNE counts, particularly in the Phase 4 deposits (Table 22). All the pig scapulae in that phase came from enclosure L7 (SL3) including five from pit group G9. It is possible that some of these were imported shoulder joints. Perhaps significantly, three of the scapulae bore evidence of butchery marks, the only pig elements to provide this type of evidence. All the marks consisted of knife cuts associated with filleting.

There was very limited ageing evidence. One of the two pig mandibles from Phase 4 belonged to a piglet under three months of age, the other to a young adult animal. In addition to the young piglet found in the grave, five mandibles from Phase 5 produced ageing evidence. Four of these belonged to pigs probably killed in their second year; the fifth was from a slightly older animal, likely slaughtered in its third year. Pigs can tolerate high levels of immature slaughter and animals killed in their second and third years are usually prevalent in Romano-British assemblages (Grant 2004).

Only five pig elements were measured. The lengths of two lower third molars (29.8mm and 32.6mm) fell well within the size of range of domestic pigs. On the other hand, an astragalus from enclosure L30 (SL11 - Phase 4) had a greatest lateral length of 53.6mm and a distal breadth of 31.4mm. These dimensions were sufficiently large for this specimen to be considered to have been from a wild boar.

Horse

It is assumed that most, if not all, the equid bones belonged to horse rather than donkey or mule but it is not impossible that the latter were represented. A metatarsal from Phase 5 was from a very small, slender specimen (distal breadth = 36.0mm), which may have belonged to a donkey. Horse bones were relatively well represented providing 12% of the identified mammal bones excluding ABGs (Table 3). They provided only 6% of the identified mammal NISP counts in Phase 4, but this increased significantly to 17% in Phase 5 features. To some extent this reflects the greater chance of survival of large mammal bones in some of the more poorly preserved Roman deposits. Comparing cattle and horse elements only (excluding ABGs), horse provided 10% of the total cattle and horse elements in Phase 4 deposits rising to 23% in Phase 5. Horses tend to be better represented in Roman rural settlements compared with urban sites, where horse/cattle assemblages are usually heavily dominated by cattle (Maltby 2010, 270). The percentage of horse, however, from Phase 5 is unusually and consistently high in different site landscapes (Table 6). Elements from all parts of the body were recovered, although hindlimb bones tended to be better represented than equivalents in the forelimb. Vertebrae, ribs and smaller bones of the lower limbs were under-represented and scapulae were rarely recovered (Tables 23-24).

Although only one small ABG of horse was recovered (L67; SL21), there was little evidence that horse carcasses were butchered for meat. Tool marks were observed on only three horse bones. From Phase 4, a complete horse third metatarsal from enclosure L54 (SL18) bore evidence of fine cuts around the shaft indicative of skinning. Another third metatarsal shaft from the Phase 5 enclosure L65 (SL21) had been shaved with a heavy blade. Similar trimming was observed on a large third metacarpal from a water pit in L89 (SL24). These marks were perhaps associated with the removal of the peripheral metapodials, which could have been required for working into points or awls. Canid gnawing marks were observed on 26 horse bones indicating that some horse carcasses were vulnerable to predation but in contrast to cattle (Table 14), no marks clearly associated with butchery for meat were observed on horse bones. Similarly, horse bones tended to less fragmented than those of cattle (Tables 13 and 24).

Horses generally could also expect to live longer than cattle. Although two of seven jaws with tooth ageing evidence still possessed deciduous teeth and belonged to horses around one and three years old, all the others belonged to adults. Age estimates derived from tooth

heights (Levine 1982) suggested two belonged to horses aged 7- 9 years, a third to one aged 12-14 years and one from a very old animal, possibly over 20 years old. Other immature horses were represented by unfused epiphyses but these were outnumbered by fused specimens even in the latest-fusing group (Table 16). One metatarsal bore evidence of degenerative joint disease of the hock (spavin), which is more commonly found in horses over ten years old. Horses were used for riding and as beasts of burden and would not usually be slaughtered at a younger age, particularly as it appears they were not required to provide meat.

The stature of the horses (most were the size of large ponies) was typical of Iron Age and Roman specimens recorded elsewhere in Britain (Table 18).

Dog

Most of the dog bones were found in three ABGs (Table 3), indicating that their carcasses were usually not processed. There is no evidence even on isolated bones for butchery marks. As today, dogs would have been kept as pets and/or as working animals.

The adult dog from pit G48 (L11; SL4; Phase 4) was from quite a large individual having an estimated shoulder height based on the tibia greatest length of 57cm (Harcourt 1974). Another complete tibia from Phase 5 belonged to a medium-sized dog with a shoulder height of around 48cm. The Roman deposits did also include two bones (from SL5 and SL10) from miniature breeds of dog, although neither of them were complete enough to estimate shoulder heights. Very small dogs began to be found in significant numbers in the Roman period and provide evidence of specialist breeding (Clark 1995).

Other Mammals and Amphibians

A humerus from SL5 (Phase 5) was the only bone identified as cat. Its distal breadth measured 17.3mm. This is sufficiently small to be from a domestic animal rather than a wildcat (O'Connor 2007). Cats have been found only very rarely on British Iron Age sites and have been recovered much less frequently than dogs on Romano-British sites.

The only evidence for red deer from Phase 4 was a sawn offcut of antler from SL3. A sawn antler tine from SL5 provided evidence of antler-working in Phase 5. A metacarpal from SL21 and a metatarsal from SL5 were the only other records of red deer.

A hind foot of a roe deer from grave SG349 (Cemetery SL10; Phase 5) could have been attached to a skin deposited in the grave. It belonged to an adult. The metatarsal was from a fairly small animal, having a greatest length of 186mm. The roe deer mandible from SL3 (Phase 4) had all three molars in full wear and also belonged to an adult. A cast antler and fragment of femur (both from SL24) were the only other roe deer elements identified. No bones of fallow deer were identified.

The only hare bone recorded was a first phalanx from an adult animal found in the empty grave/pit G135 (SL10). The cranium with its associated maxillae of an adult badger was recovered from pit G70 (SL14). The absence of the rest of the body may mean this was a

deliberate deposition. The small numbers of frog bones were, on the other hand, likely to have been from pitfall victims and the mole bone may have been from a modern intrusion.

Birds and Fish

Despite an extensive sieving programme, no fish bones were recovered and therefore there was no evidence that fish were exploited for food on any of the sites investigated.

Forty-eight bones from at least five species of bird were identified, only one of which (a femur of a rook/crow from SL3) was found in a Phase 4 deposit (Table 3). The absence of domestic fowl from British Iron Age sites is not unusual (Poole 2010). The Phase 5 Roman deposits produced 38 domestic fowl bones, 25 of which came from at least two juvenile chickens in grave SG349. No skulls were recovered but all other parts of the skeletons were represented. Most of the missing bones were the smallest and/or most fragile parts of the skeleton and therefore it is probable that the carcasses of two complete chicks were buried. Other small groups of chicken bones were found in three other graves (Table 27). Although in these cases their relationship with the human remains was less clear, their presence in these graves, given their paucity in other types of feature, is worth noting. Chickens have now been found in association with human burials on a range of late Iron Age and Roman sites (see, for example, Davis 1989; Reilly 2000; Maltby 2002; Foster 2012). Indeed, only four bones were found in non-grave contexts, all from SL21 (Table 27). These included two tarsometatarsi probably from the same cockerel from enclosure L65. No butchery marks were observed on any of the chicken bones. Although it is probable that chickens did occasionally supplement the diet, it appears that such consumption may have been reserved for special occasions, such as those associated with funerals. The cockerel tarsometarsus had a large spur (length = 23.9mm) but no evidence that this spur had been sharpened for cockfighting. None of the bones had evidence of medullary bone. Chickens tend to form a higher proportion of assemblages from Roman towns and military sites than other forms of settlement (Maltby 1997).

Five of the six duck bones (scapula; humerus; radius; tibiotarsus; tarsometatarsus) were probably from the same adult bird that was deposited in grave SG133 (along with chicken bones). Measurements of the humerus (proximal breadth (Bp) = 21.5mm; distal breadth (Bd) = 14.5mm) and tarsometatarsus (greatest length (GL) = 45.4mm; Bd = 9.0mm) indicated that the bird was the size of a mallard and may have been a domesticated bird. The other duck bone, a carpometacarpus, was of a bird of similar size (GL = 55.8mm) was found in another grave (SG192; G74) in the same cemetery. A coracoid of an adult rook/crow was found in the same grave. It seems plausible that these birds were also deliberately deposited during the burial process. Serjeantson and Morris (2011) have discussed several examples from other Romano-British sites where ravens and crows depositions may have been associated with ritual activities.

The other two bird bones belonged to birds of prey. The humerus of a sparrowhawk was found in enclosure L28. Its large size (GL = 58.3mm) indicated that this was a female. The humerus of a red kite was recovered from enclosure L37. Although these bones could be dismissed as simply indicating the presence of scavenging birds attracted to the farmsteads, it is feasible that the wings of such species could have been collected for their feathers.

Summary

The excavations of the sites in the NIAB complex provided several insights into the exploitation of animals in the Iron Age and Roman periods. In both periods the inhabitants of the various settlements relied mainly on beef for their meat supply, although they may have slaughtered more sheep than cattle, particularly in the earlier phase. There was little reliance on pork and no clear evidence that horsemeat was eaten, despite the relatively high frequency of horse bones found. Other species such as chickens, duck, roe deer, red deer and hare were eaten, at best, only very occasionally. There was no evidence for the consumption of fish or eggs. There was little evidence of specialist butchery taking place on any of the sites but some shoulders of beef and pork could have been imported and there is some evidence that small-scale antler and bone-working took place on some of the settlements. Some of the wild birds may have been hunted for their feathers.

In addition to meat, many of the cattle on the Roman sites in particular were probably exploited for traction and other work. Horses too were mainly, if not entirely, employed as working animals. Some sheep (particularly in the Roman period) were kept to an age when they will have supplied several fleeces of wool prior to slaughter. There is some evidence for the importation of new breeds (and/or the improvement in existing stock) in the Roman period, particularly with regard to the presence of some larger cattle and sheep and the appearance of miniature types of dog.

The excavations revealed interesting contrasts between the animal bone assemblages found in the cemeteries compared with those other parts of the settlements. Most of the roe deer, chicken and duck bones came from grave contexts, and these included several ABGs. One inhumation was also accompanied by a piglet that was also afforded special burial. The presence of these rare species in association with several of these burials shows they had significance that transcended their normal; contribution to the diet.

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