CHAPTER 13

THE ANIMAL BONE

By Claire Ingrem

The focus of this report is the animal bone recovered from Period 3 (*c.* A.D. 125–150—*c.* A.D. 200) and Period 4 (*c.* A.D. 200—*c.* A.D. 250/300) deposits, the majority of which came from layers in the south-east area of the excavation and is associated with occupation along the north–south street frontage. A small amount of material also came from miscellaneous pits and wells. Ceramic evidence suggests that some material may be residual (Timby, Ch. 8).

An assemblage of animal bone was also recovered from the Period 2–4 'House 1' sequence, including MBs 1–3, and this has already been published (Ingrem 2007). However, basic data from the 'House 1' sequence included in the tables and the results of that analysis are also included here to allow the entire Period 3 and 4 material from Insula IX to be viewed as a whole.

METHODOLOGY

Anatomical elements were identified to species where possible with the exception of ribs and vertebrae which were assigned to animal-size categories. Mandibles and limb bones were recorded using the zonal method developed by Serjeantson (1996) to allow the calculation of the minimum number of elements (MNE) and individuals (MNI); this is based on the most numerous zone of a single element taking into account size. Percentage survival of selected elements is based on the minimum number of elements (MNE) calculated as a percentage of the maximum number possible according to MNI. In addition, all bone fragments over 10mm in the hand-recorded material and over 2mm in the sieved samples were recorded to species or size category to produce a basic fragment count of the Number of Identified Specimens (NISP). Fragments categorised as large mammal are likely to belong to horse or cattle, those in the medium mammal category to sheep/goat or pig.

The presence of gnawing, butchery and burning, together with the agent responsible, was recorded. Measurements were taken according to the conventions of von den Driesch (1976) and Payne and Bull (1982) for mammals, and Cohen and Serjeantson (1996) for birds. The wear stages of the lower cheek teeth of cattle, caprines and pig were recorded using the method proposed by Grant (1982) and age attributed according to the method devised by Payne (1973), Legge (1981) and O'Connor (1988). The fusion stage of post-cranial bones was recorded and age ranges estimated according to Getty (1975). Measurements of the crown height of horse teeth were recorded and age estimated according to the method of Levine (1982).

A selected suite of elements was used to differentiate between sheep and goat (Boessneck 1969; Payne 1985): the distal humerus, proximal radius, distal tibia, distal metapodials, astragalus, calcaneus and deciduous fourth premolar. No elements were positively identified to goat, but for the purposes of this report the caprine remains are referred to as sheep/goat. It is likely that the birds identified as 'galliformes' are all domestic fowl. None of the characteristic features of pheasant were present on tarsometatarsi or femurs (Cohen and Serjeantson 1996). Duck have been assigned to species on the basis of size in comparison to reference specimens and using the criteria of Woelfle (1967).

The dog assemblage is the subject of a separate report (Clark, Ch. 14) although basic quantification data are included in Appendix 6, Table 57.

DATA

A total of 26,990 fragments of animal bone were recovered from Period 3 and Period 4 deposits (including the 'House 1' sequence) by hand collection, of these 57 per cent are identifiable to species, taxa, or size category (Appendix 6, Table 57a). Overall, cattle and specimens assigned to the large mammal category dominate the material, with caprines only slightly more numerous than pig. A number of other mammals are represented including horse, dog, badger (*Meles meles*), roe deer (*Capreolus capreolu*s), red deer (*Cervus elaphus*), hare (*Lepus europaeus*), and rat (*Rattus rattus*). Several species of bird are present including domestic goose (*Anser anser*), duck (*Anas*/*Aythya spp.*), galliform (probably domestic fowl), woodcock (*Scolopax rusticola*), pigeon/dove (*Columbus spp.*), raven (*Corvus corax*), rook/crow (*Corvus frugilegus*/*corone*), and thrush (*Turdidae spp.*). Fish are represented by salmonid and flatfish.

In addition, a further 5,317 fragments came from sieved samples of which 7 per cent are identifiable to species, taxa, or size category (Appendix 6, Table 57b). The remains of pig dominate this assemblage, although specimens assigned to the large mammal category are also numerous. The only mammal not present in the hand-collected material is wood mouse (*Apodemus sylvaticus*). A greater range of fish is present with cyprinid, common eel (*Anguilla anguilla*), sea bream (*Sparidae spp.*), and flatfish present; in addition single bones tentatively identified to scad (*Trachurus trachurus*) and mullet (*Muglidae spp.*) were recovered. A few amphibian bones are present including two ilia belonging to frog (*Rana temporaria*).

In general taxa representation is very similar in the assemblages recovered from both the south-east layers and the 'House 1' sequence, although caprines and pig are more numerous in the Period 4 'House 1' sequence (=MB 3), at the expense of cattle.

PERIOD 3 (*c.* A.D. 125–150–*c.* A.D. 200)

TAXA REPRESENTATION

South-east layers (Object 701)

Deposits dated to Period 3 (*c.* A.D. 125–150–*c.* A.D. 200) produced 5,191 identifiable specimens (Appendix 6, Table 57). The major domestic animals — cattle, sheep/goat and pig — dominate the assemblage with cattle most numerous and pig more frequent than caprines. Specimens assigned to the large mammal category are more numerous than those belonging to medium mammal. Horse and dog are present in small numbers. Several species of wild mammal are represented including roe deer, red deer and hare but all comprise less than one per cent of the identifiable assemblage. Galliformes dominate the bird assemblage, although greylag goose, duck, woodcock, pigeon/dove and corvid are all represented by a few specimens. The small fish assemblage contains bones belonging to salmonid, cyprinid, eel, flatfish, and probably also scad and mullet.

Excluding the dog remains (see Clark, Ch. 14), few articulated or paired bones were recovered. Two horse bones — a distal metapodial and 1st phalanx — belong to the same animal, as do a cattle radius and ulna, matching pairs of sheep metacarpals and metatarsals, and a pair of pig mandibles (Appendix 6, Table 58a).

In contrast to the NISP figures, the calculation of the minimum number of elements shows a fairly equal representation of cattle, sheep/goat and pig and the minimum number of individuals suggests there were fewer cattle (Appendix 6, Table 59a). Roe deer are represented by three individuals and red deer by one.

The majority of the material came from miscellaneous layers with a small proportion derived from pits and wells. There is some variation in the proportion of the major food animals according to feature type with cattle less well represented in the pits and layers than in the well which is dominated by cattle bones (FIG. 110a).

'House 1' sequence (=MB 1 & 2, 'ERTB 4' = MRTB 1, ERTB 1)

The majority of the assemblage from the 'House 1' sequence also derives from miscellaneous

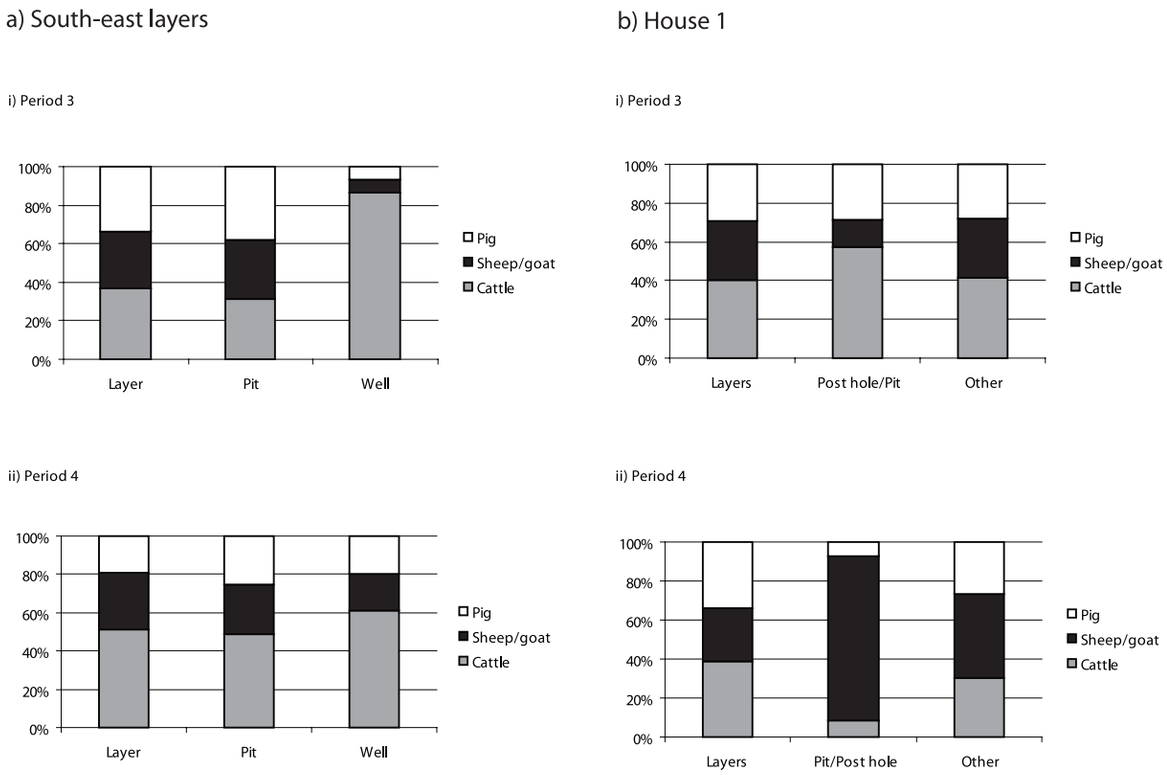

FIG. 110. Proportion of major domestic animals according to feature type (%).

layers and is very similar in terms of representation of cattle, sheep/goat and pig (Appendix 6, Table 57). Although cattle appear to be more numerous in the pits and post-holes (FIG. 110b), this is likely to reflect the small sample size (n=7) rather than depositional practices.

BODY PART REPRESENTATION

South-east layers (Object 701)

Anatomical representation according to NISP is shown in Appendix 6, Table 60a. Few horse bones were recovered and most are either loose teeth or foot bones. Cattle and sheep/goat are represented by elements from all parts of the body — head, major limbs and feet — with vertebra and rib fragments belonging to large and medium-sized mammals also present. Most parts of the pig skeleton are also present. The high frequency of metapodials is likely to reflect their naturally occurring frequency in the pig skeleton and the grouping of metacarpals and metatarsals during recording has also created a bias in their favour. As a result, pig metapodials are not directly comparable with cattle and caprines so have been omitted from the calculation of MNE and MNI (Appendix 6, Tables 59a–b).

Most of the roe and red deer bones are from the head and feet, although the presence of roe deer scapulae and red deer pelves suggests that some good quality venison was available. As would be expected for an animal usually cooked whole, the small hare assemblage includes bones from the head, major limbs and feet.

The galliform assemblage similarly includes elements from the trunk and the limbs. Other bird taxa are represented mainly by limb bones (Appendix 6, Table 61a). Apart from a few unidentifiable ribs, all of the fish bones are vertebrae.

Percentage survival has been calculated using, and is compared with, the method of Brain

(1969) in which the elements are listed according to their expected survival in a goat assemblage that has been subjected to density mediated taphonomic processes such as gnawing (FIG. 111a). In respect of the cattle assemblage, most major limb bones, tarsals and foot bones are over-represented with only the mandible, atlas, and axis notably under-represented. A similar pattern is visible for caprines although the mandible is better represented. The most notable characteristic of the pig assemblage is the scarcity of mandibles and over-representation of hind limbs.

'House 1' sequence (=MB 1 & 2, 'ERTB 4' = MRTB 1, ERTB 1)

In most respects the 'House 1' sequence is generally similar to that from the south-east layers although some forelimb bones belonging to horse and roe deer are present (Appendix 6, Table 60a, FIG. 111b).

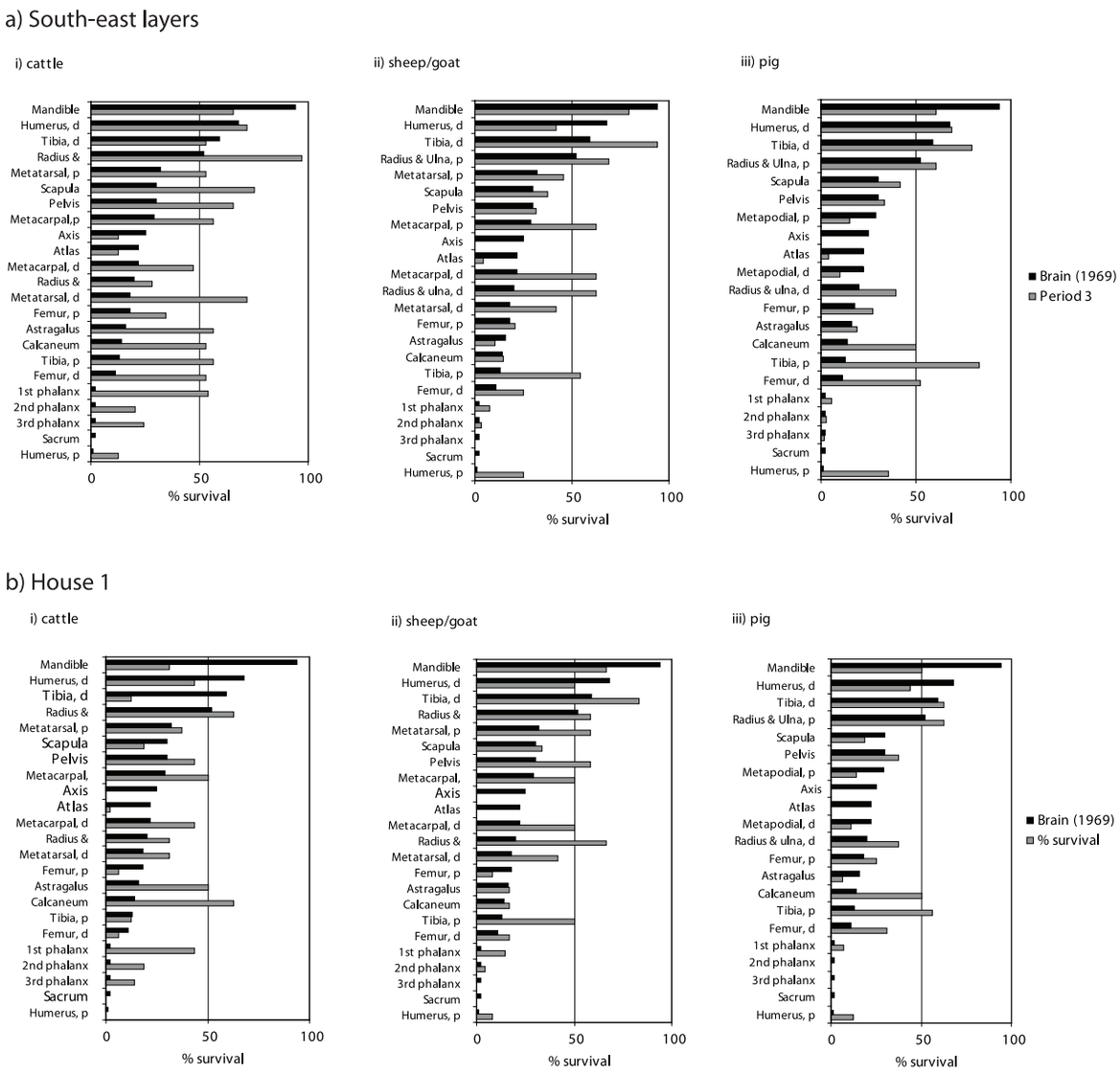

FIG. 111. Period 3: percentage survival (elements arranged according to Brain 1969).

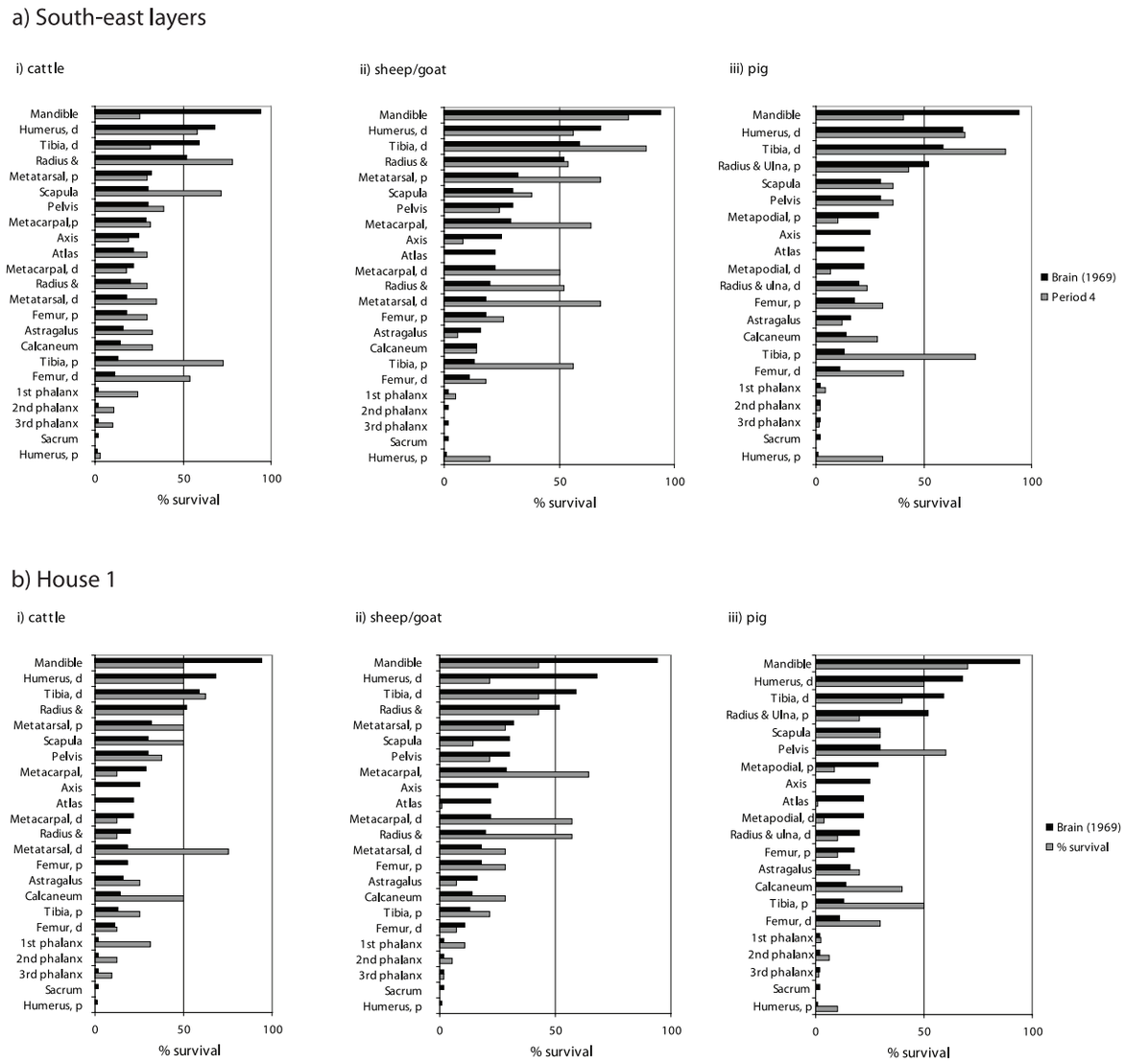

FIG. 112. Period 4: percentage survival (elements arranged according to Brain 1969).

MORTALITY AND SEX

Tooth eruption and wear data are given in Appendix 6, Tables 69–70 and bone epiphyseal fusion data can be found in Appendix 6, Tables 71–72.

South-east layers (Object 701)

All of the horse teeth derive from adults and no bones with unfused epiphyses indicative of immature animals are present.

Cattle teeth derive from animals ranging in age from very young to very old; however two clear peaks occur between 26 and 36 months and between 6 and 8 years, each representing approximately a third of the population (FIG. 113a, i). Bone epiphyseal fusion data broadly support this pattern but might suggest that the first peak in slaughter occurred later, between 3 and 4 years of age (FIG. 114a, i).

According to the dental data most sheep and goats were slaughtered between the ages of 1 and 4 years (FIG. 113a, ii). Epiphyseal fusion data similarly suggest that most (80 per cent) caprines

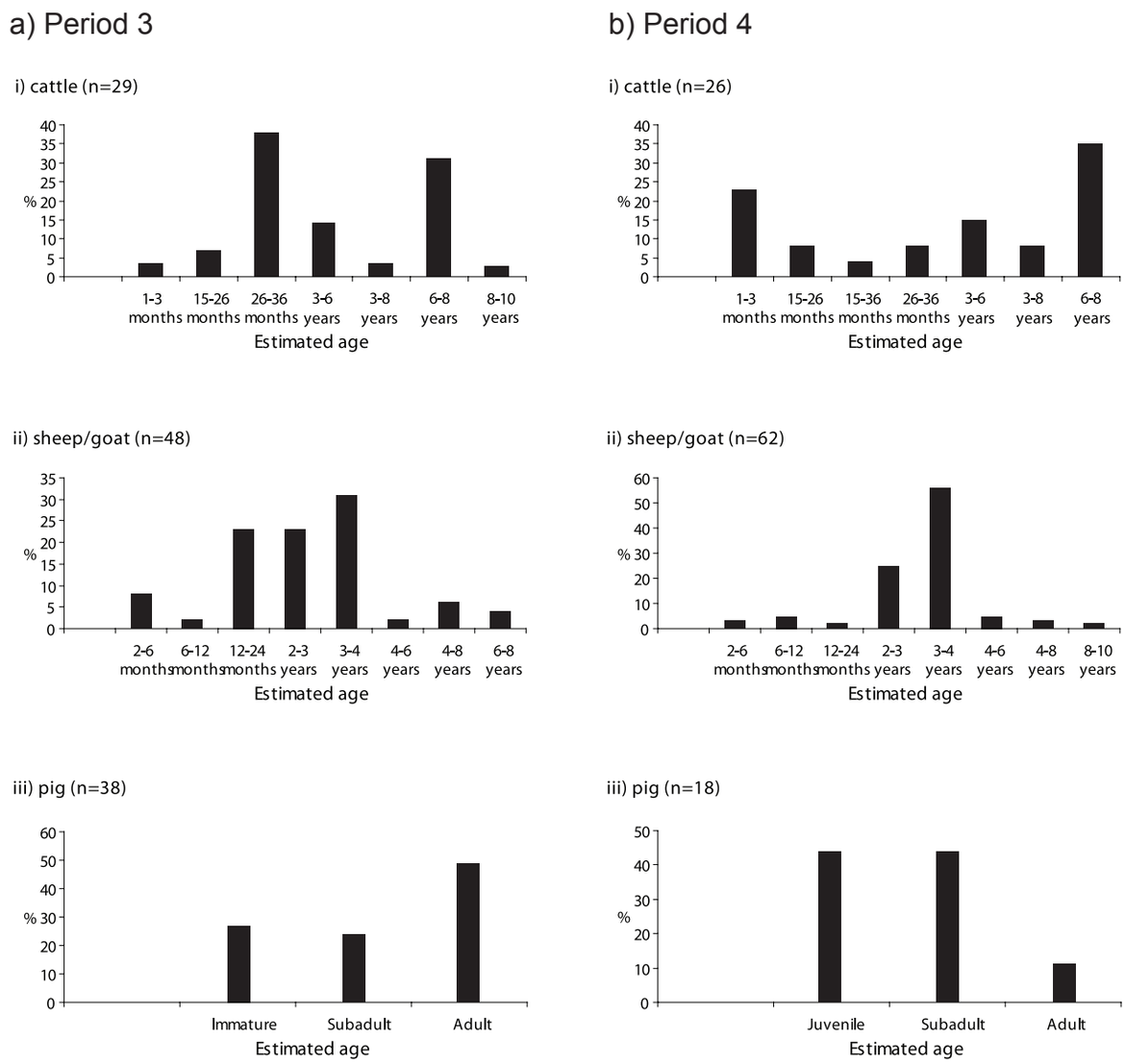

FIG. 113. South-east layers: estimated age of domestic animals according to tooth eruption and wear.

died before fully adult (FIG. 114a, ii). A few bones belonging to foetal/neonatal animals attest to the presence of very young lambs/kids.

Tooth eruption and wear data provide evidence that approximately half of the pig remains derive from animals that were immature or sub-adult, and the other half from adults (FIG. 113a, iii). The epiphyseal fusion data contradict this suggesting a steady rate of slaughter up until three years of age with few animals surviving into adulthood (FIG. 114a, iii). A few bones belonging to foetal/neonatal piglets are also present. Out of 26 pig canines that can provide an indication of sex, 18 belong to males.

The presence of a few immature galliform bones (10 per cent) is evidence that a small proportion of domestic fowl were slaughtered before reaching maturity. Three out of 22 metatarsal bones possess a spur or spur scar and so probably belong to male chickens (Sadler 1991).

'House 1' (= MB 1 & 2, 'ERTB 4' = MRTB 1, ERTB 1)

The evidence for age and sex of the remains from the 'House' 1 sequence broadly matches that

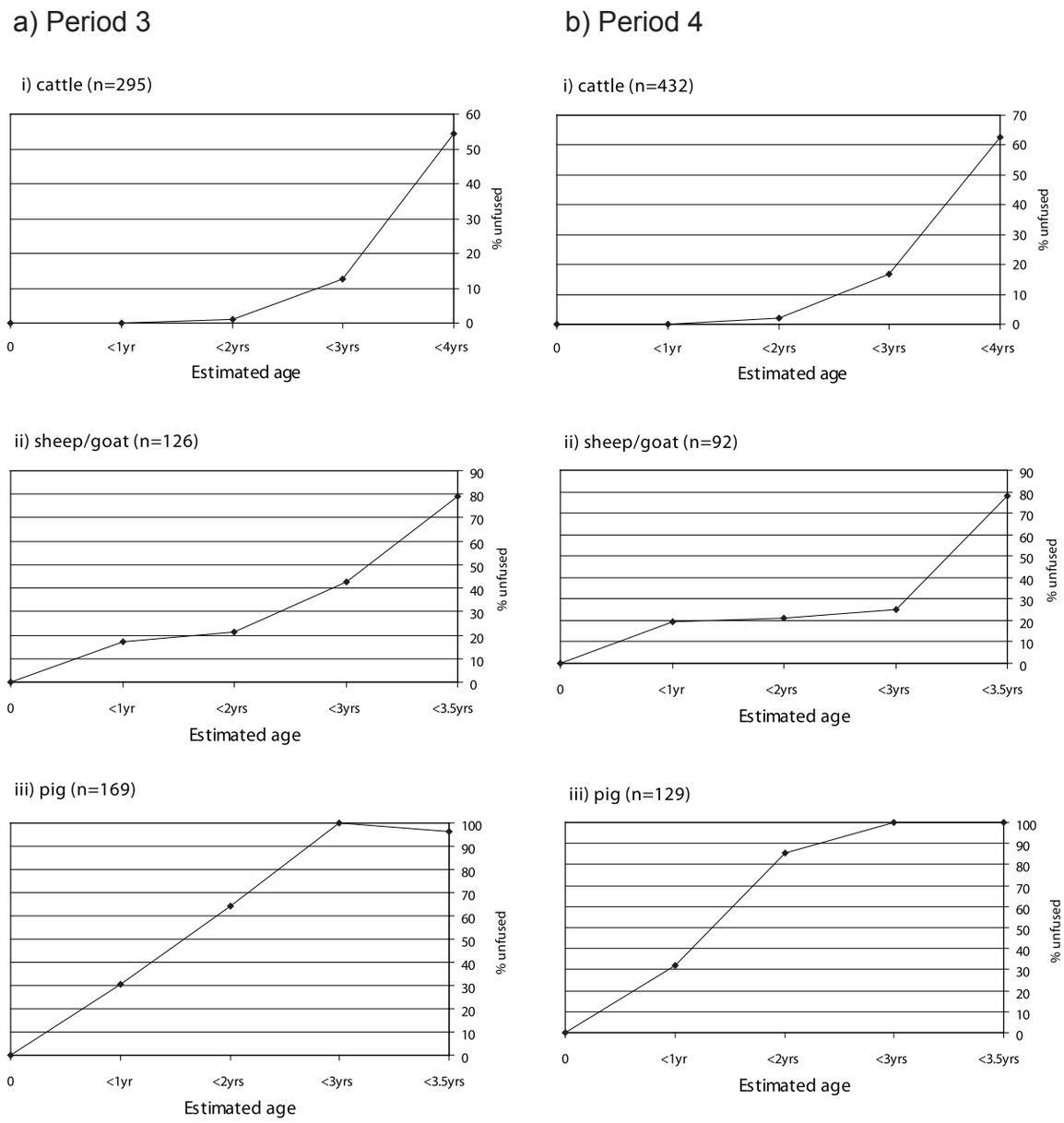

FIG. 114. South-east layers: estimated age of death according to bone epiphyseal fusion.

from the contemporary layers although male and female pigs are equally represented, by three canines each. A single galliform tarsometatarsal is without a spur.

TAPHONOMY

South-east layers (Object 701)

As discussed above, survival of the different parts of the skeleton indicates that bone density is not the only factor influencing the survival of bone and therefore it is likely that cultural factors have influenced the composition of the assemblage.

A small proportion (2 per cent) of the identifiable assemblage shows evidence for gnawing, probably by canids, and one bone displays marks associated with rodent gnawing (Appendix 6,

Table 62a). A higher incidence is visible on the bones of cattle (4 per cent) and pig (6 per cent) than on those of caprines (2 per cent).

Butchery evidence is clearly visible on 5 per cent of the identifiable assemblage (Appendix 6, Table 63). Cattle display the highest incidence (12 per cent) with chops more numerous than cut marks and a cattle metatarsal has been sawn transversely through the distal shaft. A smaller proportion of caprines (4 per cent) and pig (3 per cent) display blade marks, although cut and chop marks are more equally represented. In addition, a number of specimens possess shave marks where their surfaces have been sliced with a blade; most occur on the bones of cattle and large mammal, although a few are visible on caprine and pig specimens.

Some butchery marks occur repeatedly. In particular, numerous cattle scapulae display evidence of breakage that is suggestive of a hook being pushed into the blade and many possess chop marks where the distal part of the spine (acromion) was removed (FIG. 115). Transverse cut marks on the posterior face of cattle first phalanges indicative of skinning are also common (FIG. 116).

FIG. 115. Butchered cattle scapula showing removal of acromion.

During recording it became evident that a considerable number of bones preserve evidence suggestive of their having been broken open for marrow extraction and/or have split epiphyses likely to result from butchery even though they do not preserve blade marks. These marks can result from natural breakage but in order to gain an idea of their frequency they were recorded for Object 701 where 4 per cent of the assemblage is affected (Appendix 6, Table 64).

The incidence of burning is low (<1 per cent) with just a few fragments calcined and/or charred (Appendix 6, Table 65a).

'House 1' (= MB 1 & 2, MRTB 1, ERTB 1)

Evidence for gnawing is similarly scarce in the 'House 1' sequence (Appendix 6, Table 62b). A small proportion of the identifiable assemblage exhibits clear evidence for butchery in the form of cut and chop marks, with cuts more numerous and again mostly occurring around joint articulations (Appendix 6, Table 63b). Very few fragments are burnt (Appendix 6, Table 65b)

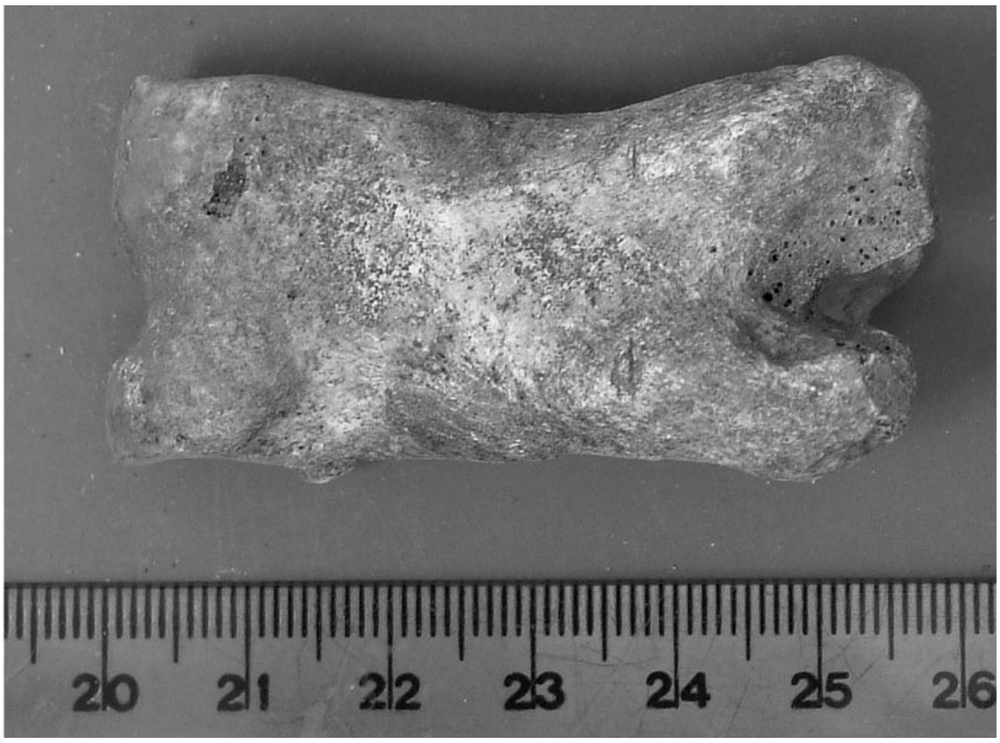

FIG. 116. Cut marks on cattle 1st phalanx.

PATHOLOGY

(*comments by Kate Clark*)

Several specimens display evidence of pathology including a cattle pelvis, navicular cuboid (FIG. 117) and 1st phalanx that display evidence of degenerative osteoarthritis. Another cattle 1st phalanx displays exostosis at the site of tendon insertion which is often associated with draught or traction (FIG. 118). A third cattle 1st phalanx has evidence of an early arthropathy with articular extension and early periarticular exostosis which is also age or draught related. A cattle

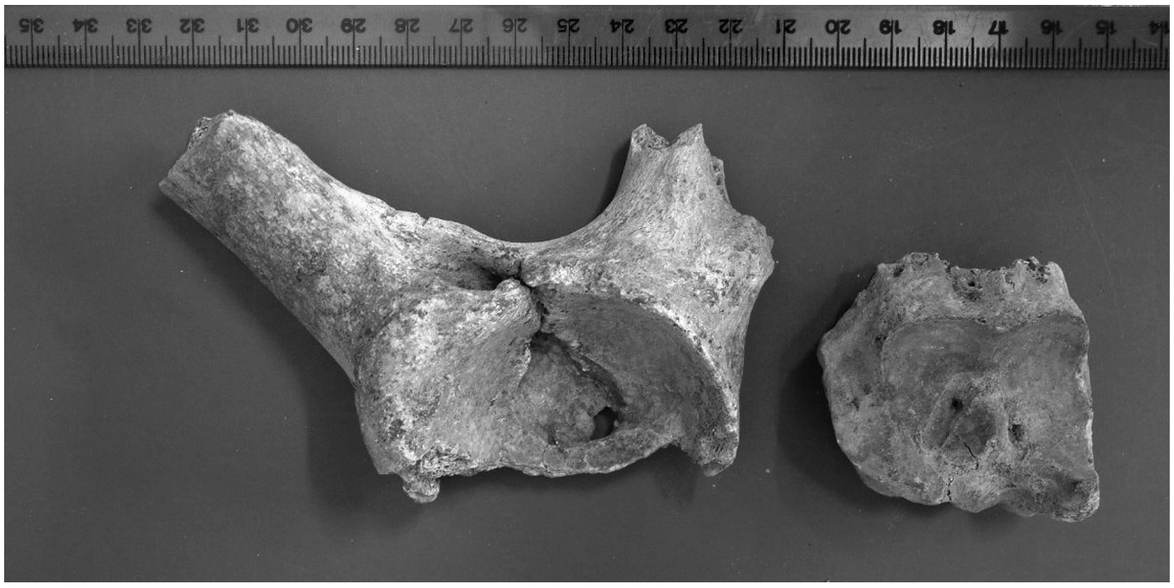

FIG. 117. Cattle pelvis and navicular cuboid with evidence of degenerative osteoarthritis.

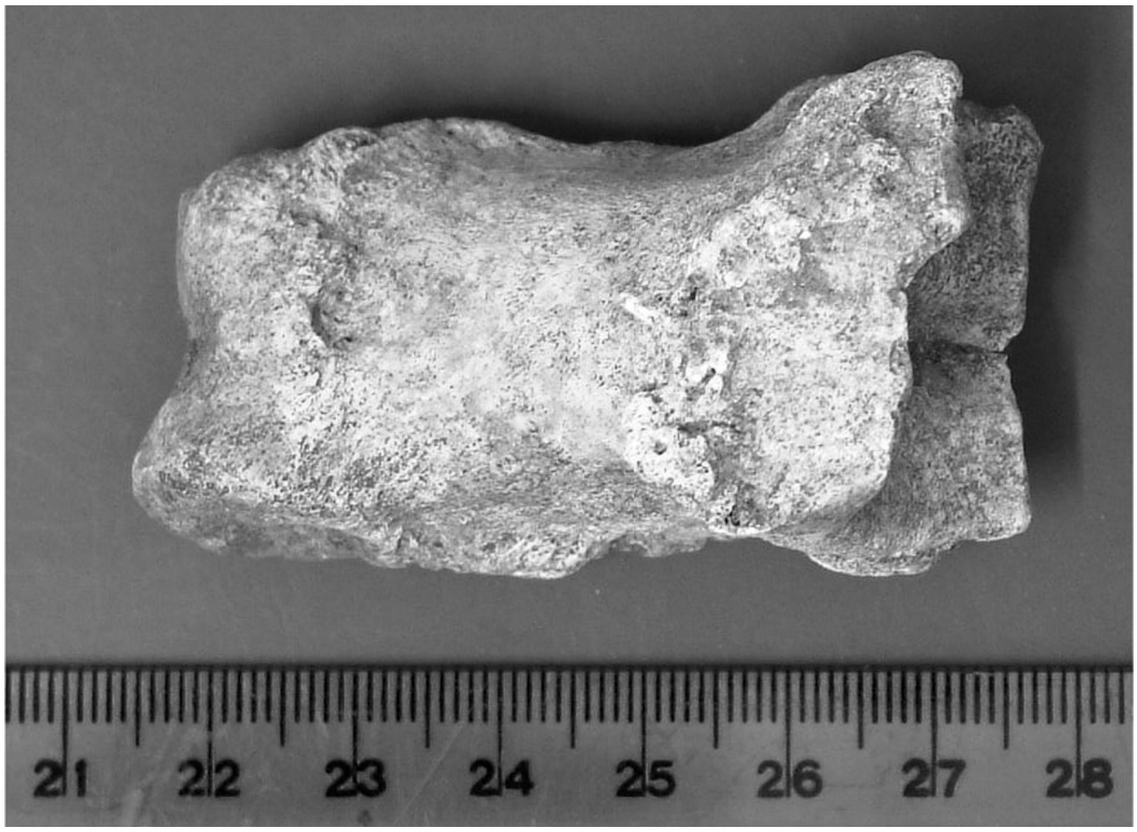

FIG. 118. Cattle 1st phalanx with exostosis at the site of the tendon insertion.

FIG. 119. Abnormally splayed cattle metatarsal with shave marks from Period 3 deposits.

metatarsal (FIG. 119) possesses abnormally splayed distal condyles that is also probably draught related (Bartosiewicz *et al.* 1993).

In addition, a galliform scapula displays swelling probably as the result of a healed fracture.

METRICAL DATA

South-east layers (Object 701)

Metrical data are given in Appendix 6, Tables 73–74. Where possible measurements have been compared with those held on ABMAP (http://ads.ahds.ac.uk/catalogue/resources.html?abmap) and in general they fall within the range recorded at other Roman sites. There are a few exceptions but most of these are less than 1mm outside of the range, although more notable in the cattle assemblage are the distal breadth of a humerus that is 1.5mm smaller, a metacarpal whose distal breadth is 2.4mm smaller, and a metatarsal whose proximal breadth is 3.1mm larger, than the ABMAP specimens.

The only caprine bones able to provide an estimate of size are two metacarpals that belong to a sheep with an estimated withers height of 566mm and 610mm (Appendix 6, Table 66) according to the factor of Teichert (in Boessneck and von den Driesch 1974). Several cattle metapodia are also complete; however the factors used to calculate withers height from these bones are sex dependent. The samples of metrical data are not large enough to separate males from females with certainty. However, proximal breadth and depth measurements have been plotted on scatter-graphs (FIG. 120) and whilst distinct clusters are not visible, females are likely

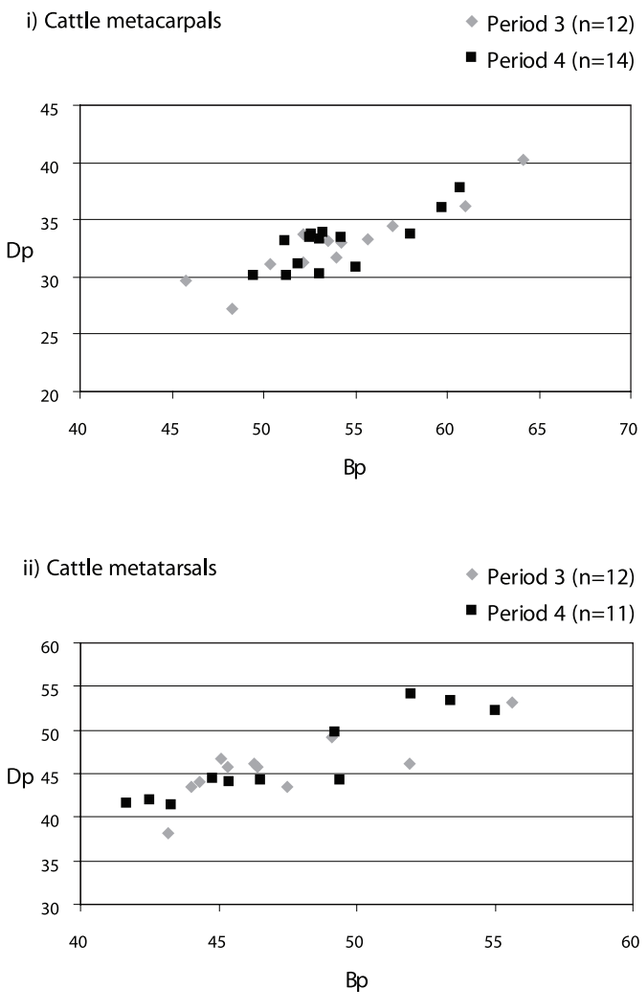

FIG. 120. South-east layers: proximal breadth and depth of cattle metapodials.

to be represented at the lower end of the scale and males at the upper. This has allowed the few metapodials that have a known greatest length to be assigned a sex and to be used to obtain an estimate of withers height using the factors of Teichert and Matolsci 1970 (in von den Driesch and Boessneck 1974). This suggests that cows were between 1.07m and 1.10m high at the withers which compares well with estimates of the average size of cattle obtained from early Roman deposits at Dorchester (Greyhound Yard) and from Roman Exeter. However, the one element assigned to the male category produced a slightly higher estimate of 1.23m (Appendix 6, Table 66) giving an overall average of 1.12m, suggesting that cattle at Silchester may have been slightly larger than those from contemporary sites in the South-West.

Metrical data for birds are given in Appendix 6, Table 75. Where possible measurements taken on bones belonging to duck (*Anas/Aythya* spp.) have been compared with modern comparative material and the data of Woelfle (1967) and all fall within the range for mallard duck.

SPATIAL ANALYSIS

South-east layers (Object 701)

The majority (86 per cent) of the Period 3 animal bone came from miscellaneous layers in the south-east quarter of the excavated area that is associated with the north–south street frontage. Taxa representation according to Object is shown in FIG. 121 and, although animal size categories are omitted, it is worth noting that large mammal comprises a considerable proportion of the samples (Appendix 6, Table 67a). Cattle (32 per cent) and pig (29 per cent) are the most frequent taxa in the layers (Object 701) although caprines are also numerous (25 per cent), with the remaining 15 per cent comprised of other taxa (FIG. 121 and Appendix 6, Table 67a).

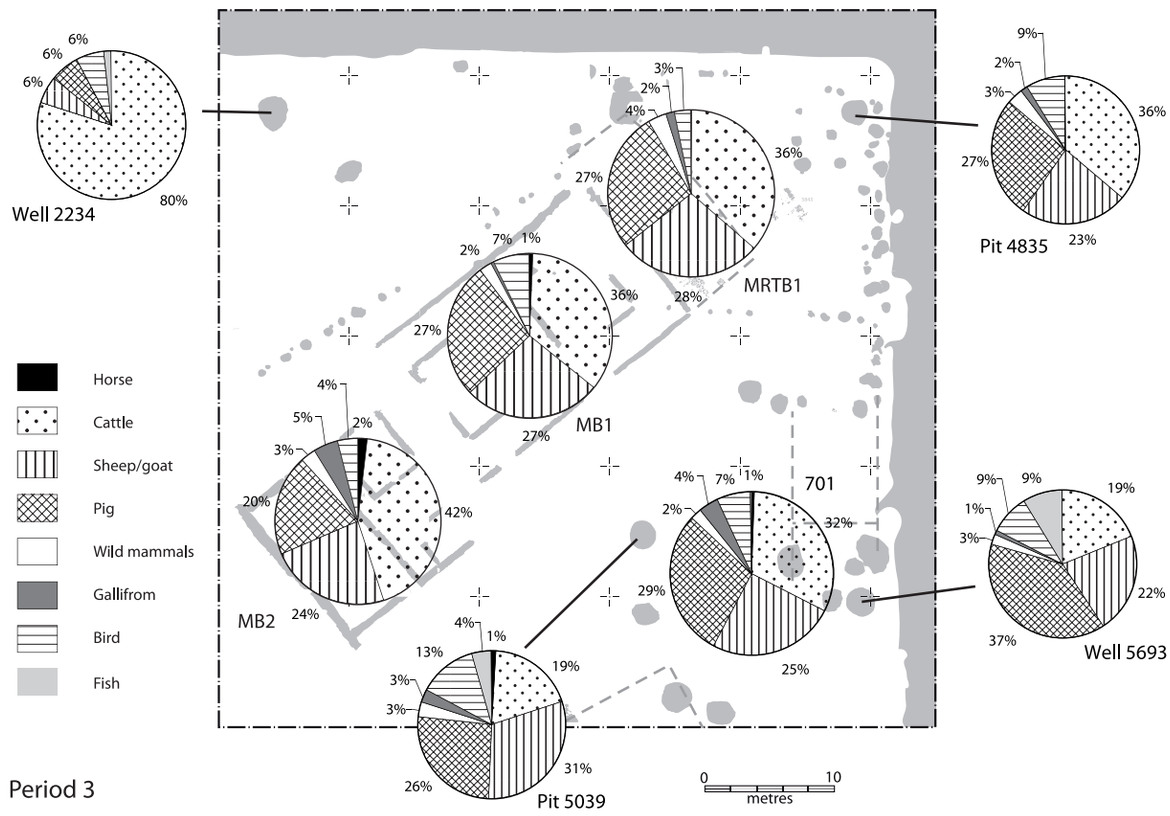

FIG. 121. Period 3: 'House 1', pits, wells and south-east layers: taxa representation according to Object.

Unsurprisingly given the large sample size, most of the horse, dog and the trace taxa came from the layers including partial fore and hind feet belonging to red deer from context 4067. Roe deer, hare, galliform, goose, duck, pigeon/dove, woodcock, rook/crow, thrush, salmon and eel are all represented (Appendix 6, Table 67a).

The pits and wells produced relatively small samples. Cattle are the least frequent of the major domestic animals in south-east pit 5039 (Object 44008) where caprines (31 per cent) are slightly more numerous than pig (FIG. 121). Other taxa comprise almost a quarter of the sample and include a few dog bones, a roe deer metacarpal, and a hare radius. Galliform, woodcock and cyprinid are also represented (Appendix 6, Table 67a).

Cattle show a similar representation in the other south-east pit, 5693 (Object 500035), in which pig is the most numerous taxa (FIG. 121). Wild animals are represented by a roe deer mandible and scapula and a hare pelvis. Goose, galliform and woodcock are amongst the bird remains and fish are represented by a few bones belonging to cyprinid and eel. The remains of two dogs, including a tibia with skinning marks, also came from this pit (Appendix 6, Table 67a).

In contrast, well 2234 in the northern area (Object 41016) contained mainly cattle bones (80 per cent) with the remaining 13 specimens belonging to sheep/goat, pig and other taxa that include two woodcock bones and a fragment of fish (FIG. 121; Appendix 6, Table 67a).

Cattle (36 per cent) are also the most numerous taxa in the northern pit 4835 (Object 500028), where pigs are slightly more numerous than caprines (FIG. 121). Wild species and other animals are scarce with only a roe deer mandible, two wood mouse, a few dog and two galliform bones identified (Appendix 6, Table 67a).

'House 1' sequence (= MB 1 & 2, 'ERTB 4' = MRTB 1, ERTB 1)

MB 2 (Object 50019) produced a rather high proportion of cattle fragments and fewer caprines than either MB 1 (Object 50018) or ERTB 4 (=MRTB 1, ERTB 1) (Object 50037) (FIG. 121).

PERIOD 4 (*c.* A.D. 200–*c.* A.D. 250)

TAXA REPRESENTATION

South-east layers (Object 700)

The assemblage recovered from Period 4 deposits is larger than the Period 3 sample comprising a total of 7,515 identifiable specimens (Appendix 6, Table 57). In addition to the taxa present in the earlier period, badger, rat, raven, eel, sea bream, flatfish and frog are all represented. Wood mouse, rook/crow, thrush and cyprinid were absent.

According to the NISP figures, cattle are slightly more numerous in this phase (Appendix 6, Table 57) comprising approximately 50 per cent of the material from layers and pits (FIG. 110b). Cattle bones also dominate the well deposits, although not to the extent seen in Period 3. A similar range of wild mammal is present including roe deer, red deer and hare, but again all represent less than one per cent of the identifiable assemblage. Galliform is the most numerous bird taxon, although greylag goose, mallard duck, woodcock, pigeon/dove and raven are all represented by a few bones (Appendix 6, Table 57). The small fish assemblage includes eel, sea bream and flatfish.

A few bones were recovered as matching pairs or articulations and 34 are from partial skeletons (Appendix 6, Table 58), including a partial piglet that came from context 3836 and a partial badger recovered from pit 2434 (context 2602).

Calculation of the minimum number of elements and individuals also indicates that cattle are considerably more numerous than caprines (Appendix 6, Table 59a).

'House 1' sequence (= MB 3)

The Period 4 assemblage from the 'House 1' sequence is smaller than the sample from the

preceding period (Appendix 6, Table 57). The NISP and MNI figures are slightly contradictory (Appendix 6, Tables 57 and 59b, ii), although caprines are more numerous whichever method is employed. The range of wild animals is narrower than was observed for the Period 3 'House 1' sequence with only roe deer, duck and woodcock represented.

BODY PART REPRESENTATION

South-east layers (Object 700)

Anatomical representation according to NISP and MNE is shown in Appendix 6, Tables 59a, ii and 60b. Despite the small size of the horse assemblage, elements from the head, major limbs and feet are all present. As with Period 3, cattle, caprines and pig are represented by elements from all parts of the body with major limb bones well represented. Vertebrae and rib fragments belonging to large and medium-sized mammals are also present. Of particular note is the large number of limb-bone fragments assigned to the large mammal category.

Roe deer are represented by a fragment of antler, mandibles, scapulae and metapodials belonging to a minimum of one individual. Several pieces of red deer antler, two tibiae, a scapula, pelvis, metatarsal and a 2nd phalanx representing at least two individuals are also present. In addition, hare major limb and foot bones are present (Appendix 6, Table 60b).

As in Period 3, the galliform sample contains elements from both major limbs and trunk with the tarsometatarsal most numerous (Appendix 6, Table 61b). Raven is represented by trunk and limb bones, whilst the rest of the bird assemblage is dominated by limb bones.

Salmon, eel and sea bream are represented solely by caudal vertebrae and flatfish by an anal pterygoid.

Percentage survival is shown in FIG. 112a alongside the model proposed by Brain (1969). As in Period 3, it appears that bone density is not the only factor affecting assemblage composition, with the general over-representation of limb bones and under-representation of some of the densest bones suggesting that cultural practices have also played a part.

'House 1' sequence (= MB 3)

The assemblage recovered from the 'House 1' sequence is very similar with the major domestic animals represented by elements from all parts of the body (Appendix 6, Table 60b). Density is clearly not the only factor affecting the assemblage as indicated by the comparison with Brain's ethnographic data (FIG. 112b).

MORTALITY AND SEX

Tooth eruption and wear data are given in Appendix 6, Tables 69–70 and bone epiphyseal fusion data in Appendix 6, Tables 71–72.

South-east layers (Object 700)

Ageing evidence for horse is again scarce. Only one bone has an unfused epiphysis, a distal tibia which provides evidence that one horse died before reaching two years of age.

The sample of cattle mandibles and loose teeth able to provide tooth eruption and wear data, although relatively small, displays two peaks in slaughter between one and three months and between six and eight years of age (FIG. 113b, i). A tibia belonging to a neonatal/foetal calf is the only evidence for the death of very young animals, with epiphyseal fusion suggesting that most animals died after reaching three years of age (FIG. 114b, i).

A larger sample of dental data is available for caprines and shows that the majority (81 per cent) were slaughtered between the ages of two and four years (FIG. 113b, ii). Epiphyseal fusion data suggest that most were culled between three and three and a half years of age (FIG. 114b, ii). The presence of very young caprines is evidenced by a few foetal/neonatal specimens.

With regard to pig, tooth eruption and wear data indicate that most pigs (89 per cent) were slaughtered before reaching adulthood (FIG. 113b, iii). Similarly, there is no evidence from bone epiphyseal fusion data to suggest that any pigs survived past three years (FIG. 114b, iii).

A few bones belonging to foetal/neonatal piglets were also recovered. Fourteen pig canines provide an indication of sex; seven belong to males and seven to females.

Only two immature galliform bones (2 per cent) were recovered from Period 4 deposits. Six out of nineteen tarsometatarsal bones possess a spur or spur scar and probably belong to cocks. Medullary bone is present in two out of seven galliform femora.

'House 1' sequence (= MB 3)

There is no evidence for very young calves although dental data provide evidence for the culling of both immature and adult cattle (Appendix 6, Table 70). Most of the caprine mandibles and loose teeth belong to animals that died after reaching three years of age, although bone data suggest that a considerable proportion were culled in their first and second years. There is evidence for adult pigs, although bone fusion data again show that most pigs were less than three years old when slaughtered. Five pig canines provide an indication of the sex of the pigs: three belong to males and two to females. Of three galliform tarsometatarsals, one has a spur.

TAPHONOMY

South-east layers (Object 700)

As with the Period 3 assemblage, percentage survival (FIG. 112) indicates that most major limb bones are present in greater numbers than would be expected in an assemblage that has been subjected to density mediated taphonomic processes alone. Cultural practices such as differential butchery and disposal have clearly played a significant role in affecting assemblage composition.

There is some evidence that dogs had access to the bones with 3 per cent of the identifiable component displaying gnaw marks (Appendix 6, Table 62a). Pig (8 per cent) possesses a higher incidence than cattle (5 per cent) and sheep/goat (5 per cent).

The incidence of butchery marks is similar in this phase with 6 per cent of the identifiable assemblage affected (Appendix 6, Table 63b). Cattle display the highest frequency (12 per cent) with cut and chop marks occurring in almost equal numbers. A smaller proportion of caprines (2 per cent) and pig (5 per cent) have blade marks, although again cut and chops occur in similar numbers. In addition, shave marks occur on a considerable proportion of the cattle and large mammal assemblages but are absent on sheep/goat and pig bones. Saw marks are visible on two pieces of red deer antler.

As in Period 3, cattle scapulae and 1st phalanges display classic evidence for butchery associated with meat processing and skinning respectively.

The incidence of burning is low (<1 per cent) with just a few fragments calcined and/or charred (Appendix 6, Table 65b).

'House 1' sequence (= MB 3)

A slightly smaller proportion of the assemblage displays gnaw marks (Appendix 6, Table 62b). Cattle and pig bones are less affected by butchery with cut marks more numerous than chops and, as in the earlier period, most are associated with disarticulation.

PATHOLOGY
(*comments by Kate Clark*)

South-east layers (Object 700)

Several specimens in the Period 4 assemblage display evidence of pathology. These include

a cattle 2nd phalanx that exhibits early signs of stress on the tendon attachment. A caprine metacarpal has ossification at the site of tendon attachment that is probably age-related (FIG. 122). A pig humerus displays evidence for osteomyelitis which seems to have partly resolved and part of a draining sinus is visible (FIG. 123). In addition, the shortened and deformed diaphysis of a galliform tibiotarsus is probably the result of a fracture.

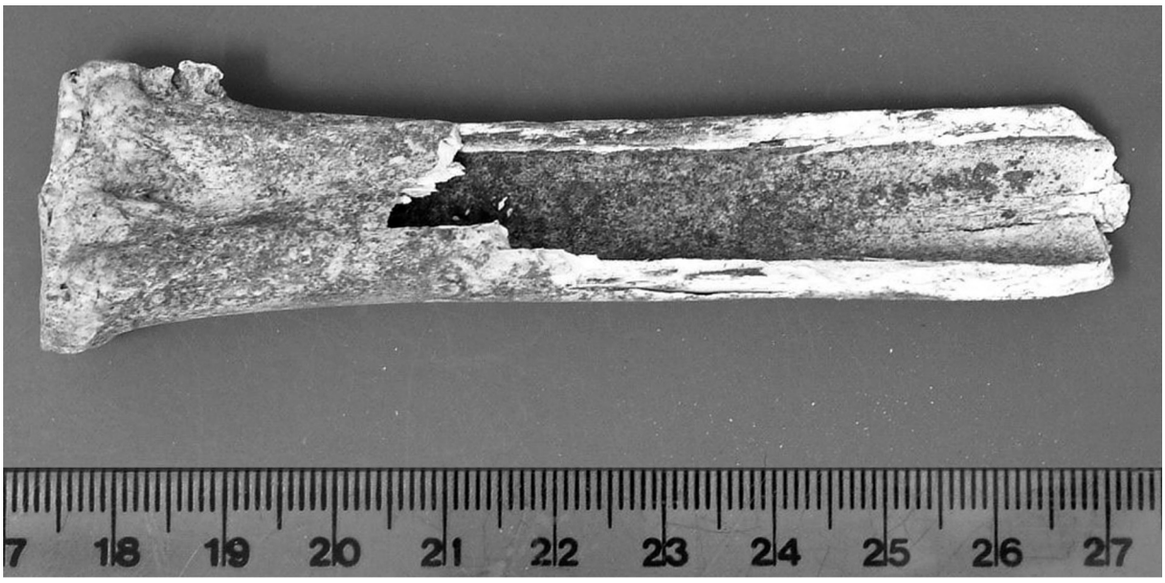

FIG. 122. Sheep/goat metacarpal from Period 4 deposits with ossification at the site of the tendon attachment.

FIG. 123. Butchered and pathological pig humerus from Period 4 deposits.

FIG. 124. Evidence for hip dysplasia on a badger pelvis and femur from Period 4 deposits.

An articulating pelvis and femur (FIG. 124) belonging to an immature badger display significant bony proliferation below the femoral caput and the acetabulum is filled indicating that the animal suffered from hip dysplasia. It is clearly a long standing lesion and so the dislocation must have occurred at a very young age.

A hare ulna displays pronounced ossification of the tendon attachment which flexes the elbow joint and suggests that the animal was aged.

METRICAL DATA

South-east layers (Object 700)

Metrical data are given in Appendix 6, Table 73 and where possible have been compared with those held on ABMAP (http://ads.ahds.ac.uk/catalogue/resources.html?abmap). Most specimens fall within the range recorded for elements from contemporary sites and the majority of those which fall outside only do so by a very small amount (less than 1mm). The exceptions are: a pig humerus that has a shaft diameter 1.6mm larger, a cattle radius that has a breadth of the proximal facies 1.2mm smaller, and a pig radius with a proximal breadth 1.2mm smaller. More notable is the presence of several relatively large cattle metatarsals, one with a proximal breadth 2.5mm larger, and three with proximal depths 2.9mm, 4mm and 4.8mm larger than those held on ABMAP, and, therefore, probably representative of large bulls.

Three metacarpals and four metatarsals provide an estimate of size (Appendix 6, Table 66a) and suggest that sheep stood between 577mm and 657mm at the withers with an average of 624mm, according to the factor of Teichert (in Boessneck & von den Driesch 1974). The sample is small but does suggest that sheep may have been larger in Period 4.

Metrical data for birds are given in Appendix 6, Table 75. Where possible measurements taken on bones belonging to duck (Anas/Aythya spp.) have been compared with modern comparative material and the data of Woelfle (1967); most fall within the range for mallard duck, although

one tarsometatarsal is slightly smaller. The greatest length of a duck humerus indicates that it belongs either to teal *(Anas crecca)* or garganey *(Anas querquedula)*.

SPATIAL ANALYSIS

South-east layers, pits and wells

More than three-quarters (76 per cent) of the animal bone from Period 4 deposits in this area of Insula IX came from miscellaneous layers associated with occupation that took place along the north–south street frontage (Object 700). The remaining small quantity derives from the south-eastern pits and wells (Appendix 6, Table 67b). Taxa representation is shown graphically in FIG. 125 which indicates that there is some variation in the representation of cattle, sheep/goat and pig according to feature, with cattle generally having a higher representation in the layers than in the pits and wells.

In the layers (Object 700), cattle are more numerous (47 per cent) than they were in Period 3 and caprines outnumber pig. Other taxa are scarce with galliform, goose, duck, pigeon/dove, woodcock and raven comprising a total of 6 per cent of the assemblage (FIG. 125). Specimens belonging to wild animals make up just one per cent, although roe deer, red deer, hare, salmon and eel are all represented (Appendix 6, Table 67b). A proportion of this assemblage derives from contexts associated with two ephemeral buildings, MRTB 4 and 5, and a comparison of these samples with the material recovered from the more general layers indicates that the northern

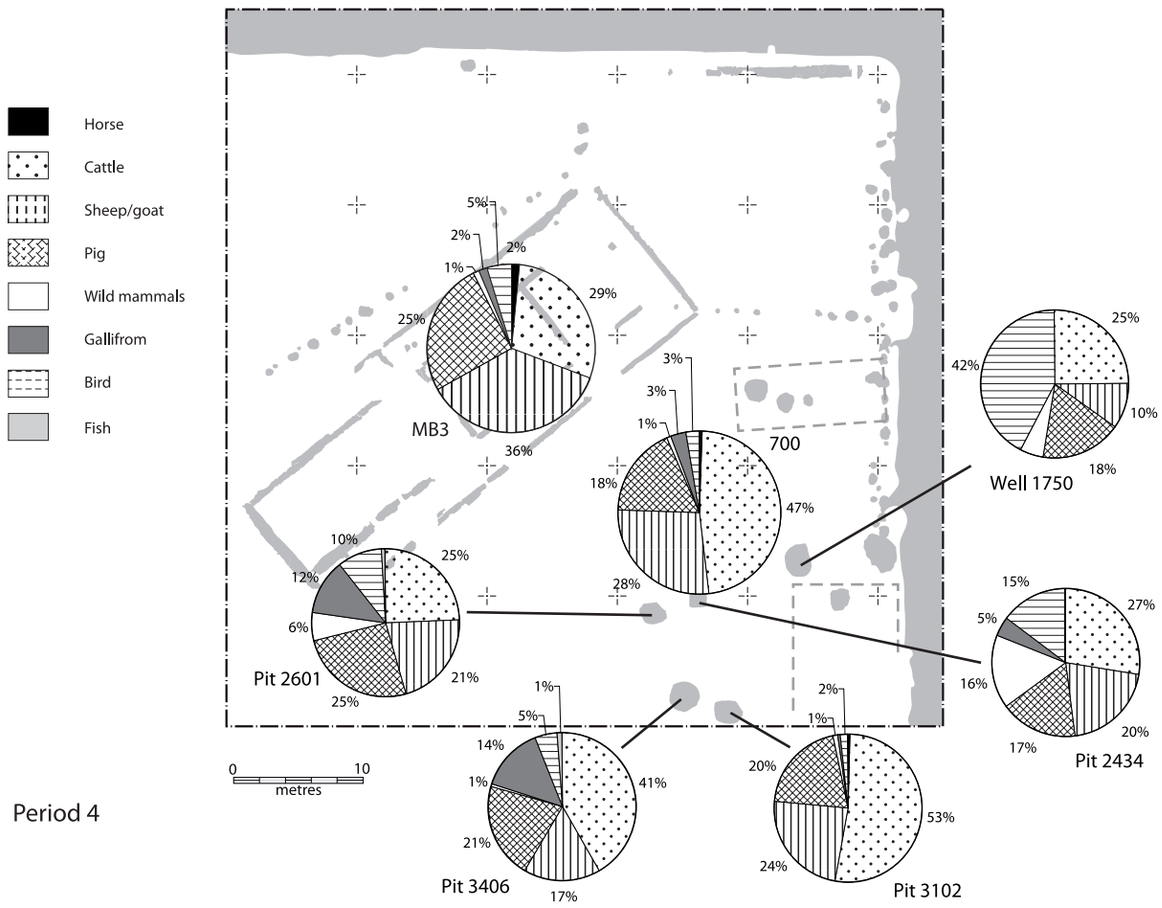

FIG. 125. Period 4: 'House 1', pits, wells and south-east layers: taxa representation according to Object.

building produced a relatively high proportion of sheep/goat at the expense of pig (Appendix 6, Table 68). A minimum of four dogs came from these deposits (Clark, Ch. 14).

The sample from well 1750 (Object 500020), although small, is dominated (43 per cent) by bird remains (FIG. 125). Of particular interest are twelve raven bones — including pairs of humerii, ulnae and tibiotarsii — that probably belong to the same skeleton, and which came from a timber structure that forms the basis of the well shaft (context 2767). A few bones belonging to domestic and wild animals, including several dog bones (Clark, Ch. 14), a red deer tibia, a pathological hare ulna and a woodcock bone, also came from the well.

Cattle are the most numerous taxa in pit 2434 (Object 500031). Other animals make up a sizeable proportion of the sample with wild animals and birds other than galliform comprising 15 and 14 per cent respectively (FIG. 125). The remains of at least three dogs (Clark, Ch. 14), three pieces of red deer antler, two partial badger skeletons, a pair of cattle horn cores, and galliform scapulae are amongst the remains. Woodcock, goose and galliform are also represented.

Pit 2601 (Object 500032) produced fairly equal quantities (25 per cent) of the major domestic animals (FIG. 125). Galliform, red deer, hare and rat are all present. Five raven bones (probably from the same individual) came from context 2762 and two pig metapodials that probably belong to the same foot also came from this pit. In addition, a minimum of two dogs are represented, at least one of which was male (Clark, Ch. 14).

Cattle remains that include a partial skull, dominate the material from pit 3406 (Object 500033) (FIG. 125). A matching pair of foetal/neonatal pig humerii also came from this pit. Galliform is present in significant numbers (14 per cent) and a few bones belonging to goose, woodcock and corvid are present (Appendix 6, Table 67b). Dog is represented by at least two individuals and also a neonate (Clark, Ch. 14).

Similarly, cattle remains dominate pit 3102 (Object 500034) but, although it produced a larger sample than any of the other pits or wells, only odd bones belonging to red deer, galliform, woodcock and dog are present (FIG. 125; Appendix 6, Table 67b).

Cattle comprise half of the sample from well 5735 (Object 500037). Dog, red deer, hare, rodent and goose are all represented. Nineteen amphibian bones came from this deposit of which two pelves belong to frog (FIG. 125; Appendix 6, Table 67b).

'House 1' sequence (= MB 3)

A single structure, MB 3 (Object 50046), occupied the site during Period 4. As in the earlier phase, most of the assemblage derives from miscellaneous layers, spreads and deposits within this structure. The largest concentrations of animal bone came from two clay levelling deposits outside and to the south of the house (contexts 3396, 4454) which produced 165 and 88 identifiable specimens respectively; pig is the most numerous species in both (FIG. 125).

Several deposits are worthy of note. These include the partial skeleton of an immature sheep, aged between 12 and 24 months, recovered from a shallow pit (context 2006). Several cattle foot bones that probably represent the disposal of feet came from an occupation deposit (context 2471) and a robber trench (context 3636). In addition, another levelling deposit (context 4454) produced a scapula and metacarpal belonging to a foetal/neonatal caprine.

INTERPRETATION AND DISCUSSION

ANIMAL EXPLOITATION

The assemblages from the south-east layers and the 'House 1' sequence are clearly dominated by the three major domesticates — cattle, caprines and pig — during both Period 3 and Period 4. Variation in the relative frequencies of these animals is generally believed to reflect the type of settlement and its degree of 'romanisation'. Highly romanised sites such as *coloniae* and those associated with the military tend to produce high values for cattle and pig, while native, rural settlements are more often associated with a high proportion of caprines (King 1991). More recently, changes in taxa frequency have been seen as part of the general intensification of

agriculture that was taking place at the time rather than simply indicating dietary preference (Hamshaw-Thomas 2000). The increased frequency of cattle that occurs in the Period 4 layers from the south-east area of Insula IX conforms to the pattern expected for an urban settlement and suggests that Insula IX became increasingly 'romanised' with time. An increasing emphasis on cattle at Silchester is also attested by the recovery of a cattle-dominated assemblage from fourth-century deposits in Insula IX (Ingrem 2006) and many other areas of the site (Maltby 1984; Barker 1983; Hamilton-Dyer 1997).

There is some variation in taxa representation, chronologically, spatially and according to the method of quantification. For instance, in contrast to the fragment counts, calculation of the minimum number of individuals for the Period 3 assemblages recovered from both the south-east layers and the 'House 1' sequence suggests that caprines and pig outnumbered cattle. This may have been the case; however the larger body size of cattle almost certainly suggests that beef was the meat most commonly eaten even in the early period and the increasing romanisation of the diet is also evidenced by the contribution made by pork. No such discrepancy occurs in the material from the Period 4 south-east layers; cattle remains are clearly dominant regardless of the method of quantification leaving little doubt that in general more beef was eaten, at the expense of pork, by the third century.

The higher frequency of caprines and pig in the Period 3 pits located in the south-eastern area compared with those in the northern part of the excavation trench is probably related to their having been used for the disposal of household food waste. During Period 4, evidence from the 'House 1' sequence and MRTB 5 suggests that mutton made a greater contribution to the diet of certain inhabitants. This has led to the suggestion (Ingrem 2007) that a pattern midway between those generally associated with native and highly romanized sites might reflect an early stage in the process of economic intensification. However, in light of the evidence now available from the south-eastern area of the excavated area, the relatively high frequency of sheep/goat appears unusual and seems more likely to suggest that some occupants, including those of 'House 1', had ready access to their preferred meat — mutton — and perhaps were slow to adopt a more Roman diet.

Spatial variation in taxa representation has been shown to exist in other areas of Silchester and at other Roman towns; it is often associated with human activities that result in differential disposal such as butchery and industrial processes. For instance, previously excavated early Roman deposits suggest that primary butchery of cattle took place on the outskirts of Silchester, with waste discarded in ditches away from the main settlement areas (Maltby 1984). Such practices would explain the relatively low number of cattle bones in central areas and would account for the under-representation of cattle jaws. At Exeter Maltby (1979) also showed that taxa frequency varied according to location within the Roman town, again as the probable result of differential butchery and disposal practices (Maltby 1985a).

A high incidence of pig, similar to that seen in the Period 3 assemblage from the south-east layers and throughout the 'House 1' sequence, also occurred in early Roman deposits at the forum-basilica prompting Grant (2000) to suggest that pigs were bred to supply the towns. More recently, this high frequency was interpreted (Grant 2002) as 'confirmation of the importance and comparative wealth of the settlement'. An abundance of pig at sites such as Skeleton Green, Herts. (Ashdown and Evans 1981), and Fishbourne, West Sussex (Grant 1971), has also been associated with high status and wealth during both the Iron Age and Roman periods. Evidence for a high frequency of pig in very early (Period 2) Roman deposits from Room 2 of ERTB 1 (Object 50030) suggests that a tradition of feasting may have been in place for some time in Insula IX and that some inhabitants may have held considerable status (Ingrem 2007).

In terms of taxa representation, the Period 3 assemblage from Insula IX appears to have much in common with that recovered from contemporary deposits (Period 6) at the forum-basilica (Grant 2000, 426). Interestingly, this similarity extends to comparisons between the Period 4 MB 3 sequence and the Period 7 (*c.* A.D. 250–400) assemblage from the basilica area in respect of the unusually high proportion of caprines, even if the chronology of the basilica assemblage is slightly later. As in MB 3, the high incidence of sheep/goat is at odds with evidence from contemporary sites and other areas of the town which led Grant (2000, 474) to suggest that

it might be explained either by an unusual food supply and local economy or by particular activities that took place in the forum-basilica, rather than representing the general pattern of food consumption in the town. In the case of MB 3, however, we should allow for residuality.

CONSUMPTION AND DISPOSAL PRACTICES

The assemblage recovered from Period 3 deposits contains bones from all parts of the cattle, sheep/goat and pig skeletons, providing a clear indication that at least some, probably most animals arrived at Silchester on the hoof in both periods. According to percentage survival cattle and pig mandibles are quite scarce, particularly in the 'House 1' sequence, suggesting that joints of beef and pork were imported. Good quality meat bones are abundant and clearly good quality cuts of meat were available to the people living in Insula IX. However, the presence of some mandibles and lower limb bones is an indication that poorer cuts of meat were also consumed and it is likely that, as was suggested for Exeter (Maltby 1979), all parts of the carcass were distributed to the town's inhabitants. It may be that the servants ate the less desirable parts of the carcass such as cattle brains (Serjeantson, pers. comm.). This pattern continues into Period 4 when the greater scarcity of cattle and pig mandibles suggests that joints of meat were increasingly imported. At the same time, a reduced incidence of mandibles in MB 3 suggests that some caprines were also arriving in a decapitated form during the third century.

Other anomalies in terms of body part representation indicate that bone survival is not solely density-dependent; human activities, including butchery, disposal and industrial processing, are likely to have had a role in determining which bones survive. As discussed above, there is evidence to suggest that in the early Roman period the preliminary butchery of cattle was carried out on the outskirts of Silchester (Maltby 1984). In the past, horn cores and foot bones were commonly left attached to the hides and taken to the tanner's/horner's workshop where they would be disposed of (Serjeantson 1989, 136) and practices of this nature would account for the scarcity of horns and feet. At Dorchester Greyhound Yard, discreet concentrations of cattle bones reflecting the dumping of waste derived from large-scale specialist activities were found in pits and other features with material dated to Period 6 (late first/early second century A.D.). The bones comprised predominantly upper limbs and scapulae. This led to the suggestion (Maltby 1993, 334) that the creation of large quantities of waste by butchers and slaughterers operating inside the town created major problems for waste disposal and resulted in the use of open spaces and available pits for this purpose. A similar problem may have existed at Silchester and would account for the mixed nature of the material recovered from many of the layers and features in Insula IX.

In addition, small foot bones — carpals, tarsals and phalanges — belonging to medium and small animals may have been missed during excavation or destroyed by dogs. There is clear evidence that dogs were present at Silchester (Clark, Ch. 14), although the generally low incidence of gnaw marks suggests that bone refuse was not readily available to dogs and that households did not generally feed dogs at the table but cleared away their rubbish.

The large number of large mammal limb-bone fragments amongst the assemblage from the south-east layers is noteworthy, particularly in Period 4, and may account for the more patchy survival of major limb bones in general in this period if fragmentation had rendered them unidentifiable. A similar pattern has been noted in the fourth-century assemblage from Insula IX (Ingrem 2006) and at contemporary sites such as *Augusta Raurica* (Augst), Switzerland (Schmidt 1968; 1972, 48) where they are believed to result from glue boiling. This activity is discussed alongside the evidence for butchery in more detail below.

ANIMAL HUSBANDRY PRACTICES

During the early Roman period, the majority of cattle were slaughtered in their third year — an age when they would have been in their prime for beef production — or as adults (6–8 years) suggesting that secondary products (milk, blood, manure and traction) were also important. More cattle were kept into adulthood during Period 4 when there is also evidence for the slaughter of

young calves (1–3 months) — a pattern often associated with dairying whereby young calves are killed off to prevent competition for milk. It is impossible to be certain whether or not the cattle remains recovered from Insula IX represent a true cross-section of the cattle exploited. However, a predominance of adult cattle is not restricted to Insula IX, the Period 5 and 6 assemblages from the forum-basilica similarly consisted mainly of adults (Grant 2000) and this pattern is commonly seen throughout the Roman period. For instance, at Greyhound Yard, Dorchester, the majority of cattle mandibles belonged to adults and there is also evidence for the slaughter of calves (Maltby 1993). An increase in elderly and immature cattle in third-century deposits from Lincoln similarly suggested that 'the production of beef, veal and dairy produce became more organised than it had been in the early Roman period (Dobney *et al.* 1999, 22). Consequently, the increasing emphasis on older cattle during Period 4 in Insula IX may, as Maltby (1981, 182) suggested for contemporary sites, reflect the chronological development of organised cattle marketing in response to urban demands.

The presence of very young animals is evidence that some cattle were raised in the environs of Silchester, indicating a degree of self-sufficiency. Pollen samples suggest that the surrounding land was suitable for cattle pasture (Keith-Lucas 1984) and some previously excavated buildings at Silchester are believed to have functioned as barns, cattle stalls and pig sties (Boon 1974). According to Maltby (1994, 85), it is likely that much of the land around urban settlements was farmed by their inhabitants and cattle would have been important animals for traction. Evidence from York and Lincoln led Dobney *et al.* (1999, 22) to suggest that cattle were multi-purpose animals bred primarily for traction and only utilised for beef once their working lives were over. The range of joint disorders seen on cattle bones also provides an indication of the importance of cattle as beasts of burden (ibid.) and there is documentary evidence for their importance for traction in ancient Italy (White 1970, 276–7).

An increasing emphasis on secondary products is also seen in respect of sheep/goat. Most were culled before reaching four years of age suggesting that although prime quality meat was important during Period 3, secondary products were a consideration, with much of the mutton derived from animals which had produced several clips of wool. The decrease in the number of young (less than two years) caprines slaughtered during Period 4 suggests, as with cattle, that there was an increasing emphasis on secondary products. This pattern is not dissimilar to that seen in the area of the basilica where, according to Grant (2000, 467), most of the sheep consumed were mature. At rural sites such as Winnall Down (Maltby 1985b) and Balksbury (Maltby 1995) Roman deposits produced a higher proportion of older caprines than their Iron Age counterparts and according to Maltby (1993, 336) the slaughter of animals for meat when they were approaching full size is a feature of many Roman assemblages. At Greyhound Yard, Dorchester a similar increase in the number of mandibles belonging to sheep aged between two and four years in later Roman deposits led Maltby (1993, 336) to suggest that this might be indirect evidence for the increasing importance of wool in the regional economy.

At rural sites such as Odell and Abingdon, the wider spread of ages displayed by the caprine population is believed by Grant (2000) to reflect a close involvement with sheep rearing. A wide range in the age of slaughter was also seen in the Period 2 deposits from the 'House 1' sequence (Ingrem 2007) and similarly suggests an involvement in caprine farming which may have decreased over time. However, the recovery of a few very young lamb/kid bones suggests that some breeding continued to take place locally and it is likely that some inhabitants were still engaged in sheep rearing outside the town. At the same time, the majority of sheep/goat may have been supplied by local farming communities. A side-effect of the increased age of cattle and caprines would have been an increase in livestock density and, according to King (1991, 17), farming communities must have been generally richer with animal husbandry playing a more visible part in the agricultural economy.

According to the dental evidence pork came from immature and adult pigs during the early Roman period and a similar pattern was seen at Fishbourne, Sussex (Grant 1971), where it was suggested that pigs were kept locally. Evidence from early Roman deposits in the basilica suggests that most pigs had been killed before, or just after, reaching dental maturity — a pattern more typical of a consumer site whereby surplus males are supplied for consumption

in the towns (Grant 2000). The probability that joints of pork were imported to Insula IX was discussed above and may account for the discrepancy that exists between the dental and bone data. The presence of a few foetal/neonatal remains is evidence that some pig husbandry took place locally throughout the Roman period, although Silchester was clearly developing its role as a consumer from the early Roman period onwards. This is supported by the predominance of male canine teeth in Period 3 deposits both in Insula IX and in the basilica where pork came from surplus males. At Greyhound Yard, Dorchester Maltby (1993, 337) suggested that boars were deliberately selected because they may have reached a greater carcass weight than sows and because they were surplus to breeding requirements. During Period 4 the majority of pork came from juvenile and immature pigs, perhaps indicating that Silchester had become more dependent on outside supplies. Boars and sows are more equally represented by canine teeth but the scarcity of mandibles suggests that the sample may not represent a true cross-section.

One of the minor changes noted by King (1991, 17) is the increasing consumption of domestic fowl in the early Roman period compared to the late Iron Age. Poultry, including chicken, duck, goose and pigeon, would have provided a welcome addition to the diet with secondary products — eggs and feathers — also valued. Evidence for young domestic fowl is scarce as are metatarsal bones with spurs, suggesting that most of the chickens represented in Insula IX were adult females, some of which were in lay. Egg production was considered a factor in the exploitation of chickens at Dorchester (Maltby 1993, 336) and it is quite possible that individuals living in towns kept hens primarily to produce eggs. This contrasts with the high proportion of males and immature birds seen in the basilica which is explained by the suggestion that eggs and young birds were brought into the town from nearby villages to be sold (Serjeantson 2000, 499). The possibility that the high proportion of young cocks might reflect sacrificial activities or cockfighting was also considered likely given the commercial nature of this area (ibid.).

BUTCHERY AND BONE PROCESSING

Throughout the Period 3 and 4 sequences there is evidence to suggest that animal carcasses were commonly disarticulated by cutting through the soft tissue surrounding joint articulations, a pattern similar to that seen on Iron Age sites. However, at the same time major limb-bone shafts and epiphyses were routinely chopped through in a manner suggestive of intensive processing in much the same way as was noted for the late Roman assemblage (Ingrem 2006). The increased ratio of cut to chop marks in Period 4 in MB 3 suggested a move away from the Iron Age tradition towards more romanised practices involving the use of metal chopping tools. However, evidence from Insula IX as a whole indicates that the use of metal tools was already well established in Period 3.

The presence of cuts on phalanges (FIG. 116) and large mammal limb articulation suggests that knives may have been the preferred tool of skilled butchers familiar with animal anatomy for carrying out certain activities such as skinning and disarticulation. However, chopping tools were also used for disarticulation and to further sub-divide the carcass into manageable-size joints. The repeated position of many cut and chop marks suggests that butchery practices were standardised. Particularly noticeable is the removal of the spine on numerous cattle shoulder blades that also have their articular surfaces chopped through and appear to have been punctured, probably by a metal hook (FIG. 115). Similar damage has been seen at other Roman sites including Greyhound Yard, Dorchester (Maltby 1993) and Augusta Raurica in Switzerland where it was suggested that the Romans smoked shoulders of beef by hanging them in the chimney (Schmidt 1972, 42). Evidence from Tongeren also attests to the preparation of meat, in this case smoked ham, which appears to have taken place on a far greater scale than domestic needs demanded (Vanderhoeven and Ervynck 2005).

Another type of damage commonly seen on the bones from the south-east layers, particularly on cattle bones, are shave/slice marks, caused by a heavy blade during filleting and resulting in small pieces of bone being removed with the meat. Marks of this nature are generally only found on urban or military sites such as Greyhound Yard, Dorchester and, according to Maltby (1993), bones processed in this way are sometimes found in large dumps suggesting that the method

was employed by specialist butchers. In this respect the assemblage from the 'House 1' sequence differs from that recovered from the south-east layers, perhaps unsurprisingly given that waste from large-scale butchery is less likely to be incorporated into waste from domestic households (Maltby 1993).

Animal bone would have been a valuable resource from which a wide range of products were derived, such as marrow, marrow oil, fat, bone grease and glue. At Tongeren, the production of secondary products appears to have become important with the general intensification of cattle husbandry and was soon organised on a large scale within the town (Vanderhoeven and Ervynck 2005). A similar situation may have arisen at Silchester as there is clearly evidence for the intensive processing of bone in the Roman assemblages from Insula IX. Other sites that have produced similar evidence include Zwammerdam, Netherlands (Mensch 1974), Augusta Raurica (Augst), Switzerland (Schmid 1972), and Greyhound Yard, Dorchester (Maltby 1993). Experimental work has shown that fragmentation of the shaft of limb bones is sufficient to achieve marrow extraction, especially if aided by heating the diaphysis to liquefy the fat content of the marrow, so that it only has to be poured out (Vanderhoeven and Ervynck 2005). The resulting oil would be of a high quality suitable for use in cosmetics, soap, medicine and lamps (Dobney 2001). This type of activity would clearly account for the numbers of deliberately broken limb bones in Insula IX.

Another characteristic of the Insula IX assemblage is the large number of cattle and large mammal limb-bone fragments, particularly in Period 4. The recovery of heavily fragmented limb bones from contexts at other Roman sites including Augusta Raurica (Schmid 1972, 48) has led several researchers to investigate the processes involved in grease and glue extraction. It has been suggested (Vanderhoeven and Ervynck 2005) that, following marrow extraction, bones were broken into smaller pieces in order to increase their surface area and then boiled to release the superficial fat and that contained within the bone itself. The resulting grease would be skimmed off after cooling, the liquid reheated and the bone fragments removed before the liquid was reduced further to produce glue composed of bone collagen. According to Stokes (2000), the end product was a crystallised glue that could easily be liquefied simply by adding tepid water before use.

HORSES

A general scarcity of horse remains is normal in towns and is often explained by the increased emphasis on the acquisition of beef by the urban population (Maltby 1985b). King notes the absence of butchery marks on horse bone and considers this as evidence that horsemeat was no longer eaten, whilst noting the possibility that different methods of food preparation may be responsible. Differences between military and native beliefs and disposal practices may also explain this pattern, as evidence from the Netherlands suggests. Here, horses were buried inside native settlements (Lauwerier 1999) but not on military sites; this is explained by Lauwerier as reflecting the existence of a taboo against eating horsemeat in the Roman military world but not among the native population. There is no evidence of butchery on the horse bones from either the south-east layers or the 'House 1' sequence, although the occasional consumption of horsemeat in the town, perhaps by a servant, is attested by a cut-marked humerus from the forum-basilica (Grant 2000, 467). If the European evidence applies to Britain then the low proportion of horse remains seen at Silchester may reflect the romanization of the town, where a taboo against horsemeat was already in existence.

Horse remains have been associated with foundation deposits during the Roman period (Luff 1982, 190) and are commonly found in Iron Age deposits where the skulls in particular are believed to have a symbolic association (Grant *et al.* 1991). A number of horse bones came from Period 4 occupation deposits, walls and gullies associated with the 'House 1' sequence and whilst the possibility exists that some of these isolated bones might represent symbolic offerings, without firm evidence for deliberate placement, it is equally plausible that the equid remains represent the mundane disposal of old or sick animals. According to Green (1992, 98), one way of minimizing economic loss was to bury deposits consisting of parts of animals rather than

whole carcasses, consequently ritual sacrifices and offerings need not consist of entire carcasses. In graves, individual bones such as a tooth, a toe, or a mandible have been interpreted as the symbolic representation of the animals concerned (ibid., 108). In this light it is interesting that most horse specimens occur in isolation, and it is possible that the 1st phalanx recovered from a Period 3 pit (5039) and the tibia from a Period 4 pit (3102) reflect ideological activities. In contrast, there is little to suggest that the horse bones recovered from the south-east layers represent anything other than the routine disposal of animals that had reached the end of their working lives.

EXPLOITATION OF WILD ANIMALS

The similarities that have been shown to exist between the assemblages recovered from Insula IX and the forum-basilica extend to wild animals, with roe deer, red deer and hare represented at both in small numbers. Clearly, these animals were occasionally hunted and eaten but made only a small contribution to the diet. Antler would have been valued as a raw material during the Roman period and the presence of a shed antler indicates that some was collected. Hunting appears to have taken place for occasional sport rather than as an activity which produced meat, but the fact that game is present at all is suggestive of a romanized household (King 1991).

A similar range of wild fowl — duck and woodcock, typical game birds of the period — was hunted and eaten in Insula IX and the forum-basilica (Serjeantson 2000). Pigeons and thrushes may be incidental but it is quite likely that they were deliberately caught and consumed. In their translation of Apicius, *The Roman Cookery Book*, Flower and Rosenbaum (1958, 145) give recipes for sauces to accompany roast and boiled wood pigeon and other birds including thrushes.

Ravens are known to have had symbolic associations and were unlikely to have been considered suitable as food. The ritual role played by ravens is strongly suggested by the recovery of skeletons from other Roman sites as well as Iron Age sites such as Danebury (Grant 1984). At Jordan Hill, Weymouth the remains of ravens were found set between tiles in a dry well associated with a Romano-Celtic temple (Green 1992, 104). Green (1992, 126) suggests that ravens and crows were seen as 'messengers from the Otherworld because of their black plumage and habit of feeding off dead things'. The primary fill of a Romano-British ritual shaft at Springhead, Kent produced the skeletons of a raven, a goose and domestic fowl (Grimm 2007). The articulated remains of a raven that was recovered from Late Iron Age (Period 3) deposits at the forum-basilica were similarly interpreted by Serjeantson (2000, 485) as a deliberate deposit because many of the bones were found in articulation. The partial raven skeletons that came from context 2762 of Period 4 pit 2601 in Insula IX appear to have symbolic associations given that an overlying context (2622) produced an ivory razor handle depicting two coupling dogs as well as the remains of at least two dogs, one of which is male.

The raven remains from the Period 4 well 1750 in Insula IX were probably also deliberately deposited, although whether these acts simply represent the disposal of natural casualties or have ideological associations is uncertain without supporting contextual evidence. According to Serjeantson (pers. comm.) the bottom of a well and within a pit are the type of contexts that one might expect to find a deliberate raven burial; however the associated material appears to be food remains and therefore fails to confirm the possibly ritual nature of the deposit.

Badgers are likely to have been valued for their distinctive pelts which, in light of the evidence for the systematic skinning of dogs (Clark, Ch. 14), may account for the presence of the two partial badger skeletons in the Period 4 pit 2434, which also produced the remains of at least three dogs. Evidence in the form of cut marks is not necessarily inflicted on the bones as a result of skinning (Serjeantson 1989, 131), although when it does occur it is normally the skull and foot bones that are affected — elements which are absent from the deposit. One of the badgers may have been relatively easy to catch given that it suffered from hip dysplasia (Clark, pers. comm.). There is documentary and archaeological evidence to suggest that the pelts of wild animals were valued by the Celts. According to Diodorus Siculus (in Green 1992, 53) the fur of wild animals was used as bedding and for covering floors. At Hochdorf, Germany there is evidence that the

Halstatt prince was laid on a couch covered by a badger skin (in Green 1992, 42). Closer to home there is evidence that badgers and foxes were trapped for fur at Danebury (ibid.).

Rodent and amphibian bones are scarce and most likely represent natural casualties that became trapped in pits and wells. The black rat arrived in Britain during the Roman period and its remains have been recovered from contemporary deposits at Wroxeter, London and York (Armitage *et al.* 1984).

Fish bones are scarce in both Period 3 and Period 4 deposits but provide evidence that some freshwater and marine fish were eaten in Insula IX during this period. The range of species present in Insula IX is similar to that found in Roman deposits from the forum-basilica area of the town and from contemporary sites such as County Hall, Dorchester (Hamilton-Dyer 1993) and York (O'Connor 1988). According to Locker (2007) the consumption of fresh marine fish such as sea bream and scad would have been associated with high-status inland sites, such as Silchester. These could have been quite easily transported from the coast either by road or by boat via the Thames, possibly kept alive in barrels of water. Freshwater taxa such as eel, carp and salmon were probably caught locally. Eel are commonly found on Roman sites and salmon also occur at many sites. That they are both migratory fish may, according to Locker (2007), have afforded them totemic status in the Celtic world.

STRUCTURED DEPOSITION

The 'House 1' sequence produced a few deposits worthy of mention, including the probable burial of an immature sheep from a pit in Room 1 of Period 2 ERTB 1 and the partial skeleton of another from a Period 4 pit associated with MB 3. Burials of domestic animals are not unusual on sites of Iron Age and Roman date but their interpretation, particularly those from Iron Age sites, has been controversial (Grant 1984; Wilson 1996; Wilson 1992; Hill 1995). Ethnographic studies have since led to much wider acceptance of the possibility that disposal of animal skulls, skeletons and articulated remains was intrinsically linked to ideology (Szynkiewicz 1990; Tambiah 1969; Wilson 1999). In addition, it is now generally accepted that complicated relationships can exist between features and finds and ritual and rubbish and that structured deposition within individual features, and, perhaps, the site as a whole, might result from ideologies that today would be considered irrational (Hill 1995; Fulford 2001).

Evidence from other areas of Silchester (Fulford 2001) and other Roman sites, including Dorchester Greyhound Yard (Woodward and Woodward 2004), indicates that pits and wells often contain deliberately placed deposits associated with foundation rituals. The raven and dog remains from the Period 4 pit discussed above almost certainly have symbolic associations. The possibility exists that some of the other more interesting deposits in Insula IX also have symbolic associations but, in the absence of contextual evidence to suggest otherwise, this must remain speculative as it is equally possible that they simply represent the more mundane disposal of butchery waste and old or sick animals that had died of natural causes.

CONCLUSION

The Period 3 and Period 4 assemblages from Insula IX conform well to the pattern seen at contemporary urban sites; consequently accidental incorporation of residual material does not appear to have masked the overall pattern. The increasing frequency of cattle throughout the early to late Roman periods reflects the development of the urban centre and the increasing romanisation of its inhabitants. The transitionary nature of Periods 3 and 4 is illustrated by characteristics of the animal bone assemblage, such as taxa representation and mortality profiles, that are generally mid-way between those associated with the Late Iron Age and the later Roman period. There is evidence for variation at the household level, with the relatively high incidence of caprines in the Period 4 assemblage from the 'House 1' sequence suggesting that some households continued eating a diet based on mutton. A range of industrial activities was clearly taking place at Silchester and there is clear evidence to suggest that intensive, systematic butchery and waste processing was well underway in Period 3. In addition to the deposition of material resulting

from routine activities, there is also evidence to suggest that some of the more unusual deposits may have had symbolic associations.