The Animal Bones from the Excavation of the Hospital of St Mary of Ospringe

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Introduction

The excavations carried out by the Central Excavations Unit of the Department of the Environment on the site of the hospital of St Mary of Ospringe, near Faversham, Kent, commonly called the Maison Dieu[1], yielded a number of animal bones. These were studied at the Ancient Monuments Laboratory, D.O.E., London, using a semi-automatic computerised recording method[2]. The archive report containing complete data on the animal bone is available on microfiche.[3]

The bone was in a relatively good state of preservation, and a total of 11,856 bones was recovered, comprised of 11,195 mammal, 275 bird and 386 fish. 7,178 of the mammal bones could be identified to species and anatomy. The mammalian bones came from the following eleven species: cattle, sheep, goat, horse, dog, cat, red deer, fallow deer, roe deer, hare and rabbit. Twelve species of bird and ten of fish were recovered[4].

Some bone also came from the 1 mm residue of bulk soil samples taken for sieving in order to recover small organic remains. Many of these were fish bones. Other bones recovered from the sieved samples included four amphibian bones (probably frog) and the limb bones of small mammals which could not be definitely assigned to species.

The animal bone has been studied in the simplified chronological groups established for the assessment of the finds in the excavation report[5]. These are reproduced below:-

1. Foundation: A few layers sealed by floors or in the backfill of construction trenches and dating to the time of the foundation.

2. Occupation: These are sealed contexts post-dating the foundation but pre-dating the latest occupation.

3. Dissolution: These are floor and yard levels in use during the latest occupation and the rubbish layers lying on them.

4. Demolition: Layers of rubble resulting from the 16th century demolition.

5. Post-medieval: To the east of the stream was an orchard, and a soil developed undisturbed over the demolition rubble. To the west of the stream, cultivation took place and the soil which resulted contained much residual material from the rubbish layers below in a yard.

6. Recent: Topsoil and fill of all pits and post holes relating to standing or recently demolished buildings.

For certain analyses these groups have been further combined as follows:- Foundation/Occupation (c. 1230-1470), Dissolution/Demolition (1470-1550) and Post-medieval/Recent (c. 1550 onwards).

Fragmentation and Butchery

The numbers of the different skeletal elements from the mammal species found at the site are shown in Tables 1 to 5 for the whole site, Foundation/Occupation, Dissolution/Demolition, Post-medieval and Recent phases respectively. The major domestic food species only are considered here. Sheep and goat are recorded together in the tables as 'ovicaprid', but the majority of these would have been sheep. For cattle and pig all the major limb bones are represented as they are for sheep, but in the latter they far exceed the proportions of other bones such as skull and mandible. All parts of the body are represented for all species although in varying quantities, which suggests that at least some of the meat consumed came from whole carcasses which were slaughtered on the site rather than separate joints brought in from a butcher's. However as calves and pigs' heads especially might have themselves been 'joints' of meat, one cannot deduce from this the proportions of meat supplied from these two different sources.

The degree of fragmentation of the bones was recorded, and examination of the material from the three major food animals, cattle, sheep and pig, revealed that the greatest differences were between species, and that

for each species differences between archaeological phases were minimal. The latter might in part reflect conservatism in butchery techniques. There were more similarities between pig and sheep than between either of these two species and cattle, which can be largely attributed to similarities in butchery practice on the two smaller animals. This is illustrated in Figs. 1, 2 and 3 for cattle, sheep and pig respectively. These show by means of pie diagrams the distribution of the numbers of a particular bone element between different fragment size categories (expressed as a percentage of the bone which is present). The diagrams compare the fragmentation patterns in the Medieval period with that in the post-medieval and modern period.

All bones were examined carefully for any signs of butchery. The major loci for the different types of butchery marks found are shown in Figs. 4 and 5 for cattle and sheep respectively. There was insufficient data for a similar treatment of pig, but from the little available it seems that the pig carcass was treated in a similar manner to that of the sheep.

In the Medieval period and earlier, cattle were slaughtered by pole-axeing. Archaeological evidence for this has been found on the animal bones from Portchester Castle[6], but at Maison Dieu, no evidence for this was apparent on the few cattle skulls recovered. Horn cores had been cut off at their base, presumably to utilise the horns, again a common practice in many periods. Butchery marks on the mandibles might have resulted from removal of the cheek meat and tongue. Vertebrae were often, but not invariably split along the length of the spinal column. This is usually considered to be the result of splitting the carcass in half, while hanging up, a common practice in the Medieval period onwards. The major limb bones were invariably chopped through the articulation (at shoulder, elbow, hip and hock joints) and also through their mid-shafts

which in some cases may have been a secondary process, perhaps prior to cooking, or to remove the marrow.

Metapodials were often chopped through the mid-shaft, presumably for marrow extraction as these bones possess virtually no meat. Some metatarsals had knife cuts just below the proximal articulation which may be from skinning the animal. Possible skinning marks were also found on some first phalanges, suggesting that the skin was not always removed from exactly the same point on the carcass.

Sheep skulls were split saggitally, as recorded from other Medieval sites presumably to remove the brain, and the horn cores had been chopped off with part of the frontal bone attached: this would have avoided damaging the base of the horn sheath. As at Portchester[7], the sheep had been butchered using choppers and knives, but not to the same extent as the cattle bones, as is to be expected with this smaller animal. In contrast to cattle no butchery marks were evident on any metapodials or phalanges. Four humeri from the Dissolution and Post-medieval phases had the middle of their shafts encircled by knife cuts. Similar specimens have been recorded from Nonsuch Palace[8] and from the early Tudor levels at Baynard's Castle, London[9]. These may be the result of preliminary bone working, rather than butchery, as suggested by Armitage[10]. A few tibiae had holes through the distal part of the shaft, which may be the result of butchery or some other cause. This has been recorded from other sites, eg Roman Brancaster[11] and Magiovinium[12].

Measurements

Measurements on archaeological bones can be used to:- a. examine the variations in animal size for a particular site, to aid the interpretation of stock keeping practise by for example, indicating proportions of different sexes or 'breeds' b. to estimate the size of the beasts by calculating the wither's height c. to facilitate comparisons with other sites.

a. Histograms and scatter diagrams were constructed from the data. Measurements for cattle and sheep seem to fit a normal distribution.

b. Wither's height estimates for cattle and sheep are given in Table 6. These do not show any trend of increase in size with time. This might be due to the small sample size.

c. Some comparisons of the cattle bones from Maison Dieu with those from other Medieval sites are given in Table 7. This shows that cattle from Maison Dieu are within the range for cattle in the Medieval period throughout the country. Jewell[13] concluded that there had been an increase in the size of cattle from Roman to Medieval times, but it now seems probable that this trend was not simple and that it occurred at different times in different parts of the country. At Exeter[14] for example there is little difference in size between the Roman and Medieval cattle and an improvement in stock size does not take place until the sixteenth century. During the fourteenth century there would have been little incentive for the production of good beasts, because of the single legal market price for cattle at that time[15]. However in south-east England, improvement was probably taking place from mid-fourteenth century onwards at least on the more progressive estates of this region[16].

Sheep measurements are compared with those from other Medieval sites in Table 8, and fit the fairly uniform size range of that period.
A summary of the major measurements taken is given in the appendix.

Ageing data

Information for the ageing of archaeological animal remains is derived from two sources: the epiphyseal fusion of the long bones, and the eruption and wear of the teeth. Although modern age equivalents are used throughout, the maturation stages of ancient stock may well have taken place over a longer time period, but this need not greatly affect interpretation, as the optimum age for killing off beasts kept for different purposes will be directly affected by the age at which the animal reaches certain developmental stages.

Table 9 gives the number of bones which are fused and unfused in the different age classes. Tables 10, 11 and 12 give data on ages from teeth[17].

Considering first the cattle, in the later phases, Dissolution/Demolition onwards, there is a slight peak at 3-4 years or sub-adult animals. This may correspond to the optimum slaughter age for animals kept primarily for beef production, though the older animals (4+) may represent the contribution to the diet of some slaughtered animals after their typical span of working life. Leonard Mascall, writing in 1587, says that oxen should be broken to labour at 3 years and not later than 5, worked till 10 and then fattened for slaughter, and in 1770 Rye says that oxen should be worked till 5 or 6 then fattened[18].

The majority of sheep died at $2\frac{1}{2}$-$3\frac{1}{2}$ years suggesting that the animals were primarily kept for wool or milk. Deaths in the pig population are largely of young animals, which would have been killed for meat at 1-2 years.

Pathology

Several bones exhibited skeletal abnormalities, the examination of which was aided by radiography.

Considering first examples of trauma and injury, two bones had healed fractures. A sheep-sized rib had healed neatly, with a small amount of callus formation. This broken rib would probably not have seriously affected the animal. A fowl tarsometatarsus, probably a female as no spur was present, had been fractured in the mid-shaft region, and this had subsequently healed at an angle of about 18 degrees. This injury would have caused lameness in the affected leg. A cattle horn core had a small bony growth at its base which may have been the result of an earlier injury.

The most common manifestations of disease were conditions comparable to arthritis. These were found on the proximal joint surfaces of a cattle second phalanx, a sheep metacarpal, two sheep metatarsals, a dog

metatarsal and a fowl coracoid. These were not severe except in the case of the sheep metatarsals where the animals would probably have been lame in the hind legs affected.

Two fowl tarsometatarsi, both from male birds, had ossified tendons which had become attached to the bone with a considerable amount of exostosis in the affected area (Plate IA and IB). This condition has previously been recorded in archaeological specimens eg Artillery Lane, London[19], Nonsuch Palace[20], and Bristol Castle, where Noddle suggests that "these massive osteophytic outgrowths may possibly have been caused by a chronic trauma to the back of the leg which might occur if the animal had been semi-paralysed for a long time, shuffling around on its hocks"[21]. All examples of this kind so far recorded are from males, which might suggest either that it is related to a condition with a sex-linked genetic factor, or that it is perhaps an age related condition only appearing in males because they are kept to a greater age than the females[22].

Other diseased specimens included a 'cattle-sized' vertebra (Plate IIA) in which there were a number of smooth pits and indentations in the caudal joint surface of the centrum, similar to present day symptoms of tuberculosis[23]. A sheep tibia (Plate IIB) had abnormally thick walls to its shaft, where the cortical bone had increased inwards to almost obliterate the marrow cavity, although there was also slight thickening of the outer surface. The cause of this is not known, but modern parallels suggest that it might be connected with a mineral or vitamin deficiency. Similar symptoms have been recorded in dogs deficient in vitamin A[24].

A cattle metatarsal had a splayed distal end, a condition found quite frequently in archaeological specimens and thought to be caused by excess pressure on the joint, from using the beast as a draught animal. A sheep humerus had a bony outgrowth on the medial side of the distal articulation (Plate III). Similar examples have been recorded from other archaeological sites eg Medieval Bristol[25] and Saxon Ipswich[26], and a

comparable condition in modern sheep is thought to be caused by undue pressure on the front limbs perhaps resulting indirectly from a large rib cage[27]. Finally, two sheep horn cores had surface depressions which may be due to the affects of malnutrition on the especially thin walls which seem to be an attribute of the castrated animal[28].

Birds

275 bird bones (2.4 per cent of the total animal bone) were recovered from the site. Twelve species were represented, three of which were domesticated. These were: domestic fowl (Gallus sp), domestic goose (Anser sp), domestic duck/mallard (Anas sp/Anas platyrhynchos), grey heron (Ardea cinerea), teal (Anas crecca), woodcock (Scolopax rusticola), snipe (Gallinago gallinago), stock dove (Columba oenas), rock dove/feral pigeon (Columba livia), tawny owl (Strix aluco), magpie (Pica pica) and rook (Corvus frugilegus).

224 or 81.5 per cent of the bird bones were identifiable to species and anatomy and of these 204 (74 per cent) were from domestic species. Table 13 shows the number of bones from the different parts of the skeleton from each species for the different archaeological phases.

The most numerous bird was domestic fowl followed by goose. Other species were represented by single bones or a few bones at most. Considering first the poultry: though fowl has been found to be the most popular species of poultry on Roman sites in Britain[29], by Medieval times it may have been rivalled in importance by the goose. Noddles'[30] comparison of several Medieval sites showed that goose invariably contributed a higher percentage (by number of fragments) to the diet than did fowl. This is not, however, the case at Maison Dieu and also at some other Medieval sites eg Exeter[31] and Portchester[32]. Maltby[33] suggests that these variations may be due to the development of regional variations in poultry keeping at this time.

Throughout the occupation of the site the overall contribution of fowl to the bird bone is 66.7 per cent and that of goose is 16.7 per cent and these did not

vary much between the different phases. The percentage of immature fowl bones was 13.5 for the whole site which is somewhere between the values for Roman and Medieval phases at Exeter[34].

Where measurements could be taken these showed that there was a large size range among the domestic fowl which might indicate that selective breeding had taken or was taking place, as was the case at Exeter[35]. At Southampton[36], however, the fowl were of the small size common to the Roman period in Britain. The geese at Maison Dieu were large, comparable in size to modern birds, as were those from Southampton[37] and Exeter[38], but this was not invariably the case on Medieval sites as those from Portchester Castle[39] were rather small and nearer in size to the wild bean goose than to the grey-lag from which the domestic goose has been derived.

Butchery marks were infrequent on bird bones, probably because the carcass of a bird does not require much butchery because of its small size. Knife cuts were found on a fowl tibiotarsus. It is quite common for the distal end of the tibiotarsus to have knife cuts as this is the position of removal of the lower meatless part of the leg from the rest of the carcass.

Two male tarsometatarsi had the tips of the spur cut off. The reason for this is not clear, but it is unlikely that it is butchery, as there is no meat on this bone. Bramwell[40] has suggested that this is caused by the attachment of metal spurs in fighting cocks. If this were the case one might expect some signs of healing and as none are present it seems more likely that these marks were made after the death of the animal. It is interesting that these two bones showed pathological symptoms, and there may be some connection[41].

The single duck bone found was similar in size to a mallard. Pigeon and stock dove may have been domestic or semi-wild. There was a dovecote

on the site and so these birds were presumably kept as food and for their eggs. Of the remaining species teal, woodcock, snipe and heron were probably caught to eat. Teal frequents fresh water and woodcock and snipe are primarily inland birds of moist woodland marsh and river bank. Grey herons are common near any area of open water either fresh or salt and may have been caught on fishing trips: fish ponds were a common amenity on edieval lay and monastic estates and fish was a much more important item of food in the middle ages and later than it is today. In the Journal of Prior William More[42] an entry for a fishing catch for Lady Day 1522 includes 13 herons among the list of fish. Herons and the other waterfowl might also have been caught with hawks.[43]

The remaining birds, tawny owl, rook and magpie are unlikely to have been eaten, but are often found near human habitation.

Fish

The fish bones from the excavation contained representatives of ten species which are listed in Table 14 under their respective habitats.

They were recovered by two methods: handpicked, and from the 1 mm residue of sieved bulk soil samples. In Table 13, the number recovered by each method is shown. It can be seen that evidence for four of the species (roker, eel, herring, and mullet) came entirely from sieving, and a fifth (plaice/flounder) was represented equally by both methods. The table also shows the excavation phase from which the bones came.

The total number of fish bones was 386, of which 126 (32 per cent) were identifiable to species. However, most of the indeterminate fragments were fin-rays, which have no species - specific features. If one excludes fin-rays from the total, 74 per cent of the bones are identifiable. Considering handpicked and sieved bones separately, the percentages of identified bones are 86 per cent and 66 per cent respectively. Cod bones are the most frequent from the handpicked sample, and herring from the sieved sample.

The species recorded are listed below. Brief notes on their present distribution and economic importance are given[44] as this helps the interpretation of the archaeological sample.

Roker or Thornback ray (Raja clavata).

The only distinctive parts of this cartilaginous fish which are calcified, and therefore normally survive on archaeological sites, are the 'bucklers', well-developed dermal denticles with button-like bases. One was recovered from a sieved sample of the Dissolution phase. This is the commonest ray in shallow water, usually found between depths of 10 and 60 metres. It is the principal constituent of the 'skate' landed by inshore fishing vessels, the great majority taken in bottom trawls, but some on lines.

Eel (Anguilla anguilla).

Vertebrae from this species were recovered from the Occupation and Demolition phases. The eel lives both in the sea and in fresh water and could have been caught in an estuary or in the shallows of the sea. It is a valuable food fish throughout Europe. It is particularly vulnerable to riverine traps and is also caught on lines.

Conger eel (Conger conger).

Head bones were recovered from the Occupation and Demolition phases. The large marine eel is common on rocks and offshore. Today, it is not much esteemed as a food fish. Knife cuts were noted on a quadrate.

Herring (Clupea harengus).

Numerous vertebrae were recovered by sieving from the Occupation and Demolition phases. Though it has declined in numbers since the beginning of this century, the herring is still one of the most important food fishes of Northern Europe, and has been since the twelfth century, when most herrings were landed through the Baltic Ports.[45]

Salmonid (Salmo sp).

A single vertebra was recovered from the Dissolution phase. Members of the salmon family are fresh-water fish which migrate to the sea. The fish could have been caught on a line in a river or the sea, or if migrating, in a riverine or estuarine trap.

Cod (Gadus morhua).

Head bones and vertebrae were recovered from all phases of the site. A temporal bone from the Dissolution phase possessed knife cuts - probably incurred in cutting off the head. It was possible to measure one premaxilla from the Post-medieval phase, and from this to estimate the length, weight and age of the fish from a graph:[46]

Premaxilla measurement	= 17.5 mms
Estimated length	= 110 cms
Estimated gutted weight	= 12.5 kgs
Estimated age	= 10 yrs

This size is near the average for cod caught today (average weight 11.3 kg and length 120 cms).[47]

Haddock (Melanogrammus aeglefinus).

This species lives close to the sea-bed in depths of 40-300 metres, and is today an important commercial fish throughout the North Atlantic fishing grounds. Two cleithra were recovered from the dissolution phase. These were both swollen; a condition that has been described as probably a case of hyperosteosis, which could be taken as the norm, as it appears so frequently in large haddock (over 45 cms).[48]

Thick-lipped grey mullet (Chelon labrosus).

This fish inhabits coastal and estuarine waters and is a food fish. One vertebra was recovered from the dissolution phase.

Turbot (Scopthalmus maximus).

This large flatfish inhabits shallow inshore waters, from just below the shore line to a depth of about 80 metres. It is caught in trawls,

seines and by lines. Bones were recovered from the ccupation and issolution phases.

Plaice/Flounder (Pleuronectes platessa/Platichthys flesus).

It is difficult to distinguish the archaeological remains of these two similarly sized and closely related flatfish. The plaice is a bottom living fish, which can be caught in trawls and seines, but can also be captured on lines. The flounder is estuarine. Bones from either or both of these fish were retrieved from the Occupation, and Dissolution and Demolition phases.

The fish fauna represented comprises two main elements, marine species and euryhaline species which could be captured in the sea, in estuarine water, or in rivers. Of the marine species the herring were most probably captured by floating nets similar to the traditional East Anglian drift net although shore seines could have been used in their capture. Conger eel, cod, haddock, and turbot, however, were most probably captured by hook and line fishing which was possibly the earliest fishing method employed. The presence of these three species suggests that they may have been captured some distance offshore, for the haddock is today rarely found close inshore and the cod comes inshore only during winter in the south of England. Roker are also caught on lines but could also be taken in permanent shore-line traps (kiddles). The presence of grey mullet, flounder/plaice, and to a lesser extent eel and salmonid strongly indicates the use of a kiddle net which is constructed of wood, extends between tidemarks and catches fishes which exploit the food resources of the tidal flats (flatfishes and grey mullet) or migrate along the coast (grey mullet, eel, salmonids, and possibly turbot and roker). These kiddles are of great antiquity and widely used in the Thames mouth, for example, where vertical tidal movement is considerable.[49] On the Kent coast the antiquity of the use of kiddles and other fishing techniques is

corroborated by various allusions to fishing methods practised, for example, in an early plaint (1461) of debt at New Romney by John Wardeyne against John Morne, the latter was distrained by 7 herring nets, 2 sport nets, 1 shrimp net and 2 kiddle nets[50].

The salmonids and the eels could have been captured in streams locally. Ospringe is near the coast, on the Swale, and there are streams close by. Six of the species found at Maison Dieu (eel, salmon, herring, conger, "codling" and haddock) are included in a list of the various kinds caught on the Kentish coast in the 14th century recorded in the Journal of Daniel Rowe, a fishmonger and Common Clerk of New Romney. The list also includes sprats, porpoise, lampreys, whiting, tench and 'stikes of pimpernelle' which are eels strung 25 to a stick[51].

Discussion

Probably the earliest account of the area in which the Maison Dieu was built, is that of the Domesday Survey[52] which describes the holding of Ospringe in the hundred of Faversham as having land for 20 ploughs, a mill, a fishery, a salt pan, a meadow of 13 acres and woodland to render 80 swine. The hospital was founded around 1232 and was used as such until 1516 when it was dissolved as an institution. During its later years it suffered poor fortune and management and its buildings probably fell into considerable neglect. Most of the animal bones came from the Dissolution period of the last declining years of the hospital from c. 1483-1516 and from 1516 onwards until c. 1550 during which time the buildings were rented off privately and so changed in function[53].

Occasional references to purchases of gifts have survived, for example in 1235 "the king also caused fifty hogs to be sent to the hospital from his park at Havering or elsewhere if more convenient",[54] perhaps for the establishment of a herd. Records of the yearly purchase of large quantities of herrings have survived[55] and in 1485 the hospital was bequeathed 60 ewes by Stephen Randolph[56].

The Maison Dieu served the dual purpose of providing accommodation for pilgrims and for the king himself while travelling or on business in the area, and of housing the infirm. The King during his visits would have been fed in a suitable style and the staff of the hospital as well as the royal corrodians would have been fed quite sumptuously, while the diet of the permanent almspeople would have been less grand. In the survey of 1571 the lands of the Maison Dieu in the possession of St John's College amounted to 64 acres of which 36.3 were arable and 27.7 pasture. These lands were then valued at £8-16s-8d in c. 1510 however the hospital land had been valued at £70-13s-4d. Assuming that both refer to rental value and that value per acre had not changed and that proportion of arable to pasture was similar (their rental value may have been different) this suggests an acreage in 1510 of c. 512 acres. However the original total would have been considerably higher as they had included the Manor of Headcorn, also during the fifteenth century royal enquiries showed that various lands had been unlawfully sold or disposed of to pay off or in lieu of debts incurred by misuse of funds and bad management[57].

It is possible that these lands enabled the hospital to be at least partly self sufficient for much of its existence, feeding its inhabitants on meat raised on the hospital grounds and perhaps making some profit from the sale of wool. It also received considerable gifts of land and money and in addition received rents in kind particularly as barley. Throughout most of its history they were exempt from the usual taxes, being under the King's protection.

There was a Maison Dieu at Dover of a contemporary foundation date, for which an inventory has survived from the time of its dissolution, which itemises the livestock kept[58]. This lists totals of 1600 sheep, 119 cattle and 29 horses. Details from this are referred to below, where the individual species are discussed, as it is assumed that the Maison Dieu at Ospringe would have had not dissimilar stock.

Cattle

Few cattle skulls were found and so little can be concluded with regard to the conformation of the cattle kept. From measurements it seems that the cattle at Maison Dieu are of the rather small size typical of the Medieval period. It is thought that at this time cattle would have been primarily bred for draught or milk purposes, with meat being a secondary product. However recent evidence suggests that improvements in livestock keeping and breeding occurred earlier than was previously thought at least in parts of south east Britain in the later middle ages[59]. The inventory of the Maison Dieu at Dover includes 3 milch cows kept at the house and the following kept at Romney Marsh:- 20 lean bullocks of 'Northern Ware' possibly imported from Northern England, 8 stock bullocks, 3 fat oxen for the larder, 2 kine and 4 lean country bullocks, and cattle kept at Whitfield, 20 young oxen, 13 bullocks of 3 years, 13 bullocks of 2 years, 35 kine and 15 calves[60].

Sheep/Goat

Very few goat bones were found, all of which were either skull fragments or metapodials (2 from Dissolution/Demolition, 5 from Post-medieval and 2 from Recent phases). In late Medieval Britain goats had a low status in the agricultural economy[61]. Where kept they were few in number and usually ran with the sheep flock. They are not mentioned in the inventory for the Maison Dieu at Dover[62]. Sheep however were recovered in considerable numbers. Unfortunately, few skull fragments survived, which makes it impossible to attempt reconstructions of the sheep's appearance.

Pig

Pig remains, though found in quantity, were largely immature and fragmentary. They are likely to be the remains solely of domestic animals. The Dover inventory mentions 1 boar, 3 sows and 16 young hogs kept at the house, and 17 young hogs kept at Whitfield[63]. In England, pigs are likely to have provided a high proportion of the meat diet throughout the Middle Ages.

Horses

Horses were represented by 64 bones including 15 loose teeth. Not many measurements could be taken and it was only possible to estimate the wither's height on 3 bones, one each from Dissolution/Demolition, Post-medieval and Recent phases. These gave heights of 14, 13.6 and 13.9 hands respectively (1 hand=101.6 mms)[64]. Medieval horses from London had withers' heights of 13-14 hands and Dent and Goodall[6] state that the average height of British horses remained at about 13 hands until well into the seventeenth century despite efforts at improving the size of horses. Horse bones from all phases were of mature animals which were presumably kept as working beasts. The Dover inventory lists a total of 15 mares and colts and 14 horses and geldings[66]. No butchery marks were present on any of the bones nor were there any signs of pathology.

Dogs

Seventy-seven dog bones were recovered which may represent dogs of a variety of sizes but unfortunately very few were complete enough for the estimation of shoulder height. An incomplete skeleton from a Post-medieval context would have had a shoulder height of between 61.5 and 66.5 cms and one from a Recent context would have been 62.5 cms high[67]. The majority of dog limb bone epiphyses fuse within the first year of life[68]. Most of the limb bones found were from mature animals with no very young individuals. Many of the dog bones were recovered as either incomplete skeletons or as small groups of bones which were probably articulated but had been disturbed during the time they had remained buried in the ground. No butchery marks were found on any dog bones which suggests that they were probably not eaten at this site.

Cats

Fifty-seven cat bones were recovered. Cats were present in all phases of the site. Cat bones are fully mature at 6 months[69] and although some bones were from immature animals most were mature.

Deer

Three species of deer were present: red, fallow and roe. These would have been hunted and eaten. The majority of deer bones came from the Dissolution/Demolition phases.

Rabbits and Hares

Rabbit bones were recovered from all phases in small quantities, and hares from all except the Foundation/Occupation phases.

Birds

It is difficult to say how important a contribution birds made to the diet at this Medieval site. The quantity of bird bones recovered will be influenced by preservation, excavation techniques and other factors. Although sieved samples were taken from certain archaeological contexts these did not greatly increase the total of bird bones, and did not add any new species to the bird bone recovered during normal excavation. The bird bone assemblage comprised three species of domestic poultry and also several wild species most of which would have been hunted and eaten.

Fish

A variety of species of fish had been eaten at the site, caught in both rivers and the sea. It is likely that fish was a major food item in the diet, and herrings, at least, must have been consumed at the hospital in considerable quantities, as commencing in the year 1277, sixteen yearly entries occur in the hundred rolls of purchases of 4,000 herrings at 8s 4d per thousand for the Maison Dieu at Ospringe[70].

The mammal species composition for the different phases of the site is shown in Table 15 expressed as a percentage of the total identifiable fragments of mammal bone. The difference in sample size between phases precludes any definitive interpretations from the phase comparisons. Caution must be exercised in comparing these with other sites as the method of quantifying species proportions varies. In this case total identified

bone, not total bone recovered, and 'cow-sized' and 'sheep-sized' fragments are combined with cattle and sheep respectively. These figures have been compared with those from some other Medieval sites in southern Britain[71]. At Maison Dieu there are approximately equal proportions of cattle and sheep throughout, which is in contrast to other sites where cattle invariably outnumber sheep. This probably reflects the great importance of sheep in the economy in Kent at this time. On the other hand the number of pigs with the exception of the high figure for the post-medieval period was similar to the other sites.

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References and notes

1. G. H. Smith, 'The excavation of the hospital of St. Mary of Ospringe, commonly called Maison Dieu', Arch. Cant. xcv (1979), 81-184.
2. R. T. Jones, 'Osteometric methodology', Ancient Monuments Laboratory Report Number 2333 (1979).
3. The archive is held at the Ancient Monuments Laboratory, as is a more detailed bone report (Ancient Monuments laboratory Report Number 3185).
4. See p. 8 for list of bird species and p. 10 for list of fish species.
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TABLE 1: The numbers of mammal bones from different species and different parts of the skeleton for the whole site

	Cattle	Cow-sized	Ovicaprid	Sheep-sized	Pig	Horse	Dog	Cat	Rabbit	Hare	Red Deer	Fallow Deer	Roe Deer	Indeterminate Species	TOTAL
Skull	73	-	60	-	243	-	2	1	-	-	1 (Antler)	-	-	2	382
Mandible	73	1	51	-	91	3	5	5	1	1	-	-	-	-	231
Loose Teeth	134	-	67	1	160	15	-	-	-	-	-	-	-	-	377
Scapula	69	6	126	6	56	6	2	-	2	-	-	-	-	4	277
Humerus	74	2	207	1	79	2	5	11	7	-	-	-	-	-	388
Radius	83	-	266	-	54	1	3	3	3	-	-	3	1	-	417
Ulna	42	-	60	-	54	-	5	4	-	1	-	-	-	-	166
Metacarpal	83	-	55	-	-	3	-	-	-	-	-	1	-	-	142
First Phalanx	56	-	20	-	52	4	1	-	-	-	-	-	-	-	133
Second Phalanx	25	-	7	-	22	2	-	-	-	-	-	-	-	-	56
Third Phalanx	25	-	3	-	5	1	-	-	-	-	-	-	-	-	34
Os Coxae	92	5	122	5	39	1	3	3	4	-	-	-	-	-	274
Femur	116	5	68	7	35	4	7	12	8	-	1	6	1	-	270
Patella	9	-	-	-	1	1	-	-	-	-	-	-	-	-	11
Tibia	65	-	240	-	62	4	11	17	-	1	-	4	7	-	411
Fibula	-	-	-	-	3	-	1	-	-	-	-	-	-	-	4
Calcaneus	37	-	47	-	42	1	3	-	-	-	-	1	-	-	131
Astragalus	32	-	18	-	18	3	-	-	-	-	-	2	-	-	73
Navicular	16	-	7	-	1	2	-	-	-	-	-	-	-	-	26
Centroquartal	97	-	61	-	-	2	1	-	1	1	1	1	1	-	166
Metapodials	31	-	7	-	117	3	12	-	2	1	-	-	-	-	173
Rib	-	823	2	879	142	-	5	1	-	-	-	-	-	-	1,857
Costal Cartilage	1	20	1	2	-	-	-	-	-	-	-	-	-		24
Atlas vertebra	7	-	31	1	13	-	2	-	-	-	-	-	-	-	54
Axis vertebra	9	-	25	2	4	1	1	-	-	-	-	-	-	-	42
Cervical vertebra	-	23	7	48	15	1	4	-	-	-	-	-	-	-	98
Thoracic vertebra	-	24	2	31	17	-	1	-	-	-	-	-	-	-	75
Lumbar vertebra	-	62	5	55	11	1	1	-	2	1	-	-	-	-	138
Sacrum	9	2	4	1	-	2	1	-	-	-	-	-	-	-	19
Caudal vertebra	-	13	-	4	1	-	-	-	-	-	-	-	-	1	19
Vertebra	1	405	4	133	154	-	-	-	-	2	-	-	-	-	699
Indeterminate Fragments	2	8	1	5	-	1	1	-	-	-	-	-	-	4,010	4,028
TOTAL	1,261	1,404	1,664	1,176	1,518	64	77	57	30	8	3	18	10	4,017	11,195

TABLE 2: The numbers of bones from different species and different parts of the skeleton for the **Foundation and Occupation phases**

	Cattle	Cow-sized	Ovicaprid	Sheep-sized	Pig	Horse	Cat	Rabbit	Fallow Deer	Indeterminate Species	TOTAL
Skull	1	-	3	-	3	-	-	-	-	-	7
Mandible	2	-	5	-	6	-	-	-	-	-	13
Loose Teeth	4	-	2	-	14	3	-	-	-	-	23
Scapula	4	1	1	-	2	-	-	-	-	-	8
Humerus	4	-	7	1	-	-	1	-	-	-	13
Radius	1	-	11	-	4	-	1	1	-	-	18
Ulna	1	-	4	-	3	-	-	-	-	-	8
Metacarpal	1	-	3	-	-	-	-	-	-	-	4
First Phalanx	4	-	4	-	-	-	-	-	-	-	8
Second Phalanx	-	-	1	-	-	-	-	-	-	-	1
Third Phalanx	3	-	-	-	-	-	-	-	-	-	3
Os Coxae	2	-	1	-	1	-	1	1	-	-	6
Femur	5	1	5	1	2	-	1	-	-	-	15
Tibia	2	-	16	-	3	-	1	-	-	-	22
Calcaneus	2	-	5	-	1	-	-	-	1	-	9
Astragalus	-	-	1	-	2	-	-	-	-	-	3
Metatarsal	10	-	2	-	-	-	-	-	-	-	12
Metapodial	1	-	-	-	13	-	-	-	-	-	14
Rib	-	24	-	60	-	-	1	-	-	-	85
Costal Cartilage	-	-	1	-	-	-	-	-	-	-	1
Cervical vertebra	-	-	1	1	1	-	-	-	-	-	3
Atlas vertebra	-	-	-	-	-	-	-	-	-	-	-
Axis vertebra	-	-	1	-	1	-	-	-	-	-	2
Thoracic vertebra	-	2	-	1	-	-	-	-	-	-	3
Lumbar vertebra	-	2	-	4	-	-	-	-	-	-	6
Candal vertebra	-	1	-	-	-	-	-	-	-	-	1
Sacrum	1	-	-	-	-	-	-	-	-	-	1
Vertebra	-	5	-	3	-	-	-	-	-	-	8
Indeterminate Fragments	-	-	-	-	-	-	-	-	-	219	219
TOTAL	48	36	74	71	56	3	6	2	1	219	516

TABLE 3: The numbers of bones from different species and different parts of the skeleton for the **Dissolution** and **Demolition phases**

	Cattle	Cow-sized	Ovicaprid	Sheep-sized	Pig	Horse	Dog	Cat	Rabbit	Hare	Red Deer	Fallow Deer	Roe Deer	Indeterminate Species	TOTAL
Skull	47	-	18	-	59	-	-	-	-	-	-	-	-	1	125
Mandible	54	1	33	-	51	1	-	4	1	-	-	-	-	-	145
Loose Teeth	85	-	35	1	81	3	4	-	-	-	-	-	-	-	209
Scapula	53	3	96	6	29	2	-	-	1	-	-	-	-	4	194
Humerus	47	1	142	-	38	1	2	6	7	-	-	-	-	-	244
Radius	58	-	179	-	26	-	1	-	2	-	-	2	1	-	269
Ulna	22	-	38	-	25	-	1	1	-	1	-	-	-	-	88
Metacarpal	52	-	25	-	-	-	-	-	-	-	-	-	-	-	77
First Phalanx	32	-	5	-	25	1	-	-	-	-	-	-	-	-	63
Second Phalanx	13	-	2	-	11	-	-	-	-	-	-	-	-	-	26
Third Phalanx	10	-	1	-	3	-	-	-	-	-	-	-	-	-	14
Os Coxae	75	-	88	-	12	-	1	1	3	-	-	-	-	-	180
Femur	82	2	38	4	15	2	2	3	4	-	1	5	1	-	159
Patella	5	-	-	-	1	-	-	-	-	-	-	-	-	-	6
Tibia	49	-	169	-	32	1	5	7	-	1	-	3	6	-	273
Fibula	-	-	-	-	2	-	1	-	-	-	-	-	-	-	3
Calcaneus	19	-	33	-	23	1	1	-	-	-	-	-	-	-	77
Astragalus	25	-	14	-	10	1	-	-	-	-	-	2	-	-	52
Navicular	9	-	6	-	-	-	-	-	-	-	-	-	-	-	15
Metatarsal	60	-	35	-	-	-	-	-	-	-	-	-	1	-	96
Metapodial	16	-	3	-	44	1	3	-	1	-	-	-	-	-	68
Rib	-	570	1	610	-	-	1	-	-	-	-	-	-	-	1,182
Costal Cartilage	1	20	-	-	-	-	-	-	-	-	-	-	-	-	21
Atlas vertebra	4	-	23	1	10	-	-	-	-	-	-	-	-	-	38
Axis vertebra	6	-	19	2	2	-	-	-	-	-	-	-	-	-	29
Cervical vertebra	-	17	3	39	6	-	-	-	-	-	-	-	-	-	65
Thoracic vertebra	-	17	2	22	-	-	-	-	-	-	-	-	-	-	41
Lumbar vertebra	-	49	-	31	4	-	-	-	1	1	-	-	-	-	86
Sacrum	4	2	3	-	-	-	-	-	-	-	-	-	-	-	9
Caudal vertebra	-	6	-	1	-	-	-	-	-	-	-	-	-	-	7
Vertebra	1	312	1	103	-	-	-	-	-	-	-	-	-	-	417
Indeterminate Fragments	1	4	-	-	-	-	-	-	-	-	-	-	-	2,449	2,454
TOTAL	830	1,004	1,012	820	509	14	22	22	20	3	1	12	9	2,454	6,732

TABLE 4: The numbers of bones from different species and different parts of the skeleton for the Post-medieval phase

	Cattle	Cow-sized	Ovicaprid	Sheep-sized	Pig	Horse	Dog	Cat	Rabbit	Hare	Red Deer	Fallow Deer	Roe Deer	Indeterminate Species	TOTAL
Skull	17	-	19	-	150	-	1	-	-	-	1 (Antler)	-	-	1	189
Mandible	12	-	8	-	23	-	4	1	-	1	-	-	-	-	49
Loose Teeth	33	-	18	-	40	5	3	-	-	-	-	-	-	-	99
Scapula	8	2	24	-	17	2	-	-	-	-	-	-	-	-	53
Humerus	13	1	41	-	24	-	1	1	-	-	-	-	-	-	81
Radius	18	-	61	-	14	1	1	-	-	-	-	1	-	-	96
Ulna	13	-	15	-	19	-	2	2	-	-	-	-	-	-	51
Metacarpal	20	-	15	-	-	1	-	-	-	-	-	1	-	-	37
First Phalanx	15	-	4	-	19	3	-	-	-	-	-	-	-	-	41
Second Phalanx	8	-	2	-	9	1	-	-	-	-	-	-	-	-	20
Third Phalanx	8	-	2	-	-	-	-	-	-	-	-	-	-	-	10
Os Coxae	11	5	27	-	20	-	2	1	-	-	-	-	-	-	66
Femur	23	2	15	2	13	2	3	3	3	-	-	1	-	-	67
Patella	3	-	-	-	-	-	-	-	-	-	-	-	-	-	3
Tibia	11	-	41	-	19	1	4	3	-	-	-	-	1	-	80
Fibula	-	-	-	-	1	-	-	-	-	-	-	-	-	-	1
Calcaneus	8	-	3	-	11	-	2	-	-	-	-	-	-	-	24
Astragalus	6	-	2	-	4	2	-	-	-	-	-	-	-	-	14
Navicular	6	-	-	-	1	2	-	-	-	-	-	-	-	-	9
Metatarsal	21	-	16	-	-	-	1	-	1	1	-	1	-	-	41
Metapodial	8	-	1	-	16	1	1	-	1	1	-	-	-	-	29
Rib	-	170	1	164	84	-	1	-	-	-	-	-	-	-	420
Costal Cartilage	-	-	-	1	-	-	-	-	-	-	-	-	-	-	1
Atlas vertebra	3	-	6	-	1	-	1	-	-	-	-	-	-	-	11
Axis vertebra	-	-	4	-	-	-	-	-	-	-	-	-	-	-	4
Cervical vertebra	-	3	2	3	-	1	-	-	-	-	-	-	-	-	9
Thoracic vertebra	-	3	-	7	-	-	-	-	-	-	-	-	-	-	10
Lumbar vertebra	-	10	2	17	-	1	1	-	-	-	-	-	-	-	31
Sacrum	4	-	1	1	-	2	-	-	-	-	-	-	-	-	8
Caudal vertebra	-	2	-	3	-	-	-	-	-	-	-	-	-	-	5
Vertebra	-	62	3	21	119	-	-	-	-	2	-	-	-	-	207
Indeterminate Fragments	1	4	-	4	25	-	-	-	-	-	-	-	-	907	941
TOTAL	270	264	333	223	629	25	28	11	5	5	1	4	1	908	2,707

TABLE 5: The numbers of bones from different species and different parts of the skeleton for the Recent phase

	Cattle	Cow-sized	Ovicaprid	Sheep-sized	Pig	Horse	Dog	Cat	Rabbit	Fallow Deer	Indeterminate Species	TOTAL
Skull	7	-	7	-	27	-	1	-	-	-	-	42
Mandible	4	-	3	-	6	2	-	-	-	-	-	15
Loose Teeth	12	-	8	-	23	3	1	-	-	-	-	47
Scapula	4	-	2	-	3	1	-	-	-	-	-	10
Humerus	8	-	17	-	7	1	1	-	-	-	-	34
Radius	5	-	15	-	4	-	-	-	-	-	-	24
Ulna	6	-	3	-	2	-	1	-	-	-	-	12
Metacarpal	9	-	11	-	-	2	-	-	-	-	-	22
First Phalanx	5	-	6	-	3	-	1	-	-	-	-	15
Second Phalanx	4	-	2	-	2	1	-	-	-	-	-	9
Third Phalanx	4	-	-	-	2	1	-	-	-	-	-	7
Os Coxae	3	-	6	-	2	1	-	-	-	-	-	12
Femur	3	-	8	-	-	-	-	1	1	-	-	13
Patella	1	-	-	-	-	1	-	-	-	-	-	2
Tibia	3	-	13	-	4	2	-	3	-	1	-	26
Fibula	-	-	5	-	-	-	-	-	-	-	-	5
Calcaneus	7	-	8	-	6	-	-	-	-	-	-	21
Astragalus	1	-	-	-	1	-	-	-	-	-	-	2
Navicular	1	-	-	-	-	1	-	-	-	-	-	2
Metatarsal	6	-	-	-	-	2	-	-	-	-	-	8
Metapodial	6	-	3	-	13	1	1	-	-	-	-	24
Rib	-	57	-	38	-	-	1	-	-	-	-	96
Costal Cartilege	-	-	-	1	-	-	-	-	-	-	-	1
Atlas	-	-	2	-	-	-	-	-	-	-	-	2
Axis	3	-	1	-	-	1	-	-	-	-	-	5
Cervical vertebra	-	2	1	5	3	-	-	-	-	-	-	11
Thoracic vertebra	-	1	-	1	-	-	-	-	-	-	-	2
Lumbar vertebra	-	1	-	3	-	-	-	-	1	-	-	5
Sacrum	-	-	-	-	-	-	-	-	-	-	-	-
Caudal vertebra	-	4	-	-	1	-	-	-	-	-	1	6
Vertebra	-	25	-	5	-	-	-	-	-	-	-	30
Indeterminate Fragment	-	-	-	-	-	-	-	-	-	-	388	388
TOTAL	102	90	121	53	109	20	7	4	2	1	389	898

A

TABLE 6 Withers height estimates calculated from measurements of the long bones of cattle and sheep.

a. Cattle

Phase	Bone	Withers No	Height Range	Mean
Dissolution/ Demolition	Metacarpal	2	113.8–130.4	122.1
	Metatarsal	1	130.1	
Post-medieval	Metacarpal	1	124.3	
	Metatarsal	2	125.4–126.4	125.9
Recent	Metacarpal	1	120	

b. Sheep

Phase	Bone	Withers No	Height Range	Mean
Foundation/ Occupation	Calcaneus	3	52–54.7	53.4
Dissolution/ Demolition	Radius	22	56–66.8	62.0
	Metatarsal	3	56.8–62.7	59.5
	Calcaneus	24	45.9–59.8	55.5
Post-medieval	Radius	3	55.2–64.4	58.5
	Metacarpal	6	55–63.4	58.5
	Tibia	1	58	
	Calcaneus	2	53.4–56.6	55
	Metatarsal	3	56–61.8	59.4
Recent	Radius	2	56.8	
	Calcaneus	2	51.2–57.3	54.3

A Factors used for withers height estimates are those of Fock for cattle and Teichert for sheep, given in von den Driesch and Boessneck (1974). See note 64.

TABLE 7 Selected measurements of cattle bones compared with those from some other Medieval sites.

a. Distal width of tibia (mms)

Site	Range	No	
Maison Dieu (Dissolution/ Demolition)	54.6–66.1	4	
Maison Dieu (Post-medieval)	62	1	
Portchester	44 –64	20	A
Northolt	71	1	A
Petergate	72	1	A
Exeter	46.8–62.7	83	B
Southampton	52	1	C

b. Distal width and length of metatarsal (mms)

Site	Range:	Length	No	Range:	distal width	No	
Maison Dieu (Foundation/ Occupation)		–	–		47.5–50.8	2	
Maison Dieu (Dissolution/ Demolition)		240	1		47.8–58.4	6	
Maison Dieu (Post-medieval)		230–232	2		47.8–55.7	2	
Maison Dieu (Recent)		–	–		50 –58	2	
Portchester		193–224	11		44 –59	21	A
Northolt		203–209	3		48 –56	2	A
Petergate		–	–		47 –60	6	A
Kirkestall		209	1		45–70	118	A
Exeter		182–223	17		–	–	B
Southampton		282	1		–	–	C

A after Grant (1977) see note 7.

B after Maltby (1979) see note 14.

C after Noddle (1975) see note 36.

TABLE 8: Selected measurements of sheep bones compared with those from some other Medieval sites

Distal width of tibia

Site	Range (mms)	No	
Maison Dieu (Foundation/Occupation)	23-26.8	11	
Maison Dieu (Dissolution/Demolition)	21.6-29.1	79	
Maison Dieu (Post-medieval)	24.1-28.6	78	
Maison Dieu (Recent)	24.5-27.8	5	
Southampton	24-28	4	A
Southern England (8 sites)	22-29	-	B

A after Noddle (1975) see note 36.

B after Noddle (1975), see note 15.

TABLE: 9 Ageing Data From Epiphyseal Fusion of Limb Cases

	Foundation/Occupation		Dissolution/Demolition		Post-Medieval		Recent	
Age (years)	No. fused	No. unfused	No. fused	No. unfused	No. fused	No. unfused	No fused	No. unfused
A/ Cattle								
1 - 1½	2	1	51	4	18	1	6	1
2 - 3	4	3	39	28	13	12	7	2
3 - 3½	1	1	9	32	4	9	4	3
3½ - 4	2	4	24	51	7	13	2	3
B/ Sheep								
10 months	4	1	223	2	26	4	19	1
1½ - 2	13	0	98	10	33	2	7	4
2½ - 3	10	3	96	39	12	10	12	2
3 - 3½	2	8	31	25	10	4	4	4
C/ Pig								
1	2	1	30	8	9	22	5	2
2 - 2½	0	12	12	70	5	29	0	14
3 - 3½	0	7	1	41	0	67	1	5

TABLE **/o:** Ageing Data from Tooth Eruption in Mandibles of Cattle.

Wear Stages of Individual Teeth

Phase	DP2	DP3	DP4	PM1	PM2	PM3	PM4	M1	M2	M3
	A B C	A B C	A B C	O A B C	O A B C	A B C	O A B C	O A B C	A B C	A B C
EM/MM	- - -	- - -	- - -	- - - -	- - - -	- - -	- - - -	- - - -	- - 1	- - 1
LM/D	4 7 1	- 8 7	1 5 11	1 1 1 2	1 1 1 -	1 1 -	4 - - 3	2 - - 5	2 - 4	- - -
PM	1 2 1	- 1 2	- 1 2	- - - 1	- 1 - 1	1 - 2	1 1 - 2	- - - 2	- - 4	- - 2
R	- - -	- - -	- - -	- - - -	1 - - -	- - 1	- - - 1	- - - -	- - -	- - -

Key

O	not erupted
A	not worn
B	enamel only worn
C	in wear

TABLE 11: Ageing Data from Tooth Eruption in Mandibles of Sheep.

Wear Stages of Individual Teeth

Phase	DP2 A B C	DP3 A B C	DP4 A B C	PM1 A B C	PM2 A B C	PM3 A B C	PM4 A B C	M1 O A B C	M2 A B C	M3 A B C
Foundation Occupation	- - -	- - -	- - -	- - -	- - 1	- - 2	- - 2	- - - 3	- - 3	- - 3
Demolition Dissolution	- 1 -	- 1 3	- - 7	- - -	1 - 3	1 1 5	1 1 6	4 1 1 12	- 1 13	2 - 12
Post-medieval	- - -	- - -	- - 1	- - 1	- - 1	- - 1	- - -	1 - - 2	- - 2	- - 3
Recent	- - -	- - 1	- - 1	- - -	- - 1	- - 1	- - 1	- - - -	- - -	- - -

Key

O	not erupted
A	not worn
B	enamel only worn
C	in wear

TABLE 12: Ageing Data from Tooth Eruption in Mandibles of Pig.

Wear Stages of Individual Teeth

Phase	DP2 O A B C	DP3 O A B C	DP4 A B C	PM1 A B C	PM2 A B C	PM3 A B C	PM4 A B C	M1 O A B C	M2 O A B C	M3 O A B C
Foundation/ Occupstion	- - - 1	- - - 1	- - -	- - -	- - 1	- - -	- 1 1	- - - 3	- - - 2	- - - -
Dissolution /Demolition	- - - 1	- - 1 1	1 1 2	- - -	2 1 2	- 3 3	- 5 4	- - - -	- 2 4 9	6 3 5 2
Post medieval	2 - - -	2 - - -	2 - -	- - -	- - 1	1 1 2	- 1 4	- - - 4	- 2 - 2	4 - - -
Recent	- - - 1	- - - 1	- - 2	- - -	- - -	- - -	- 2 1	- 1 1 3	1 - 2 1	2 - - 1

Key

O	not erupted
A	not worn
B	enamel only worn
C	in wear

TABLE 13: The bird species and anatomies from the different phases at the site

Bone	Species																									
	Fowl	Goose	Duck	Rook	Stock Dove	Pigeon/Rock Dove	Indeterminate Species	Fowl	Goose	Heron	Teal	Woodcock	Snipe	Tawny Owl	Magpie	Rook	Stock Dove	Pigeon/Rock Dove	Indeterminate Species	Fowl	Duck	Rook	Indeterminate Species	Fowl	Goose	Indeterminate Species	TOTAL
Skull	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	1	-	-	-	-	-	4
Mandible	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	2
Coracoid	4	-	-	1	-	-	-	9	3	-	-	-	-	-	-	1	-	1	-	3	-	-	-	1	-	-	23
Furcula	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Scapula	-	-	-	-	-	-	-	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4
Humerus	6	1	1	-	-	1	-	26	-	-	1	1	-	-	-	-	-	1	1	2	1	1	-	2	-	-	46
Radius	6	-	-	-	-	-	-	4	1	-	-	-	-	-	-	-	-	-	-	1	1	-	-	-	-	-	13
Ulna	3	-	-	-	-	1	-	8	1	-	-	-	1	-	1	-	-	-	1	5	-	-	-	1	-	-	22
Carpometacarpal	1	-	-	-	-	1	-	5	3	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	12
Sternum	-	-	-	-	-	-	1	2	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	6
Os Coxae	1	-	-	-	-	-	-	3	1	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	1	-	7
Femur	4	2	-	-	-	-	-	17	2	-	-	-	-	-	1	-	1	1	-	1	2	-	-	2	-	-	36
Tibiotarsus	3	-	-	-	-	-	-	16	4	-	-	-	-	-	-	-	1	-	-	3	5	-	-	1	1	-	34
Tarsometatarsal	1	1	-	-	1	-	-	5	2	1	-	1	-	1	-	-	-	-	-	2	1	-	-	-	-	-	16
Synsacrum	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Ribs	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	-	-	-	-	-	-	-	4
Indeterminate Fragments	-	-	-	-	-	-	13	-	-	-	-	-	-	-	-	-	-	-	24	-	-	-	4	-	-	2	44
TOTAL	29	5	1	1	1	3	14	101	18	1	1	2	1	1	2	1	2	3	30	23	11	1	4	8	2	2	275
Phase	Foundation/Occupation							Dissolution/Demolition												Post - medieval				Recent			

Table: 14 The species of fish from the different phases of the site

Species	Phase																TOTAL
	FOU		OCC		DIS		DEM		PM		R		Total				
	HP	S	HP	S	HP	S	HP	S	HP	S	HP	S	HP	S			
Freshwater/Estuarine																	
Eel	-	-	-	2	-	-	-	3	-	-	-	-	-	5			5
Salmonid	-	-	-	-	-	-	1	-	-	-	-	-	1	-			1
Grey Mullet	-	-	-	-	-	-	-	1	-	-	-	-	-	1			1
Indeterminate																	
Plaice/Flounder	-	-	3	3	4	2	-	4	-	-	-	-	7	9			16
Marine																	
Roker	-	-	-	-	-	1	-	-	-	-	-	-	-	1			1
Herring	-	-	-	6	-	-	-	49	-	-	-	-	-	53			53
Conger Eel	-	-	1	-	-	-	3	-	-	-	-	-	4	-			4
Cod	1	-	10	-	14	-	7	-	6	-	-	-	38	-			38
Haddock	-	-	-	-	2	-	-	-	-	-	-	-	2	-			2
Turbot	-	-	4	-	1	-	-	-	-	-	-	-	5	-			5
Indeterminate species	-	-	54	40	44	16	1	103	1	-	1	-	105	159			260
TOTAL	1	0	72	51	65	19	12	159	7	0	1	0	158	228			386

Key: HP - hand picked
S - sieved
FOU - Foundation
OCC - Occupation
DIS - Dissolution
DEM - Demolition
PM - Post-medieval
R - Recent

TABLE 15: Comparison of Percentage Species Composition for the different Phases within the site

Phase	Cattle	Sheep	Goat	Pig	Horse	Dog	Cat	Rabbit and Hare	Deer	Total number of identified fragments
Foundation/ Occupation	28	49	-	19	1	-	2	0.7	0.3	297
Dissolution/ Demolition	42.8	42.8	0.05	12	0.3	0.5	0.5	0.5	0.5	4,278
Post-medieval	29.7	30.6	0.3	35	1.4	1.6	0.6	0.6	0.3	1,799
Recent	37.7	33.8	0.4	21.4	4	1.4	0.8	0.4	0.2	509
WHOLE SITE	37	38.3	0.2	20.8	0.9	1	0.8	0.5	0.4	7,178

APPENDIX

Measurements:- All measurements are in mms. The range for a particular measurement is given, followed by the number of measurements in brackets.

Species	Bone	Phase	L	PB	PD	DB	DD
Cattle	Humerus	Diss/Dem				64-79 (2)	62-78 (2)
	Radius	Diss/Dem		73.6-93 (9)	33-44 (6)	65.2-78 (2)	
		PM		77-81.7 (2)	36.9-45 (2)		
	Metacarpal	Fou/Occ		67.7 (1)	35 (1)		
		Diss/Dem	186-213 (2)	50.7-64.4 (22)	28.9-41.3 (21)	51.9-72.2 (9)	
		PM	203 (1)	54-62.1 (4)	32.4-40 (3)	46-62 (6)	
		R	196 (1)	54-66.4 (2)	34-41.8 (2)	55 (1)	
	Femur	PM				52 (1)	66.7 (1)
	Tibia	Diss/Dem				54.6-66.1 (4)	39.3-46.8 (4)
		PM				62 (1)	
	Calcaneus	Diss/Dem	112.9-132.9 (3)				
	Metatarsal	Fou/Occ		40.1-51 (3)	39.1-49.3 (3)	47.5-50.8 (2)	
		Diss/Dem	240 (1)	41.4-55.1 (21)	39.8-55 (21)	47.8-58.4 (6)	
		PM	230-232 (2)	45.5-59.3 (6)	38-53 (6)	47.8-57.1 (2)	
		R		45-47.8 (2)	45.4-48 (2)	50-58 (2)	
Sheep	Humerus	Diss/Dem				26.4-39.4 (83)	20.7-27.8 (74)
		PM				26.4-37.6 (19)	20.4-29 (19)
		R				28.8-32.4 (8)	25-28.8 (7)
	Radius	Fou/Occ		28.6-32.3 (4)	11-15.8 (4)	26.8-32.6 (5)	19-22 (5)
		Diss/Dem	141-167 (21)	26.8-34.3 (71)	12.4-29.8 (80)	24.9-31.9 (36)	17-21.8 (34)
		PM	138-161 (3)	28-37.9 (23)	9.8-21.2 (23)	26.8-29 (3)	18-29.4 (4)
		R	142 (2)	28.1-32 (5)	14-16.8 (5)	26.2-30 (4)	18-19.5 (4)
	Metacarpal	Fou/Occ		24.5 (1)	17.8 (1)	24.4 (1)	
		Diss/Dem		20-25 (9)	15.3-18.4 (9)	26 (1)	
		PM	114-131 (6)	19.6-27.8 (7)	11.8-20.3 (7)	22.5-31 (7)	
		R		21.6-24.6 (3)	16.5-17.7 (3)		

Species	Bone	Phase	L		PB		PD		DB		DD	
Sheep (Cont'd)	Femur	Diss/Dem							34-43.8	(5)	41.7-46	(5)
		PM							34.9-39	(4)	40.6-47.1	(3)
	Tibia	Fou/Occ							23-26.8	(11)	17.6-20.1	(11)
		Diss/Dem			37.8-43.8	(8)	38.4-41.3	(6)	23.3-29.1	(79)	17.2-22.4	(76)
		PM	193	(1)	39-44.5		35-41.3		24.1-28.6	(18)	18.1-24.4	(16)
		R							24.5-27.8	(5)	19.6-27.7	(5)
	Calcaneus	Fou/Occ	50.8-53.5	(3)								
		Diss/Dem	44.9-58.5	(24)								
		PM	52.3-55.3	(2)								
		R	50-56	(2)								
	Metatarsal	Diss/Dem	126-139	(3)	18.5-21.5	(10)	18.6-22.6	(10)	22-24.6	(7)		
		PM	133-137	(3)	19.6-22.4	(8)	19.2-23.8	(8)	22.5-27	(3)		
		R			19.6-21.7	(2)	19.4-20	(2)				
Pig	Humerus	Diss/Dem							36.7-45.6	(9)	36.4-44	(8)
		PM							37.4-41.7	(2)	38.3-40.9	(2)
	Radius	Fou/Occ			30	(1)	21.6	(1)				
		Diss/Dem			29-34.4	(4)	21.2-24.5	(4)				
		PM			25.5-31	(3)	18.5-21	(3)				
		R			32.8	(1)	26.2	(1)				
	Tibia	Diss/Dem							31.4-40.8	(3)	27.3-34.4	(3)
		PM							31.8-34	(2)	27.5-29.3	(2)
	Calcaneus	PM	89	(1)								
Fallow Deer	Radius	Diss/Dem			36-38.4	(2)	19.9-21.2	(2)				
	Metacarpal	PM			25.6	(1)	17.2	(1)				
	Tibia	Diss/Dem			54	(1)	55	(1)	32.5	(1)	23.4	(1)
		R							31.9	(1)	23.8	(1)
	Calcaneus	Fou/Occ	88	(1)								

Species	Bone	Phase	L	PB	PD	DB	DD
Roe Deer	Radius	Diss/Dem				29.6 (1)	19 (1)
	Tibia	Diss/Dem				23.8–29 (4)	19.3–21.3 (3)
Fowl	Coracoid	Fou/Occ	49 (1)				
		Diss/Dem	53.2–60.3 (5)				
		PM	52.5–62.5 (2)				
		R	60.4 (1)				
	Humerus	Fou/Occ	65–73.4 (2)				
		Diss/Dem	63.4–85 (9)				
	Radius	Fou/Occ	59.8–63.8 (3)				
		Diss/Dem	65.5–73.9 (2)				
	Ulna	Fou/Occ	86.8 (1)				
		Diss/Dem	62.9–77.5 (3)				
		PM	77.6 (1)				
	Femur	Diss/Dem	69–93.7 (9)				
		PM	75.6 (1)				
		R	79.6				
	Tibiotarsus	Diss/Dem	136.5 (1)				
Goose	Femur	Diss/Dem	88 (1)				
	Tanometatarum	Diss/Dem	88.7–96 (2)				

KEY

Fou/Occ - FOUNDATION/OCCUPATION

Diss/Dem - DISSOLUTION/DEMOLITION

PM - POST-MEDIEVAL

R - RECENT

L - Length.

PB - Proximal breadth.

PD - Proximal depth.

DB - Distal breadth.

DD - Distal depth.

Plates

IA Maison Dieu, Ospringe. A fowl tarsometatarsus (male) with ossified tendons and exostosis along the shaft. The tip of the spur has been sawn off.

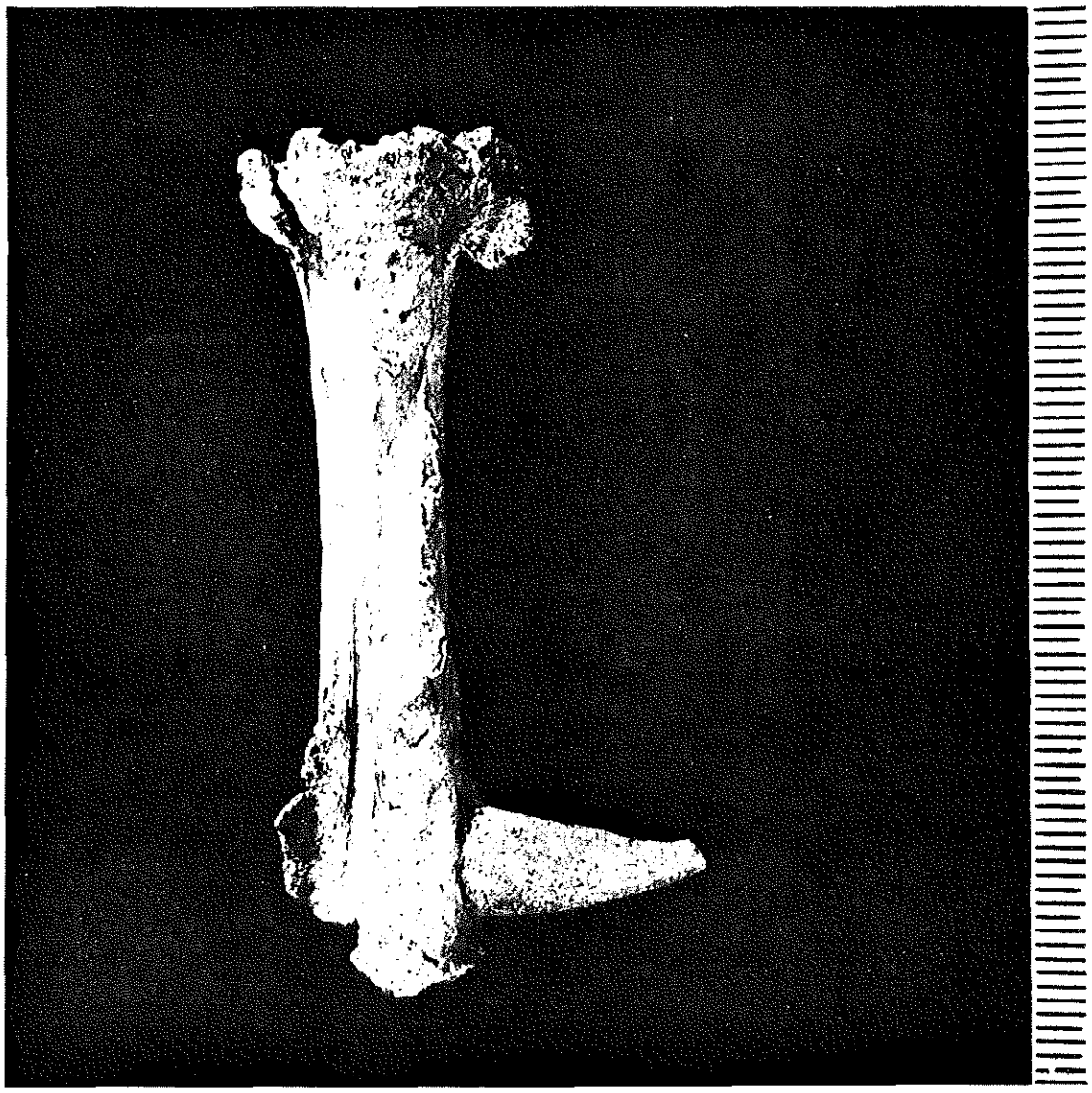
IB Maison Dieu, Ospringe. A fowl tarsometatarsus (male) with ossified tendons and exostosis along the shaft. The spur has been pared down probably with a knife. This might have been prior to fitting a metal spur for cock-fighting.

IIA Maison Dieu, Ospringe. The caudal joint surface of a cattle-sized vertebra showing a number of pits and indentations which resemble symptoms of tuberculosis.

IIB Maison Dieu, Ospringe. A sheep tibia in which the cortical bone of the shaft is abnormally thickened, almost completely obliterating the marrow cavity.

III Maison Dieu, Ospringe. A sheep humerus with a slight amount of exostosis on the medial edge of the distal joint surface.

PLATE IA



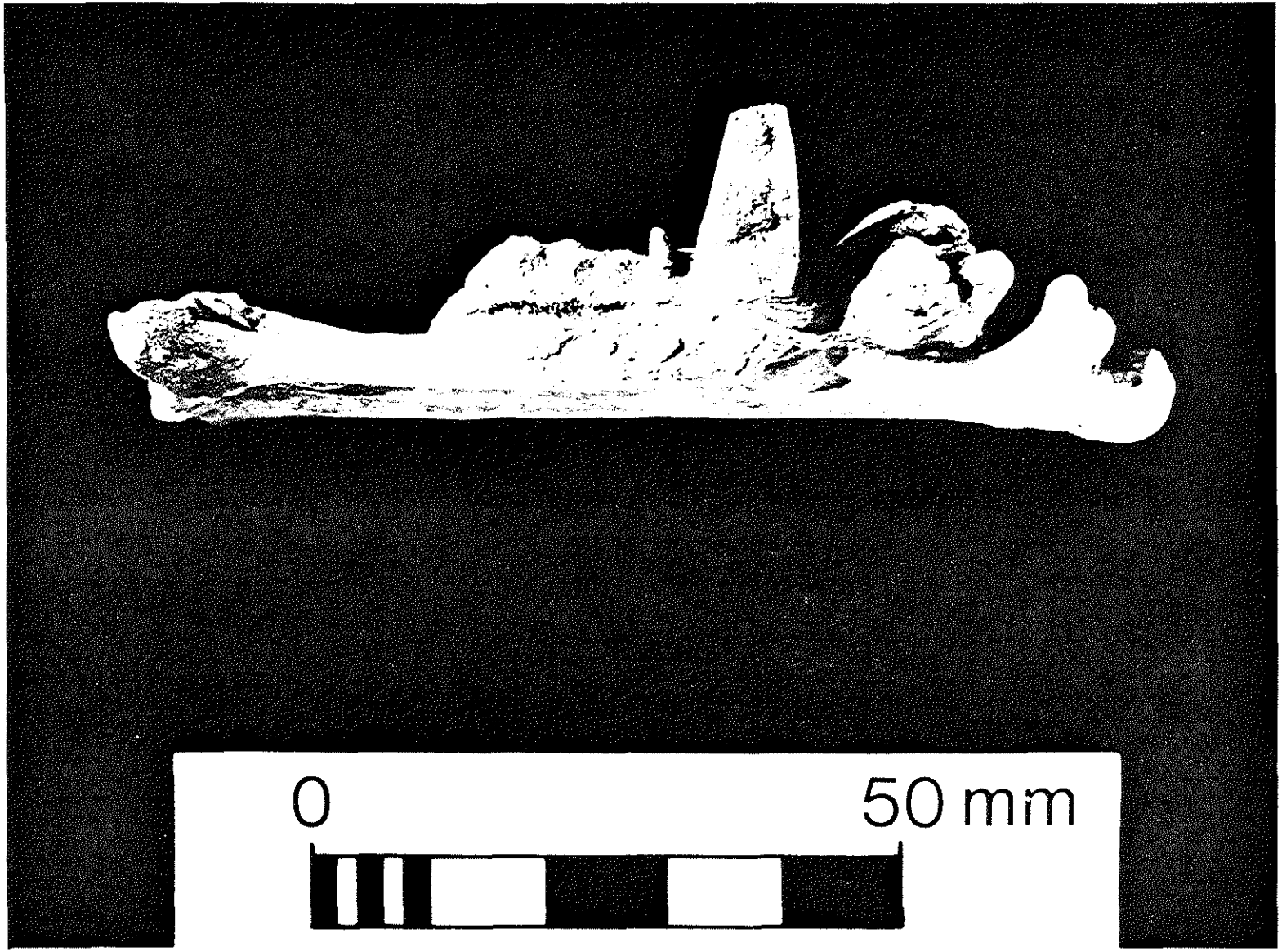


PLATE IB

PLATE IIA

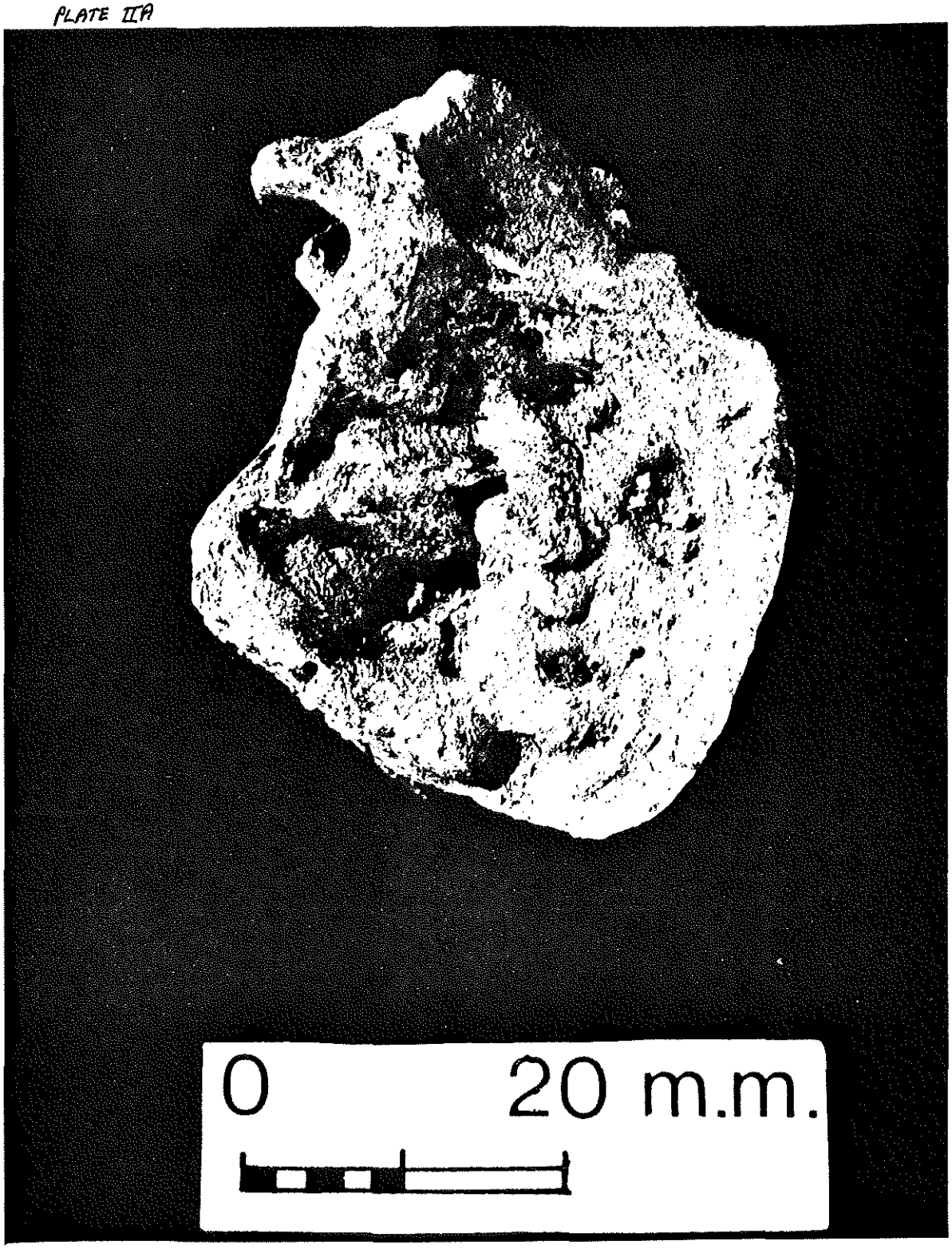
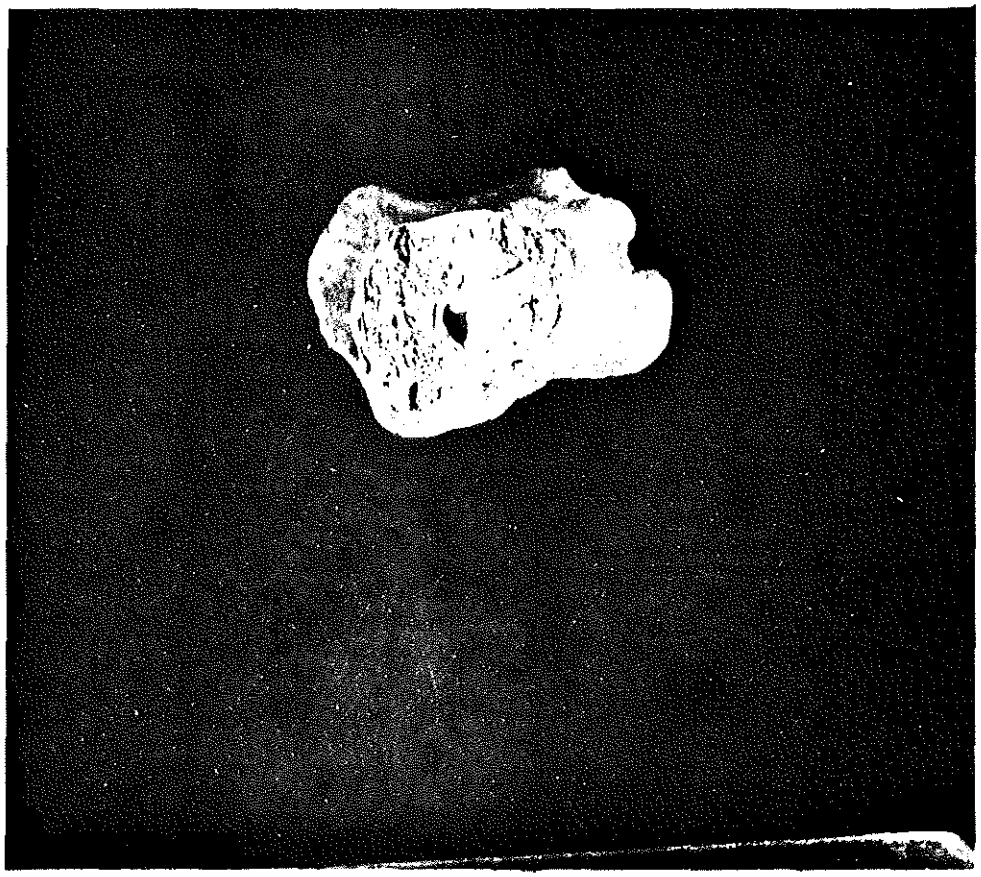


PLATE IIB

PLATE III



Figures

1. Fragmentation of cattle bones. The individual fragments from each bone element are divided into size categories, expressed as a percentage of the bone which is present (see key). Pie diagrams illustrate the relative proportion of fragments from these different size categories for each bone element. (A) Medieval (B) Post-medieval and Recent.

2. Fragmentation of sheep bones. The individual fragments from each bone elementare divided into size categories, expressed as a percentage of the bone which is present (see key). Pie diagrams illustrate the relative proportion of fragments from these different size categories for each bone element. (A) Medieval (B) Post-medieval and Recent.

3. Fragmentation of pig bones. The individual fragments from each bone element are divided into size categories, expressed as a percentage of the bone which is present (see key). Pie diagrams illustrate the relative proportion of fragments from these different size categories for each bone element. (A) Medieval (B) Post-medieval and Recent.

4. Cattle butchery. Diagrammatic summary of the butchery marks found on cattle bones from the Dissolution and Demolition phases.

5. Sheep butchery. Diagrammatic summary of the butchery marks found on sheep bones from the Dissolution and Demolition phases.

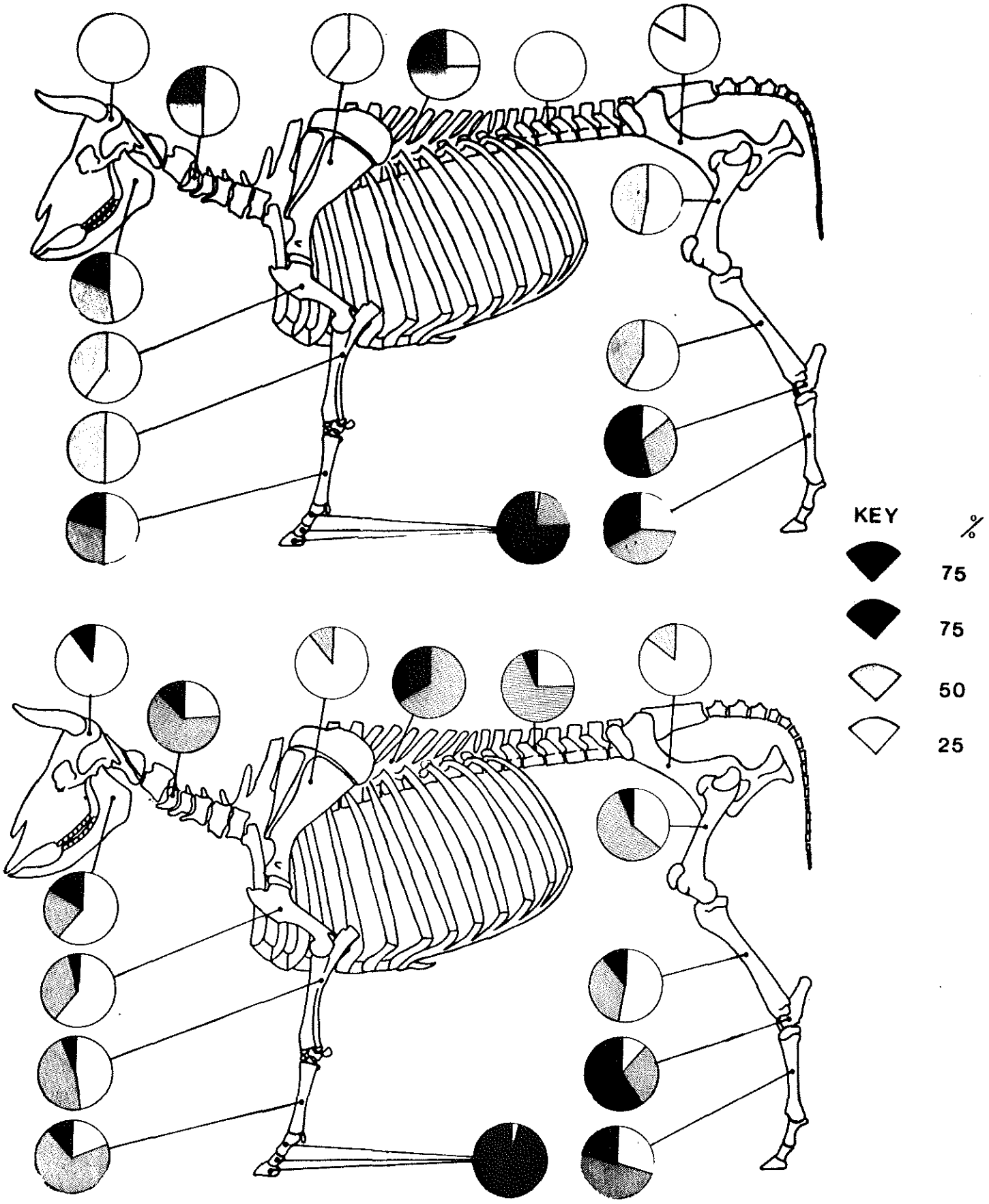


FIGURE 1

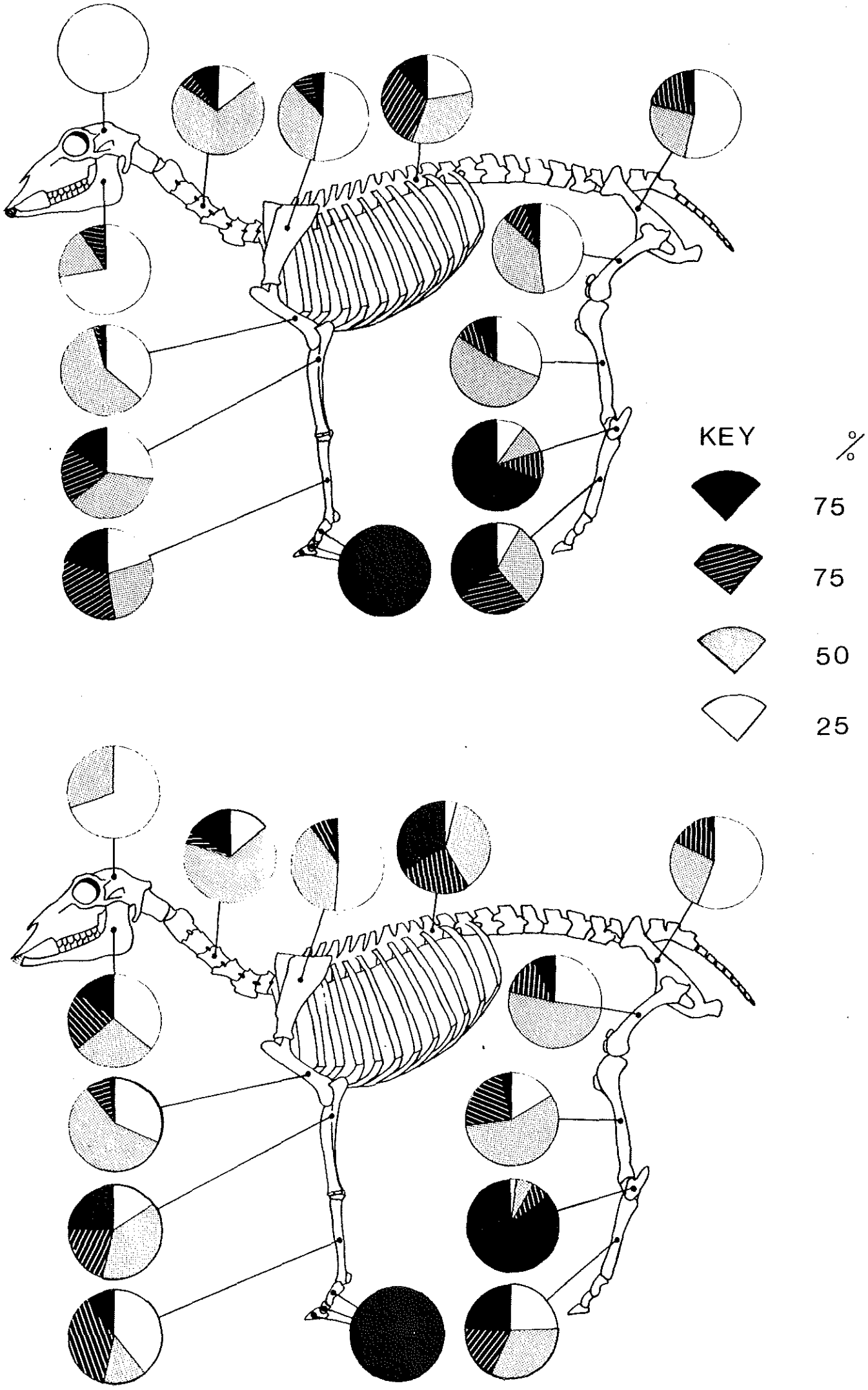


FIGURE 2

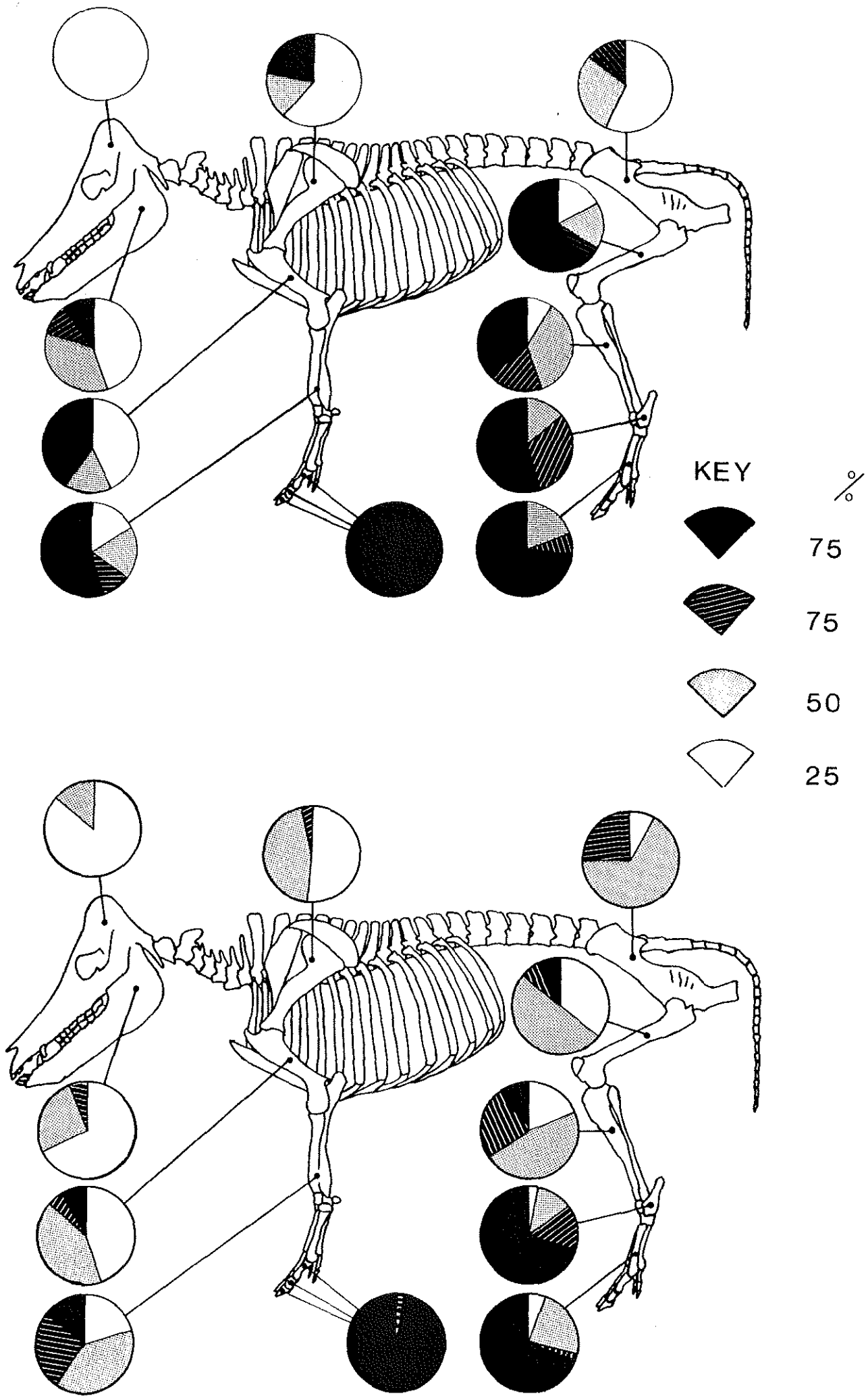


FIGURE 3