Ark Report 4820

The Animal Bones from West Parade, Lincoln.

by

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Introduction.

The site lay to the north of the excavations at the Park (for a report on the bones from the Park see Scott, forthcoming) within the western defences of the city. The area was very steeply sloped east to west, and was separated from the Park by a Roman street (West Parade). From documentary sources it would seem that during the medieval period, it was a residential area within the city walls.

Because the area was about to be redeveloped, the excavation of the site was rapid (one seasons dig, 1971) and basically involved the cutting of two L-shaped trenches. These revealed a section of the Roman city wall with contemporary ramparts, and a later interval tower set into the defences. A large proportion of the bone from the site was recovered from medieval features such as pits, dumps and redistributed wall and rampart material.

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For the purpose of this report, the bone material has been organised into seven chronological groups, and they are listed below:

1. Roman
2. 11th Century
3. 12th Century
4. 13th Century
5. Early Medieval (9-13th Century)
6. Late Medieval (14-15th Century)
7. Post Medieval (16th Century-Modern)

In addition, there was a very tiny proportion of unphased material, and a single context recorded as Saxon. However, these are not included in the report as the number of bones involved is so small as to render comparisons with other phases meaningless.

In total, the site yielded 9391 bone fragments of which 66% proved to be identifiable (see Table 1 for a list of the species identified). The preservation of the bone was very good, for whilst it was very fragmentary, less than 1% was heavily abraded, and only 1.2% of all identified bone showed signs of having been gnawed. The bone in general was ochre-brown in appearance and not friable, by complete contrast however the bone from context [illegible] was very 'fresh' in appearance and pale in hue.

Methods and Techniques.

Because most of the 173 bone bearing contexts contained so few bone fragments, information was recorded on small index cards. The data collected were as follows:

1. An estimate of the quantity of bone per context e.g. two boxes.

2. Any features of preservation e.g. gnawing, charring or abrasion.

3. The species, skeletal element or fragment type.

4. Dental attrition and eruption state (Grant, 1982).

5. Disease or injury.

6. The fusion of the longbone epiphyses.

7. Non metrical traits e.g. the presence or absence of the second premolar in the mandibles of cattle and sheep.

8. Any evidence of butchery.

There were five substantially larger contexts which were recorded in greater detail on specially designed sheets devised by Dr. Terry O'Connor. Additionally, measurements were taken on the more complete bones using vernier calipers based on the system devised by von den Driesch (1976), and these form the biometry archive included at the end of this report.

Recording sheets, index cards and other archive material are stored at the Environmental Archaeology Unit, University of York, and the bones themselves are the property of the Trust for Lincolnshire Archaeology.

Results.

Abundance and Frequency.

In determining the relative importance of the various animal species represented on a site, a number of techniques can be applied. Firstly, calculating the total number of identified fragments for each species gives some measure of abundance (Table 2), although the poor preservation and retrieval of small bones can distort the distribution. Secondly, on larger sites yielding more bone, it is possible to find the minimum number of individuals of any given species by counting the most frequently occuring skeletal element, although on a site such as this, consisting as it does of so many small contexts, this technique is not really applicable. Instead, a very simple method of calculating the frequency of species is to count the number of contexts in which a given species is represented (O'Connor,1985). To compare frequency across phases, the numbers can be standardised by dividing the number of contexts in which a given species is found by the total number of contexts from that particular phase. The results are given in Table 3.

Cattle was by far the most commonly represented species both in terms of frequecy and abundance, but what was remarkable was the consistency of these percentages throughout the early medieval period,

varying between 91.3 and 95.2% in terms of frequency, and 40.2 to 44.9% abundance.

The distribution of sheep bones was even more consistent. Between the 12th century and the late medieval period the figure remained constant at 85.7%, and the abundance fluctuated only between 36.2 and 45.8% for the same period.

Pig and horse were fairly frequent but never abundant, throughout all phases of the site. Species such as red deer, dog and cat were scarce. Small mammals and amphibians were only represented in the Roman phase, and then only in one context (BF), but this is almost certainly a consequence of not having sieved material from the site. Similarly the proportions of small fish such as eels in no way represents their true importance as a food item during the medieval period as highlightedat sites such as Lurk Lane, Beverley (Scott, forthcoming) where only when soil samples were sieved did such species become apparent. The considerable fluctuation observed in the frequencies of bird species is probably a consequence of the small numbers involved.

Carcass components

The four largest contexts from the site, which were recorded in full, were further examined to assess the proportions of various skeletal elements being deposited. This was achieved by calculating the total number of fragments of a specific carcass component, and dividing it by the number of times that component occurs in the body of one individual e.g. if a context contained 12 sheep horn cores, the standardised figure for horn cores would be six, as each individual normally possesses one pair of horns. The results are presented in Table 4.

Sheep were under-represented by ribs throughout all contexts which is slightly surprising,but may suggest that the major meat bearing portions of the skeleton were being distributed elsewhere. Overall, contexts AJ (Post medieval) and EM (11th Century) were the most alike, both containing high proportions of sheep leg bones including the metapodials, and head bones excluding horn cores. Context AR, of late medieval date also contained a large number of sheep limb bones but not such a high proportion of skull fragments. Context EK, of 12th Century date was significently different from the other three contexts in terms of sheep carcass components, containing as it did high percentages of scapula, pelvis, skull, metapodials and horn cores, but a disproportionately small number of limb bones e.g. humerus, femur, radius and tibia.

The distribution of cattle carcass components produced rather a different picture. Bones of the skull predominated, and throughout all phases rib was under represented. As with sheep bones, the earliest and latest of the contexts (EM and AJ respectively) appeared to be the most alike, containing a high proportion of limb bones. Context EK contained a high percentage of fore limb only, and context AR, a disproportionally large number of scapulae and pelvic fragments.

The paucity of pig bone meant that it was pointless to analyse the distribution of carcass components.

Because the contexts cover such a time span, and such patterns as existed (i.e. the similarity of EM and AJ) cannot justifiably be explained as evidence of specialised butchery continuing in the same area of the city in the same way over several hundred years, the contexts probably represent a random distribution of butchery and household debris.

Biometry

Where possible measurements were taken on the more complete bones using the standardised system of measurements devised by von den Driesch (1976). The results are presented in the biometry archive at the end of this report.

No one bone produced a large enough measurable sample with which to make direct comparisons with material from other sites, but generally the range of measurements matched those from other sites in Lincoln e.g. Flaxengate (O'Connor, 1982) and The Park (Scott, forthcoming).

Perhaps at some future date it may be possible to make a detailed study of the biometric data already available for the city from small medieval and Roman sites.

Butchery

Only a relatively small number of bones from the site showed signs of butchery (3.3% of the total number of identified bone fragments). Because there is an almost infinite number of ways of carving up a bone, taking into account the direction in which the blow

was struck, and the portion of the bone being butchered, specific butchery methods were not quantified: rather, the most frequently repeated butchery practices are discussed in general terms.

Most butchered bone was that of cattle, although some horse, pig, red deer, and sheep bone had been reduced to smaller units. A high proportion of the butchered cattle bone was vertebrae which had been cleaved down the median sagittal plane. This indicates the practice of splitting the carcass into sides (a whole beast was often too heavy to be hung, and a 'side' was a far more manageable unit). This procedure has been recorded at other medieval sites e.g. Flaxengate (O'Connor, 1982) and Lurk Lane, Beverley (Scott, forthcoming).

In addition, the proximal and distal ends of long bones such as tibia, femur, radius and humerus exhibited a variety of butchery marks which suggests the further reduction of the carcass into the major meat bearing portions of the body. However, because so few bones were butchered, no real patterns in butchery technique could be discerned, and coupled with a study of the carcass components which showed no concentrations of specific skeletal elements, there appeared to be no evidence of specialised butchery of cattle on a large scale.

Evidence of the butchery of other animals, such as there was, consisted of paramedially split vertebrae (for sheep and pig) and a random selection of chopping and knife cuts to the limb bones.

Age at death.

Two methods of estimating the approximate age at death of cattle, sheep and pig were applied to the data. Firstly a study was made of the enamel tooth wear patterns of the lower molars and premolars using the system devised by Grant (1982). This was coupled with a study of the eruption times of the lower dentition (Silver, 1969) with amendments by Bull and Payne (1982) for pigs, and Payne (1984) for cattle and sheep. All mandibles with teeth still 'in situ' were examined and these methods applied. The results are given in Table 5.

What the results show for the cattle is, a remarkable consistency over all phases of the site with no immature individuals whatsoever (less than two years of age at death). However the sample was so small as to make further conclusions purely speculative. Similarly, the small sample of pig mandibles produced a typically diverse distribution of ages with a high proportion of immature individuals, and no apparent change in age distribution over time. The sheep did produce a reasonably large sample with some Roman material, and there did seem to be some change in the age distribution, with a higher proportion of immature sheep in the Roman and 11th Century deposits than the later levels, although this could be a result of sampling error.

The second ageing technique applied to the data was that of calculating the proportions of fused long bone epiphyses to unfused based on the work of Watson (1978), in the four largest contexts from the site (Table 6). Whilst the numbers were rather small, they appear to validate the dental evidence in that the majority of cattle appear to have been mature. Sheep fell into the subadult to adult category, whilst the scant evidence for pig does seem to indicate that they were being killed off young. Variation between the contexts is slight and probably not significant.

Non Metrical Traits.

A number of discontinuous genetically determined traits were recorded in the bones and teeth of the major domesticates, and they are listed out below;

1. The presence and absence of a second premolar in the mandibles of cattle and sheep (Andrews and Noddle, 1975)

2. The occurrence of a reduced third molar in sheep and cattle mandibles

3. The position of the nutrient foramen in sheep femur (Noddle, 1978)

4. The ratio of polled to horned sheep, and the occurrence of

polycerate individuals.

The results are presented in Table 7. With reference to the absence of a second premolar, only one cattle mandible exhibited this feature, whilst in the 11th century deposits, 12% of sheep mandibles (3 out of 25) did not possess a second premolar. It is likely that this represents the remains of a single small population and/or that inbreeding was taking place. Throughout the other phases the percentage of sheep without a second premolar is very small indeed, as one would expect on an urban site of this date.

The sheep femora showed a characteristically high proportion of nutrient foramina in the proximal locus (87.5% of identified fragments of this section of the femur shaft), with very few distal foramina and even fewer in the midshaft position. This is a typical distribution amongst modern sheep populations and is also replicated at sites such as Flaxengate, Lincoln (O'Connor, 1982)

Polled sheep were in a minority (11 cases in 79), but there did appear to be quite a concentration in the 13th century contexts (5 cases in 16). This is interesting in that at the site of Flaxengate (O'Connor, 1982), polled sheep were not represented before about 1120 and continued to become progressively more abundant throughout the medieval period until they actually outnumbered horned sheep. Whilst the numbers for West Parade are small, the observed frequency of polled sheep seems to confirm the long term change in the sheep population seen at Flaxengate. The one polycerate individual is

simply a random mutation. The trait is very uncommon in medieval unimproved breeds.

Disease and Injury.

Only a very small number of bones showed signs of disease and injury and these are listed out below:

1. WPII-CW Horse - Two 1st phalanges with boney growth along the lateral edge of the diaphysis.

2. WPII-CY Cattle - One lumbar vertebra with ossification of the longitudinal periarticular ligaments.

3. WPI-AV Cattle - One 1st phalanx with exostosis around the proximal articular surface.

4. WPI-BO Cattle - One left metacarpal with boney growth around the proximal articular surface.

5. WPI-CU Cattle - One 1st phalanx with boney change around the distal articular surface.

6. WPI-EG Cattle - One right pelvic acetabulum and ischium fragment with massive osteomyelitis lateral to the acetabulum apparently associated with a dislocation of the hip joint.

Fish Bones.

A small fish bone assemblage, consisting of 48 fragments was recovered from all phases of the site (Table 8). Identifications were made by Andrew Jones of the Environmental Archaeology Unit, University of York.

The most commonly represented species was cod, which constituted 50% of all identified fragments, and other members of the cod family (Gadidae), haddock and ling made up a further 12.5%.

The Roman fish came from the interval tower and included the tiny bones of eel, (normally only found when soil is sieved) which reflects the excellent preservation of the bone material and its careful collection. The freshwater species chub and pike were probably taken from the nearby River Witham. The presence of a salmon bone in a 13th century context, if presumed to have been taken locally, suggests that by this date the water source was still relatively free flowing and clean.

There does not appear to be any great changes in the species distribution or diversity over time, but the sample is very small. The assemblage is typical of that of an urban medieval site, and contains no 'Luxury' or unusual species.

Where possible pig mandibles were employed as a means of establishing the sex of the individual. This is relatively easy to do if the canine socket or the canine itself forms part of the mandibular fragment being examined. In male pigs the canine is a very robust tooth, triangular in cross section and with an open-ended root. The female equivalent is generally much smaller, with a more oval cross section and a root, which in juveniles tapers to a point, and in adults is actually closed (Schmid, 1972).

All of the mandibles looked at from the site were grouped as medieval (11th century to late medieval) and the results are presented in Table 9. Although the sample was small, there was clearly a high proportion of immature females i.e. the 3rd molar had not yet come into wear. This is slightly unusual, as on medieval sites there is often a disproportionate number of immature males.This would represent surplus stock being killed off young, as female pigs are normally kept for breeding. It should be borne in mind however that the mandibles are spread throughout many phases and thus the figures may be distorted by sampling error.

Context BF.

Whilst no material from the site was bulk sieved, one context (BF) produced a large assemblage of small mammal, bird, fish and amphibian bones. Consequently, this particular context is discussed separately from the bulk of the report, as it was felt that the bone warranted study in greater detail.

The context, of Late Roman date, represents the demolition levels of an interval tower set into the colonia wall, probably constructed during the 3rd century. The assemblage consisted of two boxes of bone, and the preservation of the material was excellent. Easily the most abundant species represented was dog (Table 10). MNI estimates revealed the presence of at least six individuals. A study of the wear on the teeth, and the fusion of the long bone epiphyses indicated that of the six dogs, two were of advanced years (extensive wear on the teeth). There was also the partial skeleton of a puppy, which was probably less than 3 months old when it met its death (all of its long bones were unfused). As the dogs were represented by complete skeletons, the obvious interpretation is that the corpses were deposited in the tower which had been abandoned, and may well have already begun to fall derelict.

There was a small percentage of cattle, sheep, pig, domestic fowl, goose, mallard, fish and possibly golden plover bones which represent typical domestic debris, and it is likely that this marks

the last phase of occupation or usage of the tower before it was abandoned.

abandoned.

The bulk of the assemblage consists of small mammals such as mice and voles, frogs and toads, and familiar birds such as sparrows, blackbirds, thrushes, starlings and pigeons. The presence of 'immature bird sp.' and immature raven would seem to suggest that species were nesting in the tower. The small species may represent the carrion of raptors, although the bones of birds of prey were not found in the assemblage. Additionally, the excellent preservation of the small bones, and the presence of large numbers of frogs and toads strongly suggests the remains of owl pellets. As a deserted tower would be an ideal habitat for an owl roost, it seems most likely that the small bones found in this context are the remains of small creatures hunted by owls.

Another interesting feature of the assemblage was the presence of Black Rat in Roman, albeit, late Roman levels. This adds to the ever increasing archive of the presence of the species on British Roman sites (Armitage et al, 1984).

The presence of mole is somewhat surprising in such an urban setting, but has been recovered from similar abandoned sites e.g. a garderobe pit at Lurk Lane, Beverley (Scott, forthcoming), and this possibly indicates that there were orchards and garden habitats within the city.

Thus context BF appears to contain material derived from a variety of sources. Probably the first material to have been

Thus context PF appears to contain material derived from a variety of sources. Probably the first material to have been deposited were the domestic species which represent the last phase of occupation debris. As the tower fell into disuse, dead dogs were dumped within the structure and eventually it became home to roosting and nesting birds, probably including owls, hence the concentrations of small bird, mammals and amphibians.

Discussion and Summary

West Parade produced a small but rather interesting assemblage of animal bones. The preservation was good, which meant that it was possible to identify over 65% of the bone fragments. Although no material from the site was sieved, it having been excavated during the early 1970s when the practice was not common, one context (BF) produced a very large volume of small mammal, bird and fish bone. This particular context of late Roman date formed the contents of an interval tower set into the city wall, and showed quite clearly the stages of abandonment as reflected in the bone remains, the depostion of dead domestic animals and the arrival of roosting birds such as owls whose pellets contained the bones of large numbers of amphibians, small mammals and birds.

Aside from Context BF, the rest of the material from West Parade appeared to represent mainly domestic rubbish. As only a small fraction of the bones showed signs of gnawing and abrasion, it would seem to imply that deposition of bone was a fairly rapid process and that exposure to the elements was not prolonged within any of the phases.

Cattle and sheep appeared to form the mainstay of the diet being almost equally represented in terms of frequency and abundance throughout all phases of the site. What is slightly surprising is the low frequency and abundance of pig (approxiately half as much as

recorded at Flaxengate. There are however, two possible interpretations for this. It could be argued that the lower proportions of pig bones are matched by low counts of domestic fowl, goose and other bird species which may indicate problems of recovery; certainly the figures for cattle, sheep and horse (larger species) match those from Flaxengate. However another interpretation is that the low frequency and abundance of the smaller species may be due to the nature of the site itself. During the medieval period, the area is described as being 'waste land', and it could be that only the largest elements of bone debris were being dumped on this land, away from areas of occupation. The smaller bones were deposited in dumps and pits close to the houses themselves. If this is the case, then there are parallels from the site of Coppergate York (O'Connor, pers comm.) where the proportions of pig and birds were higher in deposits close to 10th and 11th century buildings, whereas at the furthest reaches of the tenement plots, the contexts contained mainly fragments of cattle, sheep and horse. Whatever the case, the numbers of bones involved makes it impossible to distinguish subtle differences between phases, but it is clear that no one phase contained evidence of specialised butchery. The butchery that was noted suggested the splitting of cattle and sheep carcasses into sides (vertebrae split down the median sagittal plane) and jointing into the major meat bearing portions of the body.

Cattle were in general subadult to adult i.e. at least 3 years of age at death, with no very immature individuals represented. It is likely therefore that they were not being kept primarily for any one product, but were a multi-purpose resource. Similarly, sheep were mainly being killed off when adult i.e. in their third season, although there is a higher proportion of immature sheep in the Roman and 11th century phases. Pigs produced a wide range of age distribution although most were being killed off before adulthood. This picture is typical for most urban medieval sites.

The biometrical record suggests no obvious improvement in the breeding of cattle and sheep, as size remained fairly constant over all phases of the site, and correlated closely with the range of measurements from sites elsewhere in the city.

Discontinuous genetic traits such as the absence of a second premolar in sheep mandibles suggested that inbreeding may have been practiced in the 11th century (3 out of 28 cases did not possess a P2), but otherwise this evidence proved inconclusive.

As stated above, the absence of significent numbers of bird and fish remains may be due to poor recovery, but amongst the wild species identified, the assortment was typical of an urban assemblage of this date i.e.woodcock, golden plover, and corvid species.

Thus the assemblage (which, to be frank, never threatened to yield anything too surprising) lived up to expectations i.e. accumulations of household debris dumped in a sparsely populated area of the town, over quite a considerable period of time.

The careful recovery of bones from Context BF in the interval tower produced a large, diverse and informative assemblage quite different to any other samples from the site, showing how a single context may yield important evidence concerning the history and usage of one particular structure.

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Table 1. Complete Species List.

Salmon (Salmo salar)

Pike (Esox lucius)

Chub (Leuciscus cephalus)

Common eel (Anguilla anguilla)

Cod family (Gadidae)

Cod (Gadus morhua)

Haddock (Melanogrammus aeglefinus)

Ling (Molva sp.)

Toad (Bufo bufo)

Frog (Rana temporaria)

Domestic Goose (Anser anser domestic)

Teal (Anas crecca)

Mallard (Anas platyrhynchos)

Domestic fowl (Gallus gallus domestic)

Golden plover (Pluvialis apricaria)

Woodcock (Scolopax rusticola)

cf. Redshank (Tringa totanus)

Small sandpiper sp. (Scolopacidae)

Dove sp. (Columba livia or C. oenas)

Small passerine (Passeriformes)

Songthrush (Turdus philomelus)

Blackbird (Turdus merula)

Starling (Sturnus vulgaris)

House sparrow (Passer domesticus)

Yellowhammer (Emberiza citrinella)

Magpie (Pica pica)

Jackdaw (Corvus monedula)

Crow (Corvus corone)

Raven (Corvus corax)

Tiny bird sp. (Avis sp.)

Mole (Talpa europaea)

Common shrew (Sorex araneus)

Brown hare (Lepus capensis)

Large rodent sp. (Rodentia)

Small rodent sp. (Rodentia)

Water vole (Arvicola terrestris)

Field vole (Microtus agrestis)

House mouse (Mus musculus)

Black rat (Rattus rattus)

Dog (Canis familiaris domestic)

Cat (Felis catus domestic)

Horse (Equus caballus domestic)

Wild boar (Sus scrofa)

Domestic pig (Sus scrofa domestic)

Red deer (Cervus elaphus)

Roe deer (Capreolus capreolus)

Cattle (Bos sp. domestic)

Goat (Capra sp. domestic)

Sheep (Ovis sp. domestic)

Human (Homo sapiens)

Table 2. Abundance

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Roman	23	159	153	1	1	0	0	30	0	1	195	1	0	1	85	175	13	36	32	56	962	543	1505	3	6
11th Century	13	644	621	1	3	0	1	75	0	10	18	0	0	0	0	0	4	32	8	3	1433	705	2138	11	26
12th Century	4	366	391	0	2	0	0	55	0	18	5	0	0	0	0	0	2	16	13	4	876	421	1297	4	10
13th Century	5	582	460	1	1	0	1	84	0	14	43	5	0	0	0	0	19	25	26	6	1272	563	1835	9	16
Early Medieval	6	245	266	1	2	0	2	38	1	12	0	0	0	0	0	0	3	16	14	3	609	337	946	8	8
Late Medieval	3	233	225	1	0	0	0	35	1	5	3	0	0	1	0	0	1	9	8	0	525	353	878	7	7
Post Medieval	4	148	139	0	0	0	0	9	0	3	44	4	0	0	0	0	6	11	14	2	384	234	618	0	1

Key.

1.Horse
2.Cattle
3.Sheep
4.Goat
5.Red deer
6.Fallow deer
7.Roe deer
8.Domestic pig
9.Wild pig
10.Cat
11.Dog
12.Brown hare
13.Rabbit
14.Human
15.Other mammal
16.Amphibian
17.Fish
18.Domestic fowl
19.Domestic goose
20.Other bird
21.Total identified
22.Total unidentified
23.Grand total
24.Total abraded
25.Total gnawed

Table 3. Frequency

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
Roman	6	26	21	1	1	0	0	10	0	1	10	1	0	1	1	1	1	3	1	2	38
11th century	9	42	43	1	3	0	1	22	0	7	9	0	0	0	0	0	3	15	5	3	46
12th century	3	20	18	0	2	0	0	10	0	6	3	0	0	0	0	0	1	5	4	4	21
13th century	4	26	24	1	1	0	1	19	0	9	3	2	0	0	0	0	10	13	14	5	28
Early medieval	3	13	12	1	1	0	1	7	1	3	0	0	0	0	0	0	3	7	7	3	14
Late medieval	1	6	6	1	0	0	0	5	1	3	2	0	0	1	0	0	1	2	2	0	7
Post medieval	1	5	4	0	0	0	0	1	0	1	2	1	0	0	0	0	1	1	1	1	5

Key

1.Horse
2.Cattle
3.Sheep
4.Goat
5.Red deer
6.Fallow deer
7.Roe deer
8.Domestic pig
9.Wild pig
10.Cat
11.Dog
12.Brown hare
13.Rabbit
14.Human
15.Other mammals
16.Amphibians
17.Fish
18.Domestic fowl
19.Domestic goose
20.Other birds
21.Total number of contexts within the phase

Table 4. Carcass components (cattle, sheep and pig) for the largest contexts only

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
WP1-EM	0	13	10	5	10	15	5	4	16	1	8	5	4	7	15	12	1	8	4	0	0	5	0	0
WP1-EK	0	9	13	7	17	8	9	15	23	5	11	17	16	11	11	29	2	17	5	1	0	8	1	2
WP1-AR	0	8	10	6	6	4	4	17	13	1	3	9	3	11	10	11	5	12	4	1	2	2	1	0
WP1-AJ	1	3	7	2	5	10	8	11	18	0	9	4	5	15	12	16	5	12	0	0	1	2	2	1

Key

Cattle
1. Horncores
2. Skull
3. Vertebrae
4. Scapula+pelvis
5. Forelimb
6. Hindlimb
7. Hocks
8. Toes
9. Ribs

Sheep
10. Horn cores
11. Skull
12. Vertebrae
13. Scapula+pelvis
14. Forelimb
15. Hindlimb
16. Metapodials
17. Toes
18. Ribs

Pig
19. Skull
20. Vertebrae
21. Scapula+pelvis
22. Forelimb
23. Hindlimb
24. Metapodials III+IV

Table 5. Dentition (Cattle, sheep and pig)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Roman	-	-	-	-	-	-	-	2	1	2	6	-	-	-	-	-	-	-
11th century	-	-	-	-	-	-	-	2	2	6	20	1	-	-	1	-	1	-
12th century	-	-	-	1	3	3	-	1	-	4	4	1	-	-	2	1	1	-
13th century	-	-	-	-	-	1	-	-	1	5	18	3	-	2	-	5	2	-
Early medieval	-	-	-	-	1	1	-	-	-	-	9	-	-	-	2	2	-	-
Late medieval	-	-	-	1	1	1	-	-	-	1	6	-	-	-	-	1	1	-
Post medieval	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-
Total	-	-	-	2	5	6	-	5	4	18	64	5	-	2	5	9	5	-

Key.

Cattle
1.Perinatal
2.M1 not yet in wear
3.M1 in wear, M2 not yet in wear
4.M2 in wear, M3 not yet in wear
5.M3 in wear
6. Advanced wear on M3 and P4 (over wear stage 13)

Sheep
7-12. (As for Cattle)

Pig
13-18. (As for Cattle)

Table 6. Epiphyseal fusion in the largest contexts.

	1		2		3		4		5		6		7		8		9		10		11		12		13		14	
	f	uf	f	uf	f	uf	f	uf	f	uf	f	uf	f	uf	f	uf	f	uf	f	uf	f	uf	f	uf	f	uf	f	uf
EM	9	0	6	0	1	5	2	2	4	0	2	0	7	3	2	4	1	1	1	3	1	0	0	0	0	2	0	0
EK	22	0	4	0	3	1	0	9	7	1	5	0	11	3	3	2	2	10	4	0	0	1	0	1	0	0	0	0
AR	16	0	1	2	0	0	2	3	4	0	5	0	5	3	4	2	0	6	1	0	0	1	0	0	0	0	0	0
AJ	8	0	1	0	0	1	0	2	6	1	9	1	6	2	2	1	0	1	0	0	0	1	0	0	0	1	0	0

Key

Cattle
1. Early fusing (distal humerus, proximal radius, proximal phalanges 1+2)
2. Intermediate fusing (distal metacarpal, distal metatarsal, distal tibia, tuber calcis)
3. Late fusing (proximal humerus, distal radius, olecranon tuberosity, proximal+distal femur, proximal tibia)
4. Vertebrae

Sheep
5. Early fusing (distal humerus, proximal radius)
6. Intermediate fusing I (proximal phalanges 1+2, distal metacarpal)
7. Intermediate fusing II (distal tibia, distal metatarsal, olecranon tuberosity, proximal femur, tuber calcis)
8. Late fusing (distal radius, proximal humerus, distal femur, proximal tibia)
9. Vertebrae

Pig
10. Early fusing (distal humerus, proximal radius)
11. Intermediate fusing I (distal metacarpal, distal tibia)
12. Intermediate fusing II (distal metatarsal, tuber calcis)
13. Late fusing (olecranon tuberosity, proximal humerus, distal radius, proxial+distal femur, proximal tibia)
14. Vertebrae

Table 7. Non metrical traits

	A1	A2	B	C1	C2	D	E1	E2	E3	E4	E5	E6	F	G	H
Roman	0	0	0	10	0	0	1	0	0	1	0	1	1	0	0
11th century	0	0	0	25	3	0	2	1	1	4	2	2	34	2	1
12th century	6	0	0	8	1	0	2	0	0	1	0	1	13	2	0
13th century	1	0	0	21	0	0	1	0	0	1	0	1	11	5	0
Early medieval	0	1	0	6	1	0	0	0	0	0	0	0	2	0	0
Late medieval	1	0	0	5	1	0	1	0	0	0	0	1	6	0	0
Post medieval	0	0	0	0	0	0	0	0	0	0	0	0	1	2	0
Total	8	1	0	75	6	0	7	1	1	7	2	6	68	11	1

Key

Cattle
A1. P2 present
A2. P2 absent
B. Reduced 3rd molar

Sheep
C1. P2 present
C2. P2 absent
D. Reduced 3rd molar
E1. Presence of a proximal nutrient foramen on femur
E2. Absence of a proximal nutrient foramen
E3. Presence of a midshaft nutrient foramen
E4. Absence of a midshaft nutient foramen
E5. Presence of a distal nutrient foramen
E6. Absence of a distal nutrient foramen
F. Horned
G. Polled
H. Polycerate

Table 8. Fish bones

	1	2	3	4	5	6	7	8	9
Roman	0	0	5	6	1	0	0	0	1
11th century	4	0	0	0	0	1	0	0	0
12th century	1	0	0	0	0	0	0	0	0
13th century	13	3	0	0	0	0	1	1	1
Early medieval	3	0	0	0	0	0	0	0	0
Late medieval	1	0	0	0	0	0	0	0	0
Post medieval	2	0	0	0	0	0	1	0	3
Total	24	3	5	6	1	1	2	1	5

Key.

1. Cod
2. Haddock
3. Pike
4. Eel
5. Chub
6. Gadidae
7. Ling
8. Salmon
9. Indeterminate

Table 9. The sexing of pig mandibles

	Immature			Mature		
	Male	Female	Unknown	Male	Female	Unknown
Medieval	1	11	3	2	2	2

Table 10. Context BF - Complete species list.

Species	n.	%	MNI
Horse	3	0.4	1
Cattle	36	5.2	2
Sheep	60	8.7	5
Pig	16	2.3	2
Dog	177	25.7	6
Brown hare	1	0.1	1
Human	1	0.1	1
Black rat	14	2.0	2
Common shrew	1	0.1	1
Mole	2	0.3	1
Small rodent sp.	1	0.1	1
Water vole	23	3.3	2
House mouse	35	5.1	9
Field vole	6	0.9	2
Large rodent sp.	3	0.4	1
Domestic fowl	34	4.9	2
Domestic goose	32	4.7	3
Small passerine sp.	2	0.3	2
Crow	1	0.1	1
Woodcock	1	0.1	1
Jackdaw	2	0.3	1
Mallard	19	2.8	2
House sparrow	4	0.6	1
Songthrush	3	0.4	1
Magpie	1	0.1	1
Small sandpiper sp.	1	0.1	1
Golden plover	1	0.1	1
Raven	4	0.6	1
Blackbird	6	0.9	4
Yellowhammer	1	0.1	1
Pigeon	1	0.1	1
Starling	4	0.6	1
Baby bird sp.	4	0.6	1
Pike	5	0.7	2
Chub	1	0.1	1
Eel	6	0.9	4
Fish sp.	1	0.1	1
Frog	75	10.9	15
Toad	77	11.2	8
Frog/Toad	23	3.3	-

Biometry Archive.

Cattle Horn Cores

Context	R/L	Bas Cir.	Gr br.	Le br.	Length
WP1-DS	L	106.0	35.7	27.5	-
WP11-BV	L	125.0	41.8	33.6	(129)

Cattle Metacarpals

Context	R/L	Gl	Bp	Dp	Sd	Bd	Dd
WP11-BB	L	182.4	50.4	32.8	27.1	50.2	28.6
WP11-CB	R	193.6	60.5	37.3	32.6	62.2	32.2
WP1-DZ	R	180.2	55.0	32.3	31.2	57.3	29.2

Cattle Metatarsals

Context	R/L	Gl	Bp	Dd	Sd	Bd	Dd
WP1-BI	L	204.9	46.0	46.3	25.2	56.0	29.5
WP1-DU	R	194.8	38.8	38.2	20.7	45.0	24.0
WP11-BH	L	209.7	44.3	42.6	24.1	51.5	29.4

Sheep Horn Cores

Context	R/L	Bas cir.	Gr br.	Le br.	Length
WP11-EA	R	168.0	60.9	46.1	-

Sheep Radius

Context	R/L	Gl	Bp	Bfp	Dp	Sd	Bd	Bfd	Dd
WP1-BZ	L	157.0	31.9	29.6	15.9	16.3	27.8	24.3	19.2
WP1-CV	L	158.9	32.1	31.1	15.9	17.2	27.5	26.7	18.4
WP1V-AJ	L	145.5	29.6	27.1	15.3	16.4	26.8	22.1	18.9
WP1V-AW	L	142.3	32.2	28.1	15.8	17.3	28.8	23.9	18.6
WP1-EK	R	140.8	30.1	27.5	-	15.4	27.5	27.5	18.9

Sheep Metacarpal

Context	R/L	Gl	Bp	Dp	Sd	Bd	Dd
WP11-BX	L	125.9	21.3	15.7	11.9	23.5	15.8
WP1-BQ	L	124.4	21.9	16.4	13.5	24.5	15.3
WP1-AV	R	115.4	20.9	15.5	13.8	25.4	15.0

WP1-AW	R	115.2	20.8	15.1	11.9	23.5	15.2
WP1-EK	R	113.2	21.0	14.8	12.2	22.3	15.0
WP11-BU	R	115.9	22.0	15.0	12.7	25.7	15.8
WP11-EC	R	126.3	21.5	16.7	12.2	24.1	15.3

Sheep Metatarsals

Context	R/L	GL	Bp	Dp	Sd	Bd	Dd
WP11-CV	R	132.8	19.1	18.6	10.9	22.7	15.3
"	R	135.6	18.5	18.9	12.1	21.9	15.6
"	L	134.7	18.8	18.1	11.8	-	-
"	L	132.4	19.0	18.8	10.8	22.9	15.9
WP1-AJ	L	164.1	23.2	23.2	14.1	27.8	16.8
"	R	132.3	19.7	19.4	12.8	23.4	15.6
WP1-BX	R	138.8	20.0	19.0	11.7	22.7	16.0
WP1-CA	R	121.6	17.9	17.8	10.4	20.9	14.5
WP1-CI	R	139.6	19.7	19.3	10.9	23.4	15.0
WP1-EM	L	127.2	18.4	18.4	11.2	22.2	15.3
WP1-AT	R	125.0	18.9	18.5	11.2	22.5	14.1

Horse Metatarsal

Context	R/L	Gl	Bp	Dp	Sd	Bd	Dd
WP11-DE	L	268.1	49.8	44.8	31.8	52.1	38.8

Goat Horn Core

Context	R/L	Sex	Bas cir.	Gr Cr.	Le Cr.	Length
WP1-OS	R	F	133.0	50.9	34.2	(240)

Dog Tibia

Context	R/L	Gl	Bp	Sd	Bd
WP111-BF	R	157.2	29.9	11.3	-
"	L	87.1	23.1	9.0	-
"	R	99.8	26.4	11.1	
WP111-AI	R	225.2	38.9	14.1	24.7

Dog Humerus

Context	R/L	Gll	Glm	Bp	Sd	Bd	Dd
WP111-BF	L	130.5	127.9	24.2	10.7	28.2	20.3
"	L	93.5	87.9	21.4	8.2	21.5	16.5

Dog Radius.

Context	R/L	Gl	Bp	Sd	Bd
WP111-BF	L	128.7	14.5	11.0	20.1

Cat Femur.

Context	R/L	Gll	Glm	Bp	Dc	Sd	Bd	Dd
WP1-EM	L	93.8	94.8	18.1	9.1	6.9	17.8	15.9
WP1-EK	R	91.4	93.0	17.3	8.6	6.1	16.7	16.2

Cat Tibia

Context	R/L	Gl	Bp	Sd	Bd
WP1-BI	R	94.2	18.2	6.9	14.1
WP1-EK	R	98.3	16.8	5.4	13.1
"	L	98.2	16.9	5.9	13.2
WP1-EM	L	100.7	14.8	6.1	14.3

Domestic fowl Humerus

Context	R/L	Gl	Bp	Sc	Bd
WP1-BI	L	79.8	21.3	7.6	17.2
WP1-BQ	R	71.5	20.2	7.5	15.1
WP11-CI	R	77.5	-	7.5	16.5
WP11-AK	L	69.9	18.6	6.6	15.0
WP1-AT	R	75.5	21.8	7.5	15.8

Domestic fowl Ulna.

Context	R/L	GL	Bp	Dp	Sc	Bd	Dd
WP1-BU	L	61.8	8.1	10.6	4.2	8.5	6.1
WP1-CM	R	67.5	8.8	12.9	4.1	10.0	7.1
WP11-AB	L	64.4	8.9	12.0	3.9	9.1	7.9
WP1-DZ	R	65.5	8.4	11.4	4.0	9.1	7.9
WP1-EK	R	74.7	9.7	13.7	4.7	10.3	7.8

WP111-BF	L	73.7	9.7	12.9	4.4	10.1	7.6

Domestic fowl Radius.

Context	R/L	Gl	Bp	Sc	Bd
WP1-CM	R	60.7	5.1	2.7	7.1

Domestic fowl Femur.

Context	R/L	Gll	Glm	Bp	Dc	Sc	Bd	Dd
WP1-BA	R	68.4	64.1	13.7	5.8	5.6	13.0	11.1
WP1-BB	L	70.7	66.4	14.5	6.0	6.0	13.5	11.4
WP1-BJ	L	83.5	78.5	16.2	7.1	7.5	16.3	13.2
WP11-AK	R	70.8	66.9	13.9	6.3	6.3	13.6	11.2
WP1-AR	R	72.4	68.1	14.7	6.4	6.2	13.6	11.3
WP1-AP	R	74.5	69.3	15.7	6.3	6.6	14.3	11.7
WP1-EL	L	81.7	77.0	15.8	6.7	7.4	15.4	12.9
WP11-AP	R	-	70.6	-	6.2	6.3	14.8	11.9

Domestic fowl Tibia.

Context	R/L	Gl	Bp	Sc	Bd
WP1-BZ	L	101.9	17.0	5.8	10.0
WP1-EK	R	102.8	19.4	5.8	11.6
WP111-BF	L	119.1	22.2	6.7	11.1

Domestic fowl Tarsometatarsal.

Context	R/L	Gl	BP	Sc	Bd
WP1-CH	L	75.9	13.4	6.8	13.3

Goose Radius.

Context	R/L	Gl	Bp	Sc	Bd
WP11-AP	R	144.3	8.7	5.2	11.3
WP111-BF	L	139.6	8.6	6.2	10.9
"	L	152.2	8.7	6.9	10.7

Goose Ulna.

Context	R/L	Gl	Bp	Dp	Sc	Bd	Dd
WP1-AX	L	137.6	13.6	14.6	6.8	14.2	9.4
WP111-BF	L	148.5	15.3	13.7	8.1	16.0	11.7

"	L	149.5	15.1	13.6	7.2	16.0	10.8

Goose Carpometacarpals

Context	R/L	Gl	Bp	Dp	Sc	Bd	Dd
WP1-BI	R	85.0	20.9	19.3	7.3	10.0	7.1
WP1-BX	R	87.8	20.9	9.7	7.5	11.1	7.4
WP1-CB	L	85.4	21.5	8.8	6.8	10.0	7.5
WP11-AB	L	82.9	19.8	8.9	6.9	9.2	5.5
WP1-AW	R	89.6	20.2	7.4	7.4	10.0	7.3
WP11-AM	R	95.6	22,3	9.9	8.9	11.3	-
WP111-BF	L	93.3	22.1	10.2	7.8	11.7	8.1

Goose Femur.

Context	R/L	Gll	Glm	Bp	Dp	Sc	Bd	Dd
WP11-AJ	L	83.9	78.6	21.9	10.6	9.1	22.3	17.1
"	R	76.8	71.8	19.8	8.4	8.6	19.8	15.0

Goose Tarsometatarsal.

Context	R/L	Gl	BP	Sc	Bd
WP1-CQ	R	76.5	19.1	8.4	19.5
WP1-CZ	L	82.6	19.3	8.3	19.8

Mallard Humerus.

Context	R/L	Gl	Bp	Sc	Bd
WP1-BX	R	94.8	20.2	7.2	14.6

Mallard Radius.

Context	R/L	Gl	Bp	Sc	Bd
WP11-Cb	L	65.3	4.5	2.7	5.8
WP1-CB	L	72.9	6.2	3.1	7.2
WP1-CR	R	71.3	5.7	3.1	6.9
WP111-BF	L	74.3	5.2	2.9	7.1
"	L	72.5	5.0	2.8	7.1

Mallard Ulna

Context	R/L	Gl	Bp	Dp	Sc	Bd	Dd
WP1-AH	L	80.5	9.7	11.9	5.4	10.8	6.9

WP111-BF	L	78.1	10.2	11.3	5.5	11.0	6.9
"	L	79.3	10.5	-	5.6	10.2	7.9

Mallard Carpometacarpal

Context	R/L	Gl	Bp	Dp	Sc	Bd	Dd
WP1-BB	R	59.0	-	6.3	4.8	7.0	5.2
WP1-BO	L	53.6	-	-	4.3	6.9	4.9
WP11-AJ	R	62.6	14.6	7.1	5.2	7.9	5.3
WP111-BF	R	60.3	13.4	6.5	4.8	7.9	5.2
"	R	54.4	12.2	6.1	4.6	6.8	4.9
"	L	57.3	13.0	6.4	4.6	7.9	4.8

Raven Femur.

Context	R/L	Gll	Glm	Bp	Dc	Sc	Bd	Dd
WP111-AI	L	62.6	58.8	12.3	5.5	5.6	12.8	9.6