AML Report 3068

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Animal Bones from Wroxeter Military Site

100 Kgs of animal bones were presented for analysis, of which 66% by weight proved to be identifiable. This is a low proportion, and is accounted for by the fragmentary nature of the material; most of this fragmentation appeared to be deliberate chopping, carried out before the bone was deposited. The material was presented in a number of grouped layers, and a number of individual layers. These groups were preserved, as they appeared to comprise middens which differed slightly in species and anatomical composition and in the use to which the bone had been put. It was assumed that the contents of the individual layers were straightforward kitchen waste. All the middens except one contained very weathered bones, as if the material on the top had been exposed for some time.

The fragmentation of the groups was of two kinds; either very finely chopped to produce splinters for further working, or more coarsely chopped in the manner described by Mensch (1978) who suggested the bones had been used for soup making. Several of the groups contained numbers of bovine scapulae, some of which had been worked by squaring off the joint end and , in some cases, slicing off the spine. These bones would have been usable as shovels for material such as grain. A similar method of working has been described by Schmid (1976) for the site of Augusta Raurica, Switzerland. She suggests the larger chopped fragments, which she also found at this site, were for glue boiling.

The midden groups are described under the first layer number comprising them which came to hand. The bone working treatment will be called fine chopping, the "soup kitchen" method coarsechopping.

37/1 Exposed. Fine chopping. Many sheep and cattle metapodials
70/85 Exposed. Fine chopping. Many worked bovine scapulae.
88/13 Exposed. Fine chopping. Many bovine scapulae unworked.
92/65 Exposed. Coarse chopping.
84/66 Exposed. Coarse chopping. Worked bovine scapulae.
92/18 Not exposed. Fine and coarse chopping.

After identification, bird bone was presented to Mr. T. O'Connor for analysis; his report follows this one.

The species composition of the mammalian bone is set out in Table 1. It is expressed in two ways, by fragment count and by minimum number of individuals. Neither method is very satisfactory for such broken up material; either many of the bones have been reduced to several identifiable fragments, or individuals cannot be sorted out from the small fragments. The true species composition is probably somewhere between the two percentages. Also bones from the less common species may have been missed and allotted to the more common species. Thus red deer and horse may have been designated cattle, and roe deer and goat designated sheep. Hence the minimum number of individuals is more reliable for these animals.

From the point of view of meat consumed, there is no doubt that the major constituent was beef. The fragment count varies between 21% (70/85) to 75% (88/13), but the average is 47%. Estimation by minimum numbers of individuals nearly always gave a lower percentage, but since cattle are so much larger than the other two common species, beef was the main meat. Sheep and pig bones were found in more or less equal quantities , and they comprised about one-third of the individuals. The proportion of one goat to four sheep individuals seems high, but the Welsh marches are well suited to goat husbandry, which certainly flourished in the latter middle ages. There was one red deer to every eight cattle, and one roe deer to every twelve sheep, so hunting seems to have contributed a fair amount to the diet. Several of the pig individuals were wild.

There was one small collection of bones, however, which seems to have not been concerned with either food or bone working, 14/48. This comprised a large adult and an immature bovine skull, three pairs of mature bovine mandibles, three bones from a young calf, bones from an adult bovine foot, and another bone from a massive bull; one of the horn cores of this animal was also present. There were four sheep bone fragments from two individuals. Two pig bones came from a wild animal and a domestic sow. There was a very large fowl bone and two rabbit bones. Also present were several fragments from a male human skull. These bones were in various states of preservation, but the human and the bull fragments seemed similar in this respect. Several more bones were found elsewhere which might

well have come from the bull, and some sort of disturbed ritual deposit is suggested. Despite its size, this was a domestic bull. The large skull had been cut off by a blow from below.

A further attempt was made to sort out the nature of the bone midden assemblages by carrying out an anatomical analysis into the major divisions of the body amongst the cattle bones. This is set out in Table 2. Two main factors affect the results here, and they cannot be fully separated. One is the differential durability of different bones in the soil, and the other is the deposition of different bones in different areas. The cancellous bones are less durable than the compact, and the teeth more durable than either. Thus vertebrae are usually under-represented, and the hind limb, with less durable ends on more of its long bones, tends to be less well represented than the forelimb. In this particular instance the scapula shovels also made a difference. On the other hand, head and feet bones tend to be concentrated at the point of slaughter unless the metapodials are removed for working and the phalanges with the hide. Carpals and tarsals are grouped separately because they tend to accumulate at the butchery point, the tarsal bone in particular often being used to suspend the carcass, though this may not have been the case here. Such suspension is often used to split the c...ss, and very few of the vertebrae were so split. Rixson (1974) has demonstrated that Roman butchery was often carried out with the carcass lying on its back. Numbers of loose teeth indicate the amount of wear and tear the bone assemblage has suffered in the ground. The joint of the trunk and upper fore- and hind-limb are the choicest from the point of view of meat. With this in mind the following suggestions are made about the midden groups. 37/1 is mainly kitchen waste apart from the worked material, and is the best preserved group. 70/85 is the least well preserved and has a high proportion of slaughter waste. The small layers seem to have had long bones removed from them to working areas.

Besides being a method of counting species, the minimum number of individuals can also be used to assess the rough ages of the animals concerned, though many of the individuals cannot be aged, and there is probably a bias in favour of the younger individuals. Chronological ages are not employed. The ages are arrived at from a mixture of dental evidence and epiphyseal closure of the bones. The latter is a function of the maturity of the animal and is certainly much earlier in modern animals, from which the only data is available, than

than in early stock. The age groups used are: new born, juvenile or partly grown, immature almost fully grown, and mature. The method is further discussed in a paper by the author in press. The groupings are remarkably constant for all three of the major species, and are set out in Table 3. Because this is a military encampment, it seems likely that animals were bought in, and the age range may represent consumer choice whereas in a production site many of the bones may be from casualty animals. The soldiers may have purchased potential casualties, however. The mature cattle may have included their own working oxen. Though most of our meat animals today are killed in the juvenile stage, the best carcasses of the slowly maturing animals of the past would derive from immature animals. The number of mature sheep suggests that the local animals were wool producers, as the horn cores suggested a majority of wethers. The number of mature pigs is higher than usual. It suggests the local pigs were kept extensively at pannage.

Besides specific and anatomical identification and age determination, other data concerning the size, sex and type of the individual can sometimes be obtained. The bones were measured following the method advocated by Von den Driesch (1976) with a few modifications. Measurements of whole and ends of mature bones give size. Various proportions may give type. Sex is most easily deduced from the horn cores when present, or the canine teeth in the case of horses and pigs. Type is suggested again by the horn core, and sometimes by bone proportions. Despite the chopping of much of the bone, there was plenty to measure in the case of cattle and sheep, but suitable pieces were much rarer for the pig, and very few for the other animals. There was only one measurable dog bone, and that was pathological.

Bone measurements for cattle are set out in Table 4. The complete metapodials suggest a rather larger animal than was, in fact, the case because many smaller bones had been chopped, as can be seen from the range of proximal widths, which includes the whole bones. In general these animals are typical of the small size

iron age beast, which is no doubt what they were, so early in the Roman occupation. The exception is the massive bull found in the 14/48 context with possibly other bones elsewhere. This has an estimated body weight about half as much again as the others. Even in primitive stock this is a large sexual difference, and this animal may have differed genetically from the rest although its horn core was not very different in shape. Even so this animal was considerably smaller than the modern animal and indeed than typical IVth century Roman stock from good agricultural areas.

The cattle were, in general, short horned, the length along the greater curvature being less than the basal circumference. The greatest and least basal diameters indicate an oval horn, but not so sharply eliptical as the Celtic shorthorn of southern Britain. The shape is very similar for all the horns, and a scatter plot gives almost a straight line. The frontal bone was high in the centre. A female frontal and horn core is shown in Plate 1, and a selection of male horn cores, including the bull discussed above is shown in Plat 2. The other horns in this plate are probably from castrate males.

The sheep also had small and slender bones, which is again typical of the iron age animal. They were probably horned in both sexes. Only one horn core was found, but there were a number of frontals with broken or chopped horn cores and no polled specimens, however these are more fragile and may not have survived. One feature, however, has not been recorded in such early stock, and this is the projecting orbit of some of the animals (Plate 3). This is more typical of the medieval animal (Armitage, 1978). However, the sheep were probably of the primitive short tailed kind, although two types may have been present. The shape of the neck of the scapula is a measure of the primitive nature of the sheep, a short thick neck developing with the modern mutton type. The scapulae here are of two shapes, both longer than wide but some longer than others. The broken horns on the frontal bones seemed to be in two positions, and some had more projecting orbits than others. All these skull fragments seemed to come from females or castrate males.

The goats were identified mainly by their metapodials, as is frequently the case with this species. Here, however, these bones were exceptionally short and thick, even in the newborn animal. A selection of them is shown in Plate 4 compared with a sheep. This stocky metapodial is typical of many of the flocks of feral goats of Scotland, animals which are supposed to be medieval escapes. These particularly robust bones probably came from male animals, which is of interest in the light of the massive numbers of male goat bones discovered at the West Hill temple, Uley (Levitan, 1978).

As previously stated, not many pig bone measurements were possible, but those obtained are set out in Table 6. As an indicator of size, the most reliable dimension is the length of the lower third molar. This indicates a small animal, again typical of the iron age. The larger teeth are most likely to come from the wild animal. A massive wild boar canine measured 180 mm along its outer curvature. The metapodials of the domestic pigs were fairly slender, which indicates they were kept extensively and not in sties, unlike later Roman pigs.

The measurements of the bones of the other species are grouped in Table 7, and are few in number. There were three partial or complete horse metapodials, which are fairly similar in size, which is that of a large pony. Red deer present a problem, because there is such a large difference between the sexes. The few bones here come from an animal rather larger than the present Scottish one, but they are not as large as some Roman specimens. The reduction in size of British deer seems to have taken place during the Saxon period, with the exception of some of the remoter parts of Wales. The solitary dog bone which could be measured was a metatarsal bearing a healed fracture. However the bone did not seem to have been greatly shortened by this, and came from an animal about spaniel size.

Besides this dog bone, there were a number of other pathological and abnormal specimens, none of them out of the ordinary. The majority of diseases do not show up macroscopically in the bone, and most abnormalities are due to trauma and malnutrition, or are sometimes congenital. Amongst the cattle, 3 out of 25 lower third molars

lacked the fifth posterior cusp; the mandibles containing 2 of these also lacked the second permanent premolar. This is a common abnormality occurring in a normal proportion. Two of the metapodials were asymetrical and one of these had a lipped distal joint surface on the outside. This is thought to be due to the continued trauma of heavy traction. A mandibular condyle showed signs of arthritis, as did a sacroiliac joint. This last may have been the result of an injury partially dislocating this normally fixed joint. Amongst the sheep there were 2 defective mandibles. One exhibits mild peridontal disease, which is probably the result offaulty conformation and the other, an immature specimen, had a very uneven bite suggesting that one of the upper opposing molar teeth had been displaced. A metacarpal bone had the posterior tendon sheaths ossified, but this may be the result of old age. There was a first phalanx with posterior exostoses at the tendon insertion, which may have been from the same animal as the metacarpal; the exostoses on both bones would then probably have been the result of damaging the tendons. Finally, amongst the sheep there was a fractured and healed femur, with a certain amount of shortening, but very little distortion. Pig pathology was represented by a single abnormal bone, a metacarpal with proximal arthritis. Amongst the deer bones there was a small antler which appears to have been used as a pick. It has two small anterior projecting tines, which has been noticed in other Wroxeter antlers of a later date. A modern Hebridean animal has a single tine. This specimen is illustrated in Plate 5.

In summary, the animal bones from the Wroxeter military settlement consisted principally of cattle, though sheep and pig were well represented. There were also a fair number of wild animals. Horse bone and dog were very scanty. Most of the large long bones had been chopped either for culinary or industrial purposes, and many bovine scapulae may have been used as shovels. The animals were nearly all small and were probably local iron age types, though two varieties of sheep seem to have been present. There are a few hints that some of the animals were not slaughtered directly for food. There is no evidence of any unusual pathological conditions.

Table 1

Proportions of Species

Group	Cattle	Sheep	Pig	Goat	Red Deer	Roe Deer	Horse	Dog	Hare	Total
37/1 a	205 (37)	154 (28)	169 (30)	7 (1)	16 (2)	-	2 (<1)	2 (<1)	-	555
b	16 (39)	7 (17)	9 (22)	4 (10)	2 (5)	-	2 (5)	1 (1)	-	41
70/85a	82 (21)	154 (32)	129 (32)	5 (1)	7 (2)	8 (2)	5 (2)	4 (1)	3 (<1)	397
b	4 (12)	7 (29)	(29)	3 (9)	1 (3)	1 (3)	2 (6)	2 (6)	1 (2)	3
84/66a	694 (51)	387 (29)	222 (16)	8 (1)	21 (2)	8 (1)	9 (1)	3 (<1)	-	1352
b	19 (32)	15 (26)	9 (15)	4 (7)	5 (9)	1 (2)	3 (5)	2 (3)	-	58
88/13a	311 (75)	38 (9)	48 (12)	5 (1)	9 (2)	1 (<1)	1 (<1)	1 (<1)	-	414
b	13 (35)	7 (21)	7 (21)	3 (9)	2 (6)	1 (3)	1 (3)	1 (3)	-	38
92/18a	149 (44)	105 (31)	71 (21)	6 (1)	7 (2)	2 (1)	-	1 (<1)	-	341
b	6 (20)	11 (37)	5 (17)	3 (10)	3 (10)	1 (3)	-	1 (3)	-	30
All other layers a	398 (48)	155 (19)	251 (31)	4 (<1)	2 (<1)	4 (1)	2 (<1)	-	-	816
b	54 (38)	35 (25)	43 (30)	4 (3)	2 (1)	2 (1)	2 (1)	-	-	142
Total a	1839 (47)	993 (26)	890 (23)	35 (1)	62 (2)	23 (1)	19 (<1)	11 (<1)	3 (<1)	3857
b	111 (33)	85 (25)	83 (24)	21 (6)	15 (4)	6 (2)	10 (3)	7 (2)	1 (<1)	339

a Fragment count
b Minimum number individuals

Figure in brackets is % in both cases

Table 2

Anatomical Analysis Cattle Bones %

Group	Mandible	Vertebrae	Upper fore limb	Upper hind limb	Carpals and tarsals	Metapodials	Phalanges	Loose teeth
37/1	6	28	22	9	5	5	10	5
70/85	10	9	2	5	5	12	12	29
84/66	5	14	22	16	8	7	13	7
88/13	10	15	17	11	8	7	9	17
92/18	7	13	26	19	7	3	10	7
Other layers	7	21	11	13	8	10	12	12
Average	7	17	18	13	7	8	12	10

Table 3

Age Range Major Species

	Cattle		Sheep		Pig	
New Born	11	13%	9	16%	9	12%
Juvenile	7	9%	7	12%	8	11%
Immature	24	30%	20	36%	28	38%
Mature	37	48%	20	36%	29	39%
Total	79		56		74	

Table 4

Cattle Bone Measurements

All dimensions in mm

a. Whole bones

Bone	Length	Proximal width	Distal width	Mid shaft width
Radius	251	62	47	36
	252	-	-	-
	258	-	-	-
	263	-	-	-
Tibia	300	-	50	-
Metacarpal	156	41	-	24
	160	45	43	24
	163	48	47	27
	165	-	-	-
	167	48	41	26
	167	48	48	27
	170	47	45	26
	170	47	45	27
	170	47	44	28
	172	45	45	27
	174	48	47	26
	175	49	46	26
	175	-	48	27
	177	46	43	24
	177	52	49	28
	179	55	50	30
	180	52	49	31
	180	58	54	32
	185	48	47	26
	190	47	44	29
	198	-	48	32
Metatarsal	193	38	43	24
	200	40	42	24
	202	39	43	23
	203	41	45	24
	205	41	43	23
	208	45	51	28
	212	41	40	22
	213	41	49	25
	217	41	44	24
	220	41	45	24
	222	46	54	27

Table 4 Continued

b. Ends of mature bone

The figure in brackets is the number of bones which were the same size as the preceding measurement.

Bone	Position of measurement	
Lower 3rd molar	Maximum length (anterior posterior)	32 (2) 33 (2) 34 (3) 35 (3) 36 (3) 37 (4) 38 39 (3)
Scapula	Least neck width (anterior posterior)	40 42 43 (2) 44 (7) 45 (2) 46 (6) 47 (5) 48 49 (4) 50 (3) 51 54
Humerous	Width across distal condyles	52 57 58 61 (2) 62 63 65 (2) 72
Radius	Proximal width Maximum	60 (2) 67 68 77 85
Metacarpal	Proximal width Maximum	38 (3), 39 40 41 42 (4) 43 45 (3) 46 (3) 47 (6) 48 (5) 49 52 (2) 55 58
	Distal width at epiphyseal line	40 41 42 (3) 44 45 (2) 46 (6) 47 48 (5) 49 (2) 50 52 54 60
Tibia	Distal width Maximum	45 47 52 (2) 53 (2)
Ashagalus	Maximum length	56 (3) 57 (2) 58 59 60 (4) 61 (2) 72
Metatarsal	Proximal width Maximum	38 (5) 39 40 (3) 41 (6) 42 (4) 43 45 (2) 46 (3) 47
	Distal width at epiphyseal line	39 40 41 42 (2) 43 (44) 43 44 (3) 44 45 (3) 46 (2) 48 (2) 49 51 54
1st Phalanx	Maximum length	48 (2) 49 (4) 50 (4) 51 (5) 52 (15) 53 (15) 54 (12) 55 (9) 56 (8) 57 (5) 58 (4) 59 60 (4) 61 (2) 62 63 64 65

Wroxeter Military Site

Table 4 (Continued)

Horn Cores	Basal Circumference	Length over Curvature	Least basal Diameter	Greatest basal Diameter
	100	100	23	35
	102	100	24	35
	102	97	24	34
	108	120	28	38
	110	80	27	33
	110	105	26	42
	112	120	27	38
	115	110	30	40
	120	110	26	43
	125	130	29	43
	130	122	31	48
	138	130	33	46
	140	140	32	51
	150	-	37	55
			23	35
			25	32
			26	36
			28	39
			30	46
			30	46
			30	44
			34	50

Estimated body weight (kg.)

Derived from measurement of ashagalus, Noddle (1973)

156 (2) 158 160 165 169 180 184 192 194 196 280

TABLE 5 DIMENSIONS OF SHEEP AND GOAT

BONE

All dimensions in mm. The bones of goats are indicated.

BONE	LENGTH	PROXIMAL WIDTH	DISTAL WIDTH	MID SHAFT WIDTH	
Metacarpal	100	23	27	16	goat
	101	19	20	10	
	107	19	2L	10	
	110	19	22	11	
	111	18	-	11	
	112	18	21	11	
	112	19	21	10	
	113	20	22	12	
	115	20	21	10	
	117	19	21	12	
	117	19	22	11	
Metatarsal	106	20	-	14	goat
	115	18	19	11	
	115	20	23	12	goat
	115	17	20	9	
	116	16	19	9	
	117	17	20	11	
	118	19	22	12	
	120	17	19	10	
	121	17	19	9	
	122	17	21	10	
	122	17	21	11	
	122	17	-	10	
	122	18	20	10	
	123	17	20	9	
	124	17	20	10	
	125	17	19	9	
	127	17	20	10	
	128	19	20	10	
	130	18	21	10	
	130	20	21	10	
	132	17	20	10	
	135	18	20	10	

TABLE 5, Cont.

6. Ends of bones, teeth. The figure in brackets is the number of bones which were the same size as the preceding measurement. Goat bones underlined.

BONE	MEASUREMENT	
Lower third Molar	Length (anterior posterior)	19 20 21(3) 22(6) 23(3) <u>24</u> <u>25</u>
Humerus	Width across distal condyles.	24(3) 25(2) 26(4) 27(3) 27(2) <u>30</u>
Radius	Proximal width maximum.	25 26 (7) 27 <u>29</u>
	Distal width maximum.	21 22(5) 23 (8) 24(6) 25(4) 26.
Metacarpal	Proximal width maximum.	18(2) 19(8) 20(6) 21 <u>23</u> <u>25</u>
	Distal width at epiphyseal line.	20 21(6) 22(3) <u>27</u>
Tibia	Distal width maximum	19 21(12) 22(16) 23(5) 24(2) <u>24</u> <u>26</u>
Astragalus	Maximum length	21 23(2) 24(8) 25(3)
Metatarsal	Proximal width maximum	16(2) 17(15) 18(4) 19(6) 20 <u>20 (2)</u>
	Distal width maximum	12(7) 20(9) 21(4) 22(2) 23 <u>23</u>
1st phalanx	Maximum length	30(2) 31(2) 32(6) 33(2) 34(4) 35(2)
Scapula	Ratio Length neck, (glenoid - base spine) 1 minimum neck width. 1	1.06 (7) 1.12 1.13 1.14 1.15.

Wroxeter Military Site

Table 5 Contd. 2

Horn core	Least basal Diameter	Greatest basal Diameter
	17	29
	17	29
	18	30
	19	27
	20	30
	22	27
	22	36
	24	31

Table 6

Pig Bone Measurements

All dimensions in mm. The figure in brackets indicates the number of bones with the same measurement as preceding figure.

Bone	Measurement	
Lower 3rd molar	Greatest length (Anterior posterior)	31 32 (4) 33 (4) 35 37
Scapula	Least width neck (Anterior posterior)	18 19 20 (4) 21 (6) 22 (6) 23 (5) 24 29
Humerus	Width across distal condyles	27 (2) 29 31 32 (4) 33 34 36
Radius	Proximal width maximum	24 25 (3) 26 27 (2) 28 (2)
Metacarpal	Maximum length	67 70 79
Tibia	Distal width max imum	26 27 30
Ashagalus	Maximum length	34 35 37 (3) 38 39 (2) 40 43
Metatarsus	Maximum length	76 82
1st Phalanx	Maximum length	32 33 35 36 (2) 39

Wroxeter Military Site

Table 7

Measurement of bones of animals occurring in small numbers.
All measurements in mm.

Animal	Bone	Measurement		
Horse	Humerus	Maximum length	260)	same bone
		Width distal condyles	65)	
	Metatarsal	Maximum length	297)	same bone
		Proximal width	47)	
	Metacarpal	Distal width maximum	51	
Red deer	Scapula	Minimum width neck	37	
	Metacarpal	Maximum length	260)	
		Proximal width	33)	same bone
		Distal width	34)	
		Metatarsal		
		Proximal width	38	
		Astragalus		
		Maximum length	53	54 56
		1st Phalanx		
		Maximum length	53	55
Dog	Metatarsal	Maximum length	66	

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Small mammal bones from Wroxeter.

An assemblage of very small bones from context 87 was sorted and identified. The species composition of the remains makes it very likely that these bones were deposited as a regurgitated pellet from a carnivorous bird. The bones are well preserved and show little sign of etching by stomach acids. This suggests the pellet to have been from an owl, not from a raptor. The following table summarises the composition of the pellet.

		n. frags	% frags	min. no. individuals
Common shrew	(*Sorex araneus*)	12	20.3	3
Short-tailed vole	(*Microtus agrestris*)	16	27.1	4
Wood mouse	(*Apodemus sp.*)	12	20.3	3
Black rat	(*Rattus rattus*)	13	22.0	2
Small bird	(c.f. *Passer* sp.)	1	1.7	1
Frog/Toad		5	8.5	
TOTAL		59		13

The fauna suggests the presence of pasture rather than woodland in the immediate environs of the site. The most notable feature is the presence of black rat. Although generally believed to have been a Mediaeval introduction into Britain (Corbet & Southern 1977, p.237), specimens of black rat from a well at Aldergate, York, dating from the 4th - 8th centuries A.D. have recently been described (Jackham 1979). These specimens from Wroxeter predate the Aldergate rat by at least 300 years, and would appear to confirm that black rat was introduced into Britain by the Romans.

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Droxeter. The bird bones.

A total of 158 fragments of bird bone were submitted for identification from the military levels at Droxeter. The following table lists the relative frequency of species.

		n. frags	% frags	min. no. individuals
Domestic fowl	(Gallus dom.)	104	65.8	9
Goose	(Anser sp.)	2	1.3	1
Duck	(Anas sp.)	5	3.2	1
Small duck	(c.f. Aythya sp.)	3	1.9	1
Swan	(Cygnus sp.)	1	0.6	1
Woodcock	(Scolopax rusticola)	11	7.0	2
Raven	(Corvus corax)	4	2.5	1
Carrion crow	(Corvus corone)	3	1.9	1
Jackdaw	(Corvus monedula)	1	0.6	1
		7	4.4	4
Indeterminate		17	10.8	
TOTAL		158		22

Domestic fowl dominates the avifauna, as would be expected on an urban site. The fowl were rather small by modern standards. Measurements of the proximal articular surface of the tarsometatarsus (the most commonly available measurement) gave a mean of 12,92 mm. (s.d.=1.22, n = 11). Of the tarsometatarsi, four bore the spurs characteristic of cockerels, and seven were definitely unspurred. No cases were found with the malformed spurs indicative of capons. This distribution of sexes suggests that a supply of eggs was considered to be atleast as important as the availability of cocks for fighting. Almost all the fowl bones were mature.

Two different types of duck were identified. The majority of duck bones were of domesticated duck/mallard (Anas sp). Three specimens, however, were of the smaller Aythyinae (e.g. tufted duck, pochard) although it was not possible to say which of these species were represented. The paucity of goose and swan bones is striking. Maltby (1979, p.71) observed that at Exeter the domestic goose only became a regular and consistent part of the ~~east~~ fauna in Mediaeval times. Woodcock are the second commonest species, indicating that hunting of birds was carried on.

The three corvids may be seen as opportunist scavengers, probably living just outside the settlement and moving in by day to feed. That raven is the most frequent of the three contrasts with modern corvid popul-

ations and points out the previously greater abundance of this splendid bird.

A further group of bones are with Dr Bramwell.