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Level III report
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THE MAMMALIAN REMAINS FROM THE ROMAN, MEDIEVAL AND EARLY MODERN LEVELS, ST. MAGNUS, CITY OF LONDON

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INTRODUCTION

A total of 6,382 bone elements were recovered from the Roman, medieval and early modern levels; of these, 5,191 (81%) are identified to species and part of skeleton, and 1,191 (19%) remain as unidentified bone fragments. Of the total 5,191 identified bone elements, only 33 (< 1%) are from wild species, compared with 5,158 (> 99%) from domestic animals. The weight of all the bone is 47,005 g, of which 45,068 g (96%) is the weight of the identified material, and 1,937 g (4%) the unidentified.

The complete collection of mammalian bone is held in store at the Department of Urban Archaeology, Museum of London, where it may be examined on request. Under the British Museum (Natural History) computer-based catalogue scheme the specimens have been assigned the following registration numbers:-

Roman	DUA	1977	R5356	to	DUA	1977	R5477
medieval	DUA	1978	R5000	to	DUA	1978	R5208
early modern	DUA	1978	R5209	to	DUA	1978	R5211

EXCAVATION AND ANALYSIS OF THE SKELETAL REMAINS

Excavation was mainly carried out by pickaxe, spade and trowel, all bone uncovered during this operation being collected for subsequent analysis. As part of the general sampling strategy for the collection of seeds and charcoal fragments, material was taken from several selected levels and treated by flotation. The residue collected in the 1 mm mesh sieve during this procedure included seven bone elements of a foetal dog or cat (Context 37; ER ; Saxo-Norman, c.1050-1100 AD) and three bones from a possible water vole (Context 301; ER ; Roman, late 2nd-4th century AD). The only other small mammal bone from the site, the tibia of a rat, was recovered during careful troweling (Context 195; ER ; late Saxon, late 9th century AD).

Objects manufactured from animal bone were found on the site (see report on small finds), but in nearly every case the actual bone used can not be identified, and all such finished artefacts have therefore been omitted from the analysis. Two pieces of

identified bone (Context 289;ER ; Roman,late 2nd-4th century AD & Context 195; ER ; late Saxon, late 9th century AD) that represent waste from bone working industries have, however, been included.

With the exception of the bone from Contexts 222, 150, 195 (ER ; late Saxon, late 9th/10th century AD) which may include some residual Roman material, all the skeletal remains taken for analysis were from securely dated levels; those from deposits of mixed Roman and Saxon origin being excluded.

Preservation of the skeletal material is good, and many of the bones are sufficiently intact to allow measurement. Measurements (in mm) were taken from the specimens using dial calipers (Mitutoyo No.505-635, range 300 mm, with dial graduations of 0.05 mm), the points of measurement following those described by von den Driesch (1976). For linear measurements over 300 mm, a Flower's craniometer was used, and for the horn cores of cattle, sheep and goats, a flexible tape measure was employed. All measurements for long bones were maximum dimensions taken from elements with fused epiphyses.

[Copies of the complete series of tables giving summaries of the measurements for each of the species identified are available on request from the British Museum (Natural History) and the D.U.A.]

All the bone recovered from the site was weighed using a Mikro-Döft balance (range 6 kg).

All the bones from the waterlogged Roman levels are stained dark brown, those from the late Saxon, medieval and early modern levels are either stained dark brown or a pale yellowish brown colour. There are only two bones that show signs of having been charred/burnt; a tibia of pig from Context 150 (ER ; late Saxon, 10th century AD) and a metatarsal bone of sheep/goat from Context 95 (ER ; medieval, early 12th century AD). The entire length of the shaft of a complete, adult ox metatarsal bone from Context 146 (ER ; medieval, early 13th century AD) is highly polished on all four surfaces (anterior, posterior, medial & lateral). There is no other noticeable alteration made to the bone, and the significance of the smoothed shaft remains unclear.

For the purposes of the analysis, the bone material was divided into the following six groups based on stratigraphic sequence:-

(I) Roman
- I.1 Period 1 phases 1 & 5 amalgamated — 1st to 2nd century AD
- I.2 Period 1 phase 6 — late 2nd to 4th century AD

(II) Late Saxon
- Period 2 phases 2 & 3 amalgamated — late 9th/10th century AD

(III) Saxo-Norman
- Period 3 phase 2 — c.1050-1100 AD

(IV) Medieval
- Period 3 phases 3,4,5 & 6 amalgamated — early 12th to early 13th century AD (not later than c.1250 AD)

(V) Later medieval
- Period 4 phases 1,2 & 3 amalgamated — late 13th to mid 14th century AD (not earlier than c.1275 AD to not later than c.1350 AD)

(VI) Early modern
- Period 4 phase 5 — late 16th/17th century AD

THE SPECIES IDENTIFIED

The domestic and wild species identified are shown in Fig.1.

Fig. 1 : St.Magnus. Mammalian bone, domestic and wild species identified

	DOMESTIC						WILD					
	horse	ox	sheep/goat	pig	dog	cat	Red deer	Fallow deer	Roe deer	hare	rat	Water vole ?
ROMAN 1st-4th cent.AD	+	+	+	+	+	+	+		+	+		+
LATE SAXON 9th/10th cent.AD		+	+	+	+		+			+	+	
SAXO-NORMAN late 10th-11th cent.AD	+	+	+	+	+		+		+			
MEDIEVAL early 12th-13th cent.AD	+	+	+	+	+	+		+	+	+		
LATER MEDIEVAL 13th - mid 14th cent. AD		+	+	+		+						
EARLY MODERN late 16th/17th cent.		+	+	+								

KEY: + species present

The mammalian bone from the combined Roman, medieval and early modern levels is described in systematic order under species:-

Domestic horse and pony

The skeletal remains of horse were recovered from the Roman, Saxo-Norman and medieval levels, but were absent from the late Saxon, later medieval and early modern levels (Fig. 1). The equid bone from the Roman levels includes a right mandibular ramus with deciduous premolars 2, 3 & 4 erupted and in wear (Context 286; ER ; Roman, early 2nd century AD). By comparison with the collection of mandibles of known age at the BM(NH), the age of the animal at death is assessed at less than one year, probably under eight months. The presence of the remains of the foal points to the possibility that in the early 2nd century AD horse breeding was being practised if not within the City then at least close by.

For each of the two complete limb bones from adult animals, the height at the withers is calculated after the method of Kiesewalter (1888):-

Context	ER No.	Date	Bone	Estimated height at the withers (cm)
357		early 2nd cent.AD	tibia	119.5 (< 12 hands, pony size)
37		c.1050-1100 AD	metacarpus III	142.2 (approx. 14 hands)

(1 hand = 101.6 mm)

Domestic ox

For all the levels except those of the early 12th century AD (Contexts 55,95,101 amalgamated; ER) the skeletal remains of ox predominate over those of the other species. Only in the early 12th century material is the number of identified ox bones exceeded by those of sheep/goat (Fig.).

horn cores

The horn cores of ox recovered from the Roman, medieval and early modern levels can be classified (after the system of Armitage & Clutton-Brock,1976) as follows:-

Fig. 2: St. Magnus. Domestic ox. Horn cores.

AGE AT SLAUGHTER:

Age class	Description	No. specimens[a] Roman	Late Saxon	Saxo-Norman & medieval	Later medieval	Early modern
I. Juvenile (1-2 years)	spongy bone, very light in weight	-	-	4	-	-
II. Sub-adult (2-4 years)	porous bone especially round the base	3	-	11	1	-
III. Adult (over 4 years)	hard, compact bone	8	3	17	6	1

KEY: a. Complete and incomplete cores

SIZE:

Length class	Length of outer curve (mm)	No. specimens[a] Roman	Late Saxon	Saxo-Norman & medieval	Later medieval	Early modern
small horned	under 96	1	-	-	-	-
short horned	96 - 150	4	1	8	2	-
medium horned	150 - 200	2	-	2	-	-
long horned	over 200	-	-	-	1*	-

KEY: a. Complete cores only
* Plus one broken specimen

The important point shown by Fig. 2 is that the remains of long horned cattle were recovered only from the later medieval levels. This observation lends support to the picture already obtained from other medieval sites in Britain that large sized, long horned cattle first make their appearance in South Eastern England in the 14th century AD (Armitage, 1978, in press). These long horned cattle do not represent, as was previously believed (see Hughes, 1896), the offspring of imported stock from Holstein and the Low Countries, but instead probably arose from the local cattle population as a result of improved livestock husbandry and possibly selective breeding.

Height at the withers

From the length of the complete metacarpal bone from Context 222 (ER ; late Saxon, late 9th century AD) the height at the withers is estimated (after the method of Fock,1966; length X 6.13) at 110.8 cm.

From the length of each of the complete metacarpal bones from the Saxo-Norman and medieval levels (Period 3 phases 2 to 6), the height at the withers is estimated (after the method of Fock,1966; length X 6.13) as follows:-

No.specimens	Range	Mean value
18	99.1 - 121.0	110.2

(values given in cm)

From the complete radius (Context 37;ER ; Saxo-Norman, c.1050-1100 AD) and complete tibia (Context 103;ER ; Saxo-Norman, c.1050-1100 AD) the height at the withers is calculated after the method of Matolcsi (1970), as described by von den Driesch & Boessneck (1974, Table 5,p.336):

radius maximum length X 4.30
tibia maximum length X 3.45

Context	ER No.	Bone	Estimated height at the withers (cm)
37		radius	107.7
103		tibia	102.5

Domestic sheep and goat

Apart from the two partially intact crania and the eight separate horn cores listed below (Fig. 3) identified as certainly goat, together with one radius (Context 37; ER ; Saxo-Norman, c.1050-1100 AD) and one metacarpal bone (Context 357; ER ; Roman, early 2nd century AD) also possibly from goat, all the caprine bone is ascribed to sheep. It is, however, difficult to distinguish clearly between the jaws of sheep and goat, particularly if they are broken, for this reason the collection of mandibles (Fig. 6) although classified as sheep may possibly include one or more specimens of goat.

Fig. 3: St. Magnus. Goat. Horn cores

Context	ER No.	Date	No.specimens	Description
150		10th cent.AD	2	male or castrate, joined pair of horn cores attached to frontal bone
			1	castrate ?
195		10th cent.AD	1	female, with part of frontal bone still attached (hacked-off the skull)
37		c.1050-1100 AD	1	female ?
103		c.1050-1100 AD	2	female ? , joined pair of horn cores on skull
			1	male ?
			1	sex ?
			1	fragment only
192		early 12th cent.AD	1	female, chopped through at base of the core
91		c.1300-1350 AD	1	male, attached to small portion of the frontal bone (chopped-off the skull)

horned and polled (hornless) sheep

With the exception of the one four-horned animal from Context 222 (ER ; late Saxon, 10th century AD) and the one polled (hornless) individual from Context 286 (ER ; Roman, early 2nd century AD), all the sheep from the Roman and medieval levels are two-horned, with the horn cores resembling closely those seen in the modern Soay. The skull of the polled sheep from the Roman level is cleaved in half, and the surviving fragment (left side) has a very small, roughened protruberance in place of the horn core.

four-horned sheep

Context 222 (ER) a late 9th/early 10th century AD accumulation of refuse buried in river silt, contained a partially intact cranium of a four-horned sheep. The surviving portion with the four horn cores attached has been sliced-off the complete skull probably with a cleaver (Fig. 4). Measurements taken from this specimen are given in Table 22 at the end of this report.

The remains of four-horned sheep are known from other late Saxon sites in Britain, for example at St. Peter's, Northampton (Harman,1977, pers.comm.). The specimen from

St. Magnus is, however, as far as I am aware, the first such find in the City of London. Further examples of these sheep in Britain have been recovered from the medieval levels, North Elmham and the City of Hereford (Noddle, 1975), as well as from the Roman fort at Vindolanda (Hodgson,1977). In Europe, four-horned sheep have been recorded from 11th century AD Lund, Sweden (Bergquist & Lepiksaar,1957), also from a Terp (dwelling mound) in the Province of Friesland, Netherlands, dated between 600 BC and 1000 AD, and from the 14th century AD castle of Kuinre, Province of Overijssel, Netherlands (Clason, 1977a, 1977b & 1978, pers.comm.). Among modern sheep in Britain, the rams of the following breeds exhibit the four-horned condition: Jacob, Hebridean St.Kilda and Manx Loghtan.

Multihorned lambs, bearing seven horns ranged across the head, appear frequently as illustrations of the Apocalypse (Armitage & Goodall,1977), but these are highly stylised animals obviously drawn according to contemporary artistic and religious conventions rather than from nature. They can not, therefore, be accepted as portraying actual polycerate sheep. The one very fine depiction of a four-horned ram that is to be seen in the Luttrell Psalter (fo. 169), on the other hand, must have been drawn from life. This book is believed to have been written and illuminated in East Anglia in c.1340 AD, and many of the drawings that embellish the text are thought by art historians to be the work of laymen rather than monks (Millar,1932). This clearly explains why the subjects chosen for illustration are less of a religious nature and instead reflect more contemporary English life and customs. The drawing of the ram is very likely therefore to represent an early record of a local (East Anglian) four-horned sheep, drawn from a living animal and not copied from a foreign pattern book. The presence of the specimen from the St. Magnus site provides further evidence for the existence of a four-horned variety of sheep in South Eastern England in medieval times.

stature of the sheep

The method of Teichert (as described by von den Driesch & Boessneck,1974) is employed in order to estimate the height at the withers:-

Factors:	radius	length X 4.02
	metacarpus	length X 4.89
	metatarsus	length X 4.54

Fig. 5: St. Magnus. Sheep. Height at the withers

(1) ROMAN 1st - 2nd century AD

Bone	No.specimens	Height at the withers (cm) mean	range
metacarpal bone	4	61.0	57.4 - 64.2

(2) LATE SAXON 10th century AD

Bone	No.specimens	Height at the withers (cm)
metatarsal bone	1	56.8

(3) SAXO-NORMAN & MEDIEVAL 11th - 13th century AD

Bone	No.specimens	Height at the withers (cm) mean	range
radius	9	58.0	53.3 - 64.4
metacarpal bone	20	60.0	54.2 - 64.8
metatarsal bone	15	58.2	54.0 - 63.5

kill-off pattern for the sheep

The kill-off pattern (i.e. the relative number of animals killed at each age) for the sheep mandibles is presented below (Fig. 6), and is based on the method of Payne (1973).

Fig. 6: St. Magnus. Sheep mandibles. Kill-off pattern

		No.specimens				
		ROMAN	LATE SAXON	SAXO-NORMAN	MEDIEVAL	LATER MEDIEVAL
		1st-4th	9th-10th	late 10th - 11th	early 12th - 13th	13th - mid 14th cent.AD
Wear stage	Age range					
A	0-2 months	-	-	-	-	-
B	2-6 "	4	-	-	3	-
C	6-12 "	-	3	-	-	-
D	1-2 years	-	1	2	9	-
E	2-3 "	3	1	1	8	-
F	3-4 "	2	3	1	11	1
G	4-6 "	2	1	3	10	1
H	6-8 "	-	-	-	-	1
I	8-10 "	-	-	-	-	-

Note: There are no mandibles from the early modern level (Context 36;ER ; late 16th/17th century AD)

The size of each group of mandibles is too small to provide a basis for the reconstruction of the slaughtering policy of the different historic periods.

Domestic pig

All the bones of pig are identified as coming from the domestic animal, and there are, as far as I am able to ascertain, no elements that might be from the wild species.

It is of interest that the picture of the dominance of the skeletal remains of pig over those of sheep/goat observed here for the refuse from the Roman levels, St. Magnus (Fig.) is the same as that recorded previously for the Roman levels, Billingsgate Building site (Armitage,1978,in press). Furthermore, as already seen in the medieval material from the Billingsgate Buildings site, the number of identified sheep/goat bones in the medieval levels, St. Magnus exceeds that of pig (Fig.). The significance of these observations is considered below in the discussion.

Kill-off pattern

The relative numbers of animals killed at each age (i.e. the kill-off pattern) is established using information on eruption of the teeth in the mandibles; the age at which each tooth erupts being based on data for pigs of the late 18th century AD (Silver,1971, Table G, p.298-299):

Fig. 7: St. Magnus. Pig mandibles. Kill-off pattern

	Age at slaughter (years)			
	<1	1-2	2-3	3+
ROMAN				
1st-2nd cent.AD	2	3	8	7
late 2nd-4th cent.AD	-	-	-	-
LATE SAXON				
9th/10th cent.AD	-	-	4	5
SAXO-NORMAN				
late 10th-11th cent.AD	-	1	3	6
MEDIEVAL				
early 12th-13th cent.AD	-	3	5	1
LATER MEDIEVAL				
12th-mid 14th cent.AD	-	-	1	-
EARLY MODERN				
late 16th/17th cent.AD	-	-	-	-

From Fig. 7, it would appear that for all periods (Roman to later medieval) the preferred time for slaughter was when the pig was over two years of age. The size of each sample is, however, too small to provide a basis for reconstruction of the slaughtering policy of the different historic periods represented.

Apart from the two mandibles from the Roman levels, there is a noticeable absence of specimens from sucking pig. Evidence for the eating of sucking pig in medieval times is, however, provided by the presence of one radius and one humerus from Context 101 (ER ; medieval, early 12th century AD).

Domestic dog

Evidence for the disposal of the carcases of dogs among urban refuse is provided at St. Magnus by the following identified bone elements:-

Context	ER No.	Date	Description	
350		early 2nd cent.AD	1 tooth 1 ulna	
286		early 2nd cent.AD	1 ulna 1 innominate bone 2 tibia	
341		mid 2nd cent.AD	1 scapula 1 humerus 1 radius	
288		late 2nd-4th cent.AD	1 skull 2 scapula 1 humerus 1 ulna 1 femur 1 metapodial bone	all 7 elements are from one, adult dog
150		10th cent.AD	1 scapula 1 vertebra 1 sacrum	
195		10th cent.AD	1 ulna	
164		c.1050-1100 AD	1 metapodial bone	
101		early 12th cent.AD	1 metapodial bone	

Fig. 8: St. Magnus. Dog. Bone elements identified

From the complete limb bones, the following heights at the shoulder are calculated (after the method of Harcourt, 1974):-

Fig. 9: St. Magnus. Dog. Height at the shoulder

Context	ER No.	Date	Bone	Height at the shoulder (cm)	
350		early 2nd cent.AD	ulna	29.3	
286		early 2nd cent.AD	ulna	51.8	
			tibia	49.2	
341		mid 2nd cent.AD	humerus	55.7	
288		late 2nd-4th cent.AD	humerus	51.1	one animal
			ulna	50.0	
			femur	52.4	
				51.2 mean	
195		10th cent.AD	ulna	36.7	

Domestic cat

The domestic cat is represented by a complete humerus from Context 350 (ER ; Roman, early 2nd century AD) and a complete radius from Context 163 (ER ; later medieval, c.1275-1350 AD). Both of these bones have the proximal and distal epiphyses fused, and are therefore from adult animals. There is also a complete metatarsal bone from Context 101 (ER ; medieval, early 12th century AD).

Foetal dog (or cat ?)

The following seven bones were recovered by flotation from a sample of matrix taken from Context 37 (ER ; Saxo-Norman, c.1050-1100 AD):-

1 tibia
1 innominate bone
5 parts skeleton
} all bones are very little developed

These are identified as coming from a foetal dog or cat.

Red deer

The following three bone elements of Red deer Cervus elaphus are identified:-

Fig. 10: St. Magnus. Red deer. Bone elements identified

Context	ER No.	Date	Description
350		early 2nd cent.AD	1 radius, complete specimen except for the distal epiphysis which is unfused and detached (immature animal)
195		10th cent.AD	1 antler, right, incomplete (upper beam & terminal tines broken off), from a fully grown adult
104		c.1050-1100 AD	1 phalanx 1, complete bone

The antler from Context 195 is still attached to a portion of the frontal bone, showing that the Red deer stag had been hunted and killed between July and early Spring; the times between hardening of the newly grown antler and its shedding (see Lyneborg,1971,p.216). The presence of a square hole drilled through the surviving section of frontal bone, with the remnants of what appears to be an iron nail clinging to the inside surface, points to the possibility that this specimen was mounted as a trophy.

Fallow deer

Only one bone of Fallow deer Dama dama was found on the site, this is a radius from Context 146 (ER .; medieval, early 13th century AD).

Roe deer

Remains of Roe deer Capreolus capreolus were recovered from the Roman, Saxo-Norman and medieval levels (Fig. 1), and these are listed as follows:-

Fig. 11: St. Magnus. Roe deer. Bone elements identified

Context	ER No.	Date	Description
357		early 2nd cent.AD	1 femur, piece of shaft only 1 tibia, immature animal (proximal epiphysis unfused & detached) 1 metacarpal bone, proximal epiphysis and part of shaft
350		early 2nd cent.AD	1 femur, distal epiphysis and part of shaft
286		early 2nd cent.AD	1 madibular ramus, right, incomplete 1 scapula, broken 1 innominate bone, from female 1 tibia, distal epiphysis and part of shaft 2 metatarsal bone, proximal epiphysis and ¾ of shaft (distal epiphysis is broken off in both specimens)
341		mid 2nd cent.AD	1 antler, fragment only
37		c.1050-1100 AD	3 femur, distal epiphysis and part of shaft, one specimen chopped across distal end 1 metatarsal bone, distal epiphysis and part of shaft
192		early 12th cent.AD	1 humerus, complete except for part of the proximal epiphysis which has been partially destroyed by a dog gnawing and crunching the bone
101		early 12th cent.AD	1 antler, still attached to a piece of the frontal bone

Information on tooth eruption and degree of wear was used (after the method of Aitken, 1975) to establish the approximate age of the mandible from Context 286 (ER ; Roman, early 2nd century AD). The specimen is from an animal aged less than one year.

The antler from Context 101 (ER ; medieval, early 12th century AD) is still attached to a portion of the frontal bone, showing that the Roe buck had been hunted and killed between April and late October; the times between hardening of the newly grown antler and its shedding (see Prior, 1968, p.107).

The absence of skeletal remains of Roe deer in the post 12th century AD levels would seem to lend support to the belief held by historians and zoologists (see Fitter,1945,p.91) that this species of deer had by the late middle ages been hunted to extinction in the forests around London (see also Armitage, 1977,p.121).

Hare

Evidence that the hare Lepus sp. was hunted and its meat used to suppliment the diet is provided by the presence of the following skeletal elements:-

Fig. 12: St. Magnus. Hare. Bone elements identified

Context	ER No.	Date	Description
357		early 2nd cent.AD	1 scapula
286		early 2nd cent.AD	1 innominate bone 2 tibia: (1) proximal epiphysis & part shaft (2) distal epiphysis & part shaft
341		mid 2nd cent.AD	1 metapodial bone
195		10th cent.AD	1 femur, proximal epiphysis & part shaft
55		early 12th cent.AD	2 tibia, left & right possibly from same animal, distal epiphysis & part shaft

Rat

Context 195 (ER) an early 10th century AD accumulation of refuse buried in river silt, contained a tibia identified as that of an immature rat (proximal epiphysis unfused and detached). This specimen represents the earliest record that we have of rat in London.

The sealing of the refuse comprising Context 195, initially by river silt and then by further deposition of rubbish, makes it unlikely that the rat is intrusive. The animal could not have entered the late Saxon stratum by burrowing*, and the bone is therefore certainly contemporary with the rest of the associated faunal remains.

Although it is not possible to distinguish between the post cranial bones of the Black rat Rattus rattus and the Brown (or common) rat Rattus norvegicus, the early

date of the deposit in which the tibia was found makes it likely that the specimen is of Black rat. This is because there is conclusive historical evidence to show that the Brown rat was not introduced to this country until the early 18th century AD (Pennant, 1776, Vol.I,p.116; Barret-Hamilton & Hilton, 1910-21, Vol.2,p.609; Twigg, 1975,p.22); the only species to be found in Britain before this date being Rattus rattus.

The presence of a probable Black rat in 10th century AD London points to the possibility that this species was introduced to this country much earlier than was originally thought. Until recently, it has been a commonly held belief that Rattus rattus was first brought to Britain in the 12th century AD, supposedly in the ships of the crusaders returning from the Holy Land (Barret-Hamilton & Hilton,1910-21, Vol.2,p.582; Matheson,1939; Fitter,1959,p.107; Twigg, 1975,p.20). The finding of one bone on the St, Magnus site can not, however, be taken to imply the presence of a well established population of rats in the City in late Saxon times. This particular animal might just represent an isolated, chance introduction that had been unwittingly brought into the dock area of the City in the hold of a visiting ship.

Research into the history of the Black rat in the City of London from the middle ages to the present day is continuing.

* Footnote: It is worth pointing out that if, as is believed, the animal being described is the Black rat, the explanation that this individual is intrusive is even more unlikely, since the observed behaviour of modern Rattus rattus suggests that this species very rarely burrows(instead it prefers to live above ground).

? Water vole

The following parts of one skeleton were recovered from Context 301 (ER ; Roman, late 2nd-4th century AD):-

2 humerus
1 femur } epiphyses unfused & detached

As the bones are from an immature individual and are very little developed it has not proved possible to identify the species with any degree of certainty, but they may be from the Water vole Arvicola terrestris.

PATHOLOGY

A total of 19 elements (0.4 % of the total number of bones identified) show evidence of disease or deformity, these are described in systematic order under species:-

I. Domestic ox

I.1 Congenital anomaly

(a) Absence of second lower premolar

Among the five complete and partially complete mandibular rami from Context 101 (ER ; medieval, early 12th century AD) there is one specimen of an adult ox which has two premolar teeth instead of the usual three; the second permanent premolar is lacking. There is no evidence for this tooth ever having been present, and the condition can not, therefore, be attributed to premature shedding of the tooth. Mandibles of oxen with similar 'five tooth rows' from other archaeological sites have been described by Andrews & Noddle (1975), and these authors attribute the condition to a congenital anomaly.

(b) Absence of the third cusp on the lower third molar

The following mandibular rami have a lower third molar whose third cusp is lacking (i.e. has never developed):

Context	ER No.	Date	Number of specimens
357		early 2nd cent.AD	1
222		10th cent.AD	1
37		c.1050-1100 AD	2 (from same animal)
192		early 12th cent.AD	1

I.2 Traumatic injury

Two ribs from Context 101 (ER ; medieval, early 12th century AD) have been fractured. Radiographs taken of these bones show that in one specimen the healing processes were well advanced but not completed at time of death (there is a well developed callus and the fracture line has almost closed-up). In the second specimen, ~~however,~~ the two separated pieces of rib have failed to unite despite callus formation (i.e. there is non union of the fracture).

I.3 'Degenerative arthritis' (osteoarthrosis)

An innominate of a cow from Context 357 (ER ; Roman, early 2nd century AD) has part of the inside surface of the acetabulum smoothed and polished, showing

I.4 Reshaping of the bone as a result of repeated mechanical stress

One metatarsal bone from Context 146 (ER ; medieval, early 13th century AD) has a distended (extra wide) medial condyle, giving the distal end of the bone a splayed appearance. The absence of eburnation (polishing) and grooving of the articular surface rules out the possibility that this condition is the result of osteoarthrosis ('degenerative arthritis'). Instead, the splayed epiphysis may have developed in response to repeated mechanical stress; it being widely held (see Jewell,1963,p.89; Mennerich,1968,p.132; Harcourt, 1975,pers.comm.) that metapodial bones with abnormally broad distal ends (such as the specimen described here) are from plough oxen.

II. Domestic sheep

II.1 Absence of second permanent premolar

One jaw bone from an animal aged approximately 3 - 4 years (Context 192;ER ; medieval, early 12th century AD) has only five teeth; the second premolar is lacking. As with the ox mandible described above(I.1) there is no evidence of this tooth ever having been present.

II.2 Periodontal disease

Two mandibular rami (listed below) show evidence of periodontal disease i.e. recession (erosion) of the bone below the line of the cheek teeth on the medial and lateral surfaces.

Context	ER No.	Date	No.specimens	Age class (Payne,1973)
62		mid 13th cent.AD	1	G 4-6 years
99		c.1300-1350 AD	1	H 6-8 years

II.3 Exostoses

Osteophytic (bony) outgrowths are present on the following elements:-

Context	ER No.	Date	Bone	No.specimens	Description
85		c.1050-1100 AD	radius	3	bony lipping on lateral & medial rim of proximal articular surface
109		early 12th cent.AD	radius	1	bony outgrowth on lateral edge of proximal epiphysis

III. Pig

Infection introduced by traumatic injury

Metacarpal bones IV & V from one, adult pig (Context 192; ER ; medieval, early 12th century AD) show evidence of an infected lesion (abscess). Development of the condition would probably have been as follows* :

A traumatic injury to the foot such as that caused by penetration of a sharp object (e.g. iron nail, or possibly even the tusk of another pig) introduced an infection, which in turn resulted in osteomyelitis (localised inflammation) of the metacarpal bones. An abscess then formed in the junction between the bones, involving both of them in the production of new bone growth which forced the distal third of metacarpus V to bend outwards away from metacarpus IV (i.e. remodelling of the bone took place). The presence of the suppurating abscess on the foot would have resulted in lameness in the animal.

It is of interest, that in modern pigs lameness is only occasionally the result of traumatic injury, the condition being more usually associated with arthritis of an infectious nature (Roberts & Doyle, 1964,p.700). The very low incidence of evidence for ~~injury~~ wounds on foot bones of pigs from archaeological sites shows that the modern observation that lameness is only very rarely due to injury may also be true of pigs in the Roman, medieval and early modern periods.

* The reconstruction is based on a discussion held with Dr E. Appleby, Royal Veterinary College, London.

BONES GNAWED BY DOG

A total of 270 elements (5% of the total number of bones identified) have splintered ends and the surface pitted with perforation marks made by teeth, showing that the bones have been gnawed and crunched by dogs. These bones are listed as follows:-

Fig.13: St.Magnus. Number of bone elements gnawed by dog (excluding rib & vertebra)

	ROMAN 1st-4th	LATE SAXON 9th-10th	SAXO-NORMAN late 10th - 11th	MEDIEVAL early 12th - 13th	LATER MEDIEVAL 13th - mid 14th cent.AD
DOMESTIC SPECIES:					
ox	3	25	44	34	3
sheep/goat	4	9	25	57	-
pig	6	11	10	33	2
WILD SPECIES:					
Roe deer	1	-	-	2	-

Apart from one antler of Roe deer (Context 101;ER ; medieval, early 12th century AD) and one horn core of sheep (Context 55; ER ; medieval, early 12th century AD), all the bones shown in Fig.13 are from the fore and hind limbs.

One thoracic vertebra of an ox (Context 222; ER ; late Saxon, 9th/10th century AD) has also been gnawed by dog.

There are no bones recorded with evidence of gnawing by rodent.

BONE WORKING

A metatarsal bone of an adult ox from Context 289 (ER ; Roman, late 2nd to 4th century AD) has been sawn through at the proximal end and the shaft removed. The remaining piece, the proximal epiphysis attached to part of the shaft, represents the unwanted off-cut from a bone working industry. The long, straight shaft of the metatarsal bone with its thick sided walls make it the ideal raw material for fashioning into handles for large knives and cleavers, as well as in the production of buttons and gaming counters (see Armitage,1977,pp.143-147).

One other piece of bone, identified also as the waste from bone working, is a scapula of ox from Context 195 (ER ; late Saxon, 10th century AD). A square section has been cut-out (sawn ?) from the flat part of the blade.

HORN WORKING

Many of the horn cores of ox, sheep and goat have the marks made by a cleaver and/or saw on them, showing that they are the discarded waste from horn working. These specimens are listed as follows:-

Fig. 14: St.Magnus. Domestic ox. Horn cores.

Context No.	ER No.	Date	No.specimens	Implement used
357		early 2nd cent.AD	1 adult	cleaver
			1 sub-adult	cleaver & saw
350		" "	1 adult	cleaver
286		" "	2 adult	cleaver
			1 adult	saw
			1 sub-adult	cleaver
269		late 2nd-4th cent.AD	1 adult	cleaver
192		early 12th cent.AD	2 adult	cleaver
			1 sub-adult	cleaver & knife *
146		early 13th cent.AD	5 adult	cleaver
			1 adult	saw
			3 sub-adult	cleaver
			1 sub-adult	cleaver & saw *
			1 sub-adult	cleaver & knife *
			1 sub-adult	knife *
91		c.1300-1350 AD	2 adult	cleaver
			1 juvenile	cleaver

Fig. 14 (continued)

163	c.1275-1350 AD	1 adult	cleaver
		1 adult	saw
100	mid 14th cent.AD	1 adult	cleaver
		1 sub-adult	cleaver

KEY: * Evidence of skinning

Fig. 15: St.Magnus. Sheep. Horn cores

Context No.	ER No.	Date	No.specimens	Implement used
222		9th/10th cent.AD	1 (four horned)	cleaver
150		10th cent.AD	1	saw
195		10th cent.AD	1	cleaver
37		c.1050-1100 AD	2	cleaver
192		early 12th cent. AD	3	cleaver
101		early 12th cent. AD	1	cleaver
62		mid 13th cent.AD	1	cleaver
91		c.1300-1350 AD	1	cleaver

Fig. 16: St.Magnus. Goat. Horn cores

Context No.	ER No.	Date	No.specimens	Implement used
150		10th cent.AD	1	saw (?)
195		10th cent.AD	1	cleaver
192		early 12th cent.AD	1	cleaver
91		c.1300-1350 AD	1	cleaver

The evidence shows that the majority of the horn cores of sheep and goat were chopped half way through the base and then broken off the skull.

BUTCHERY

Many of the bones of domestic livestock (ox, sheep & pig) examined have marks made by a chopper or cleaver on them, showing evidence of butchery. Figs. 17 to 19 show in diagramatic form the positions on the skull and limb bones of the most frequently encountered cut marks. The diagrams show only those cuts associated with primary butchery (dressing down of the carcass) and secondary butchery (disjointing). The evidence for tertiary butchery (i.e. the splitting and cracking open of certain bone elements after the meat has been stripped from the bone, in order to extract the marrow) has been omitted. Had information on this group been included on the diagrams they would, in my opinion, have been overcrowded and difficult to interpret.

Various stages of butchery are recognised, these are described as follows:-

I. Primary butchery (dressing down the carcass)

I.1 Removal of the head

The following cervical vertebrae are chopped through, showing the position of the chop made when the head was severed from the rest of the body:-

Fig.20: St.Magnus. Domestic livestock. Vertebra.

Context No.	ER No.	Date	Species	Bone	Description
357		early 2nd cent.AD	ox	atlas	body chopped through at an oblique angle
150		10th cent.AD	ox	axis	chopped ~~through~~ obliquely downwards through anterior articular process
37		c.1050-1100 AD	ox	cervical	body chopped through
192		early 12th cent.AD	sheep	axis	anterior articular process chopped through
101		early 12th cent.AD	ox	atlas	chopped in half
146		early 13th cent.AD	ox	axis	chopped transversely across body
62		mid 13th cent.AD	sheep	axis	chopped through across the posterior end

I.2 Removal of horns from the skull

See section on horn working, above

II. Secondary butchery (disjointing)

II.1 Dividing the carcass into two halves

Only in a few of the vertebrae of domestic ox from the Saxo-Norman, medieval and later medieval levels is there evidence that the carcass had been split into two halves before disjointing. The carcass would have been suspended above the ground by its hind legs, this position enabling the butcher to first cut through the pubic symphysis and then continue downwards cleaving the vertebral column along the medial line.

None of the ox vertebrae from the Roman levels are split in half, instead they have their lateral edges sliced-off. This form of butchery is particularly noticeable in the thoracic vertebrae where the transverse process has been chopped off and the rib removed.

II.2 Cuts of meat

There are two sets of articulated bones representing the discarded remnants of joints of pig, these being:-

(1) Context 37 (ER ; Saxo-Norman, c.1050-1100 AD).
A right tibia, astragalus and calcaneum from the hind quarters of a pig aged approximately two years.

(2) Context 55 (ER ; medieval, early 12th century AD).
A right humerus, radius and ulna from the forequarters of a pig aged between one and three years. The humerus is chopped completely through the shaft a third of the distance from the distal end. A similar group of bone elements with the humerus chopped in the same way can be seen in a modern 'leg of pork' bought today from a butcher's shop.

III. Tertiary butchery — III.1 Cracking open of 'marrow bones'

The numbers of bone fragments of domestic ox representing the debris from the smashing of 'marrow bones' are given in Fig.21, below.

Fig.21: St.Magnus. Domestic ox. Butchery, debris from marrow extraction. Main dumps of refuse only

Date of Context	Total number of ox bones identified[1]	Number of fragments of ox long bone[2]	
ROMAN			
(a) 1st-2nd cent.AD	1008	91	(9%)
(b) late 2nd-4th cent.AD	136	11	(8%)
SAXO-NORMAN			
c.1050-1100 AD	513	25	(5%)
MEDIEVAL			
early 12th cent.AD	246	12	(5%)
LATER MEDIEVAL			
c.1300-1350 AD	44	0	(0%)

KEY: 1. Value given includes numbers of rib & vertebra

2. Debris from the smashing of 'marrow bones'. Shaft fragments mostly of humerus, femur and tibia, but with the occasional radius and metapodial bone. These broken fragments have either straight edged breaks or spiral fractures (see Bonnichsen, 1973).

Other evidence for the processing of bone for grease and marrow is provided by:-

(1) A group of 15 ox vertebrae (lumbar ?) from Context 357 (ER ; Roman, early 2nd century AD). These have been chopped into small segments in such a way that the cancellous (spongy) internal structure of the bone is exposed.

(2) From all levels, Roman to later medieval, there are numbers of incomplete innominate bones of ox, sheep and pig which are chopped through in at least two (sometimes three) places e.g. across the ilium just above the acetabulum and through the acetabular branch of the pubis. Similar specimens in which the ilium, ischium and pubis are chopped from the innominate, leaving the acetabular triangle intact are described from an Indian camp near Calling Lake, Alberta, Canada by Bonnichsen (1973,p.11).

III.2 Cutting flesh from the bone

The following elements have repeated, superficial marks on them made either by a chopper or large knife, showing evidence of the removal of the flesh from the bone:-

Fig.22: St.Magnus. Domestic livestock. Butchery, removal of flesh from the bone[1]

Context No.	ER No.	Date	Species	Bone	Location of chop/knife mark
288		late 2nd-4th cent.AD	ox	3 femur	on shaft
195		10th cent.AD	ox	1 humerus	anterior surface of shaft
150		10th cent.AD	ox	1 scapula	blade
103		c.1050-1100 AD	sheep	1 radius	anterior surface of shaft
37		c.1050-1100 AD	ox	1 tibia	anterior surface of shaft
37		" "	sheep	1 radius	anterior surface of shaft
37		" "	pig	1 radius	anterior surface of shaft
101		early 12th cent.AD	pig	1 jawbone	lateral surface of ascending ramus

KEY: 1. It is uncertain whether the removal of the meat from the bone occurred before or after cooking

Similar marks have been recorded on the shafts of ox bones from the Roman deposits at Portchester Castle,Hampshire (Grant,1975,p.392 & Plate XXXIXb).

DISCUSSION

The bulk of the collection of skeletal remains from each of the various levels (Roman to early modern), St.Magnus, represents the discarded debris from slaughteryard and household, and can therefore provide information on diet in the different historic periods. The only elements from the site identified as industrial waste are: the horn cores of ox, sheep and goat (listed in Figs. 14, 15 & 16, pp.22 & 23); a sawn metatarsal bone and scapula of ox (p.22). There are also groups of bone from pet dogs and cats (pp. 12 & 13), as well as isolated elements from wild rodents (rat and ? Water vole, pp. 16 & 17).

An assessment of the relative contribution made by each of the meat-yielding species to the diet in the Roman and medieval periods has been made using weight of bone, but excluding rib and vertebra (Fig. 23); where weight of bone is assumed to be directly proportional to meat yield (see Uerpmann,1973). Values for the number of identified elements (excluding rib and vertebra) are also given in Fig.23, but they provide a less accurate means of assessing the relative contribution made by each species to the diet. This is because the number recorded for a given species depends very much on the degree of fragmentation of the bones found on the site. A high value recorded for domestic ox, for instance, may not be indicative of the importance of this animal over the other classes of livestock but, instead, may simply reflect the fact that certain of the larger limb bones had been smashed into many fragments in order to extract the marrow. Because of the smaller quantities of marrow contained in the sheep and pig bones, these may not have received similar treatment and, in consequence, will be recovered as single, intact elements.

From the weights of bone given in Fig.23, it is clearly seen that the bulk of the meat in the Roman periods (Figs.23.1 (a) & (b)) came from cattle and pig, whilst in the medieval periods (Figs.23.2, 23.3 & 23.4) the meat is mostly from cattle and sheep. This predominance of the remains of pig over those of sheep in the Roman levels probably reflects a dietary preference; the importance of bacon (and lard) in the Roman military diet has been stressed by Davies (1971)[1], and it seems on the evidence presented here that this predilection for pig meat extended to the civilian population of London in Roman times. The decline in the proportion of pig bone and increase in the numbers of sheep seen in the medieval levels, St.Magnus (see also data from the Billingsgate

(1. see also, Wilkin (1976), pp.65&66)

Buildings site, Armitage, 1978, in press) provides evidence of a change in agriculture. In the middle ages and up to the 18th century AD, pigs were for the most part maintained under free-range conditions, and were allowed to forage in woodland feeding on beech mast and acorns during the autumn and winter months. With the large scale clearances of forests and woodlands in the lowlands of Southern Britain throughout the medieval period, there occured a reduction in the numbers of domestic pigs. At the same time, the growth in the wool trade meant that more sheep were being kept than previously, and the supply of draft ewes and wethers (castrated sheep) to butchers operating in the City of London consequently increased.

In both the Roman and medieval periods, the contribution from wild species is very small; meat from game animals was apparently not an important feature in the diet, but only supplimented it.

Fig.23: St.Magnus. Contribution made by each of the meat yielding species to the diet. Number and weight of bone[1]. Main dumps of refuse only.

23.1 ROMAN

(a) Period 1 phases 1 & 5 amalgamated 1st - 2nd century AD

Species	No. bones identified		Weight (g) of bone	
ox	652	(69.1%)	36,788	(86.4%)
sheep & goat	58	(6.2%)	1,002	(2.3%)
pig	216	(22.9%)	4,379	(10.3%)
Red deer	1	(0.1%)	132	(0.3%)
Roe deer	11	(1.2%)	264	(0.6%)
hare	5	(0.5%)	27	(0.1%)

(b) Period 1 phase 6 late 2nd - 4th century AD

Species	No. bones identified		Weight (g) of bone	
ox	75	(56.4%)	4,787	(84.2%)
sheep & goat	10	(7.5%)	221	(3.9%)
pig	48	(36.1%)	679	(11.9%)
Red deer	0	(0%)	0	(0%)
Roe deer	0	(0%)	0	(0%)
hare	0	(0%)	0	(0%)

23.2 SAXO-NORMAN Period 3 phase 2 c.1050 - 1100 AD

Species	No. bones identified		Weight (g) of bone	
ox	363	(56.8%)	29,193	(81.2%)
sheep & goat	139	(21.8%)	3,747	(10.4%)
pig	132	(20.7%)	2,896	(8.1%)
Red deer	1	(0.1%)	16	(0.05%)
Roe deer	4	(0.6%)	90	(0.25%)
hare	0	(0%)	0	(0%)

23.3 MEDIEVAL Period 3 phase 4 early 12th century AD

Species	No. bones identified		Weight (g) of bone	
ox	133	(28.1%)	7,560	(59.0%)
sheep & goat	206	(43.5%)	2,952	(23.0%)
pig	132	(27.8%)	2,236	(17.4%)
Red deer	0	(0%)	0	(0%)
Roe deer	1	(0.2%)	62	(0.5%)
hare	2	(0.4%)	9	(0.1%)

23.4 LATER MEDIEVAL Period 4 phase 2 c.1300 - 1350 AD

Species	No. bones identified		Weight (g) of bone	
ox	27	(60%)	2,311	(81.8%)
sheep & goat	14	(31%)	422	(14.9%)
pig	4	(9%)	92	(3.3%)
Red deer	0	(0%)	0	(0%)
Roe deer	0	(0%)	0	(0%)
hare	0	(0%)	0	(0%)

1. Excluding rib & vertebra

SUMMARY OF THE DATA

Number and weight of bone elements identified. Main dumps of refuse only.

Fig.24: Roman

(a) 1st - 2nd century AD. Contexts 357, 350, 286, 342, 341, 340, 338, 318, 309, 290 amalgamated (ER Nos.)

(b) late 2nd - 4th century AD. Contexts 319, 329, 288, 196, 301, 289, 269 amalgamated (ER Nos.)

Fig.25: Saxo-Norman c. 1050 - 1100 AD
Contexts 37, 85, 103, 104, 108, 164 amalgamated (ER Nos.)

Fig.26: Medieval early 12th century AD
Contexts 55, 95, 101 amalgamated (ER Nos.)

Fig.27: Later medieval c. 1300 - 1350 AD
Contexts 91, 99 amalgamated (ER Nos.)

Fig.24 St.Magnus,
Table 7: Roman contexts. Number and weight of bone.

1. Number of bones recovered:-

	1st - 2nd cent.	late 2nd - 4th cent.
I. Identified bone:		
I.1 All elements except vertebra & rib		
horse & pony	3	0
ox	652	75
sheep/goat	58	10
~~goat~~	~~3~~	~~0~~
pig	216	48
dog	10	7
cat	1	0
Red deer	1	0
Roe deer	11	0
hare	5	0
possible water vole (part of one skeleton)	0	3
I.2 Vertebra		
ox	132	14
sheep/goat	1	1
pig	21	6
unidentified	12	0
I.3 Rib		
ox size	224	47
sheep/(incl. goat) & pig size	141	26
II. Unidentified bone fragments	322	64

2. Weight (~~gm~~ g) of bone material:-

	1st - 2nd cent.	late 2nd - 4th cent.
I. Identified bone:		
I.1 All elements except vertebra & rib		
horse & pony	465	0
ox	36788	4787
sheep/goat	1002	221
pig	4379	679
dog	156	226
cat	11	0
Red deer	132	0
Roe deer	264	0
hare	27	0
possible water vole (part of one skeleton)	0	<1
I.2 Vertebra		
ox	5180	447
sheep/goat	7	24
pig	174	85
unidentified	76	0
I.3 Rib		
ox size	4137	791
sheep/(incl. goat) & pig size	588	125
II. Unidentified bone fragments	2739	359

Fig.25: St.Magnus, Saxo-Norman dump of refuse c.1050 - 1100 AD.
Number and weight of bone.

1. Number of bones recovered:-

I. Identified bone:

I.1 All elements except vertebra & rib

horse	3
ox	363
sheep/goat	139
pig	132
dog	1
cat	0
Red deer	1
Fallow deer	0
Roe deer	4
hare	0
foetal cat or dog (parts of one skeleton)	7

I.2 Vertebra

ox	64
sheep/goat	17
pig	13
unidentified	5

I.3 Rib

ox size	86
sheep(incl.goat) & pig size	77

II. Unidentified bone fragments 138

2. Weight (g) of bone material:-

I. Identified bone:

I.1 All elements except vertebra & rib

horse	256
ox	29193
sheep/goat	3747
pig	2896
dog	2
cat	0
Red deer	16
Fallow deer	0
Roe deer	90
foetal cat or dog (parts of one skeleton)	<1

I.2 Vertebra

ox	2532
sheep/goat	209
pig	149
unidentified	37

I.3 Rib

ox size	1284
sheep (incl.goat) & pig size	317

II. Unidentified bone fragments 957

Fig.26: St.Magnus, medieval dump of refuse, early 12th century AD. Number and weight of bone.

1. Number of bones recovered:-

I. Identified bone:

I.1 All elements except vertebra & rib

horse	2
ox	133
sheep/goat	206
pig	132
dog	1
cat	~~0~~ 1
Red deer	0
Fallow deer	0
Roe deer	1
hare	2

I.2 Vertebra

ox	29
sheep/goat	26
pig	23

I.3 Rib

ox size	84
sheep(incl. goat) & pig size	171

II. Unidentified bone fragments 167

2. Weight (g) of bone material:-

I. Identified bone:

I.1 All elements except vertebra & rib

horse	70
ox	7560
sheep/goat	2952
pig	2236
dog	1
cat	~~0~~ 1
Red deer	0
Fallow deer	0
Roe deer	62
hare	9

I.2 Vertebra

ox	525
sheep/goat	251
pig	193

I.3 Rib

ox size	1105
sheep (incl. goat) & pig	525

II. Unidentified bone fragments 905

Fig.27: St.Magnus, later medieval dump of refuse, c.1300 - 1350 AD.
Number and weight of bone.

1. Number of bones recovered:-

I. Identified bone:

I.1 All elements except vertebra & rib

horse	0
ox	27
sheep/goat	14
pig	4
dog	0
cat	0
Red deer	0
Fallow deer	0
Roe deer	0
hare	0

I.2 Vertebra

ox	6
sheep/goat	1

I.3 Rib

ox size	11
sheep (incl. goat) & pig size	12

II. Unidentified bone fragments 15

2. Weight (g) of bone material:-

I. Identified bone:

I.1 All elements except vertebra & rib

horse	0
ox	2311
sheep/goat	422
pig	92
dog	0
cat	0
Red deer	0
Fallow deer	0
Roe deer	0
hare	0

I.2 Vertebra

ox	149
sheep/goat	9

I.3 Rib

ox size	252
sheep (incl.goat) & pig size	61

II. Unidentified bone fragments 180

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ST. MAGNUS. TABLES OF MEASUREMENTS

ROMAN

(a) Period 1 Phases 1 & 5 amalgamated, 1st to 2nd century AD

Context Nos.: 357, 350, 286, 342, 341, 340, 338, 318, 309, 290

ER Nos.:

(b) Period 1 Phase 6, late 2nd to 4th century AD

Context Nos.: 319, 329, 288, 196, 301, 289, 269

ER Nos.:

Table 1 : Horse. Tibia
one specimen Context 357 (ER) early 2nd century AD

Length (GL)	302.0
Lateral length (Ll)	274.0
Prox.width (Bp)	81.5
Min.shaft width (SD)	33.7
Dist.width (Bd)	63.1

Table 2 : Ox. Horn core
adult & sub-adult only

	N	M	Range
(a) 1st - 2nd century AD			
Length of outer curve	6	131.2	95.0 - 181.0
Basal circumference	8	133.4	110.0 - 170.0
(b) late 2nd - 4th century AD			
Length of outer curve	1	-	158.0
Basal circumference	2	-	141.0 - 177.0

Table 3 : Ox. Metacarpal bone

	N	M	Range	SD	SE
(a) 1st - 2nd century AD .					
Length	-	-	-	-	-
Prox.width	9	53.1	44.7 - 62.2	6.1	2.0
Mid shaft width	-	-	-	-	-
Dist.shaft width	14	49.0	44.8 - 61.2	4.7	1.3
Dist.epiphyseal width	14	53.8	49.2 - 66.6	5.6	1.5
(b) late 2nd - 4th century AD					
Length	-	-	-	-	-
Prox.width	1	-	50.8	-	-
Mid shaft width	-	-	-	-	-
Dist.shaft width	5	53.1	50.7 - 56.5	-	-
Dist.epiphyseal width	5	57.2	54.0 - 64.2	-	-

Table 4 : Ox. Phalanx 1 (fore)
seven specimens Context 286 (ER) early 2nd century AD

	N	M	Range
Length of the peripheral half (GLpe)	7	54.0	48.5 - 59.9
Prox.width (Bp)	7	28.7	24.2 - 37.4
Dist.width (Bd)	7	26.9	23.2 - 33.5

Table 5 : Ox. Hoof core
seven specimens Context 286 (ER) early 2nd century AD

	N	M	Range
Diagonal length of the sole (DLS)	7	73.6	62.2 - 89.8
Length of the dorsal surface (Ld)	7	52.8	45.4 - 63.9
Width in middle of the sole (MBS)	7	23.3	19.3 - 28.4

Table 6 : Ox. Metatarsal bone

	N	M	Range	SD	SE
(a) 1st - 2nd century AD					
Length	2	-	204.2 - 214.9	-	-
Prox.width	9	43.2	37.2 - 53.3	5.0	1.7
Mid shaft width	2	-	22.1 - 22.6	-	-
Dist.shaft width	19	47.3	40.4 - 61.2	4.9	1.1
Dist.epiphyseal width	19	51.2	44.7 - 72.7	6.6	1.5
(b) late 2nd - 4th century AD					
Length	1	-	212.6	-	-
Prox.width	3	42.4	40.6 - 43.7	-	-
Mid shaft width	1	-	24.9	-	-
Dist.shaft width	3	49.9	48.3 - 52.7	-	-
Dist.epiphyseal width	3	51.3	50.2 - 54.2	-	-

Table 7 : Sheep. Horn core
one specimen Context 357 (ER) early 2nd century AD

Sex[a]	Measurement[b]				Description
	LOC	BC	MnD	MxD	
C/F?	92e	90	19.5	33.0	adult, cavity extends into tip

Key: a. Sex: M male
F female
C castrate

b. Measurement: LOC Length of outer curve
BC Basal circumference
MnD Minimum diameter across the base
MxD Maximum diameter across the base

Tab. 8 : Sheep. Metacarpal bone
specimens from (a) Contexts dated 1st - 2nd century AD

	N	M	Range
Length	4	124.7	117.4 - 131.3
Prox.width	5	20.5	18.5 - 22.1
Mid shaft width	4	11.8	11.2 - 12.5
Dist.shaft width	5	23.2	21.2 - 24.4
Dist.epiphyseal width	5	23.7	21.7 - 25.4

Table 9 : Pig. Lower third molar
specimens from (a) Contexts dated 1st - 2nd century AD

	N	M	Range
Length	4	30.7	26.4 - 33.1

Table 10 : Pig. Metacarpus III

Context	ER No.	Date	Measurement[a] (GL)	(Bp)	(BB)	(Bd)
318		mid 2nd cent.AD	75.8	18.2	16.2	19.3
357		ealy 2nd cent.AD	72.6	16.1	13.8	16.3

Key: a. Measurement: GL Length
Bp Prox.width
BB Mid shaft width
Bd Dist.width

see von den Driesch (1976,p.94)

Table 11 : Pig. Metacarpus IV
one specimen Context 357 (ER) early 2nd century AD

Length (GL)	75.9
Prox.width (Bp)	14.2
Mid shaft width (BB)	12.5
Dist.width (Bd)	17.0

Table 12 : Dog. Parts of skeleton
parts of skeleton (1 - 5) of one, adult dog
Context 288 (ER) late 2nd - 4th century AD

(1) Skull

Measurement[a] I	II	III	IV	IX	X	XI	XII
-	95.5	-	104e	-	-	60.4	-

Key: a. Measurement: see Harcourt (1974,p.153)

II Occipital protuberance to junction of nasal and frontal bones (nasion)
IV Maximum zygomatic width
XI Length of maxillary cheektooth row

(2) Scapula

Height (HS)	124.0
Min.length of neck (SLC)	24.0
Length of glenoid process (GLP)	28.5

(3) Ulna

Length (GL)	177.5
Width across the processus anconaeus (DPA)	22.7

(4) Humerus

Length (GL)	156.8
Prox.width (Bp)	26.6
Prox.depth (Dp)	37.3
Min.shaft width (SD)	12.5
Dist.width (Bd)	29.9

(5) Femur

Length (GL)	170.9
Prox.width (Bp)	34.6
Depth of the caput femoris(DC)	17.7
Min.shaft width (SD)	12.8
Dist.width (Bd)	28.2

Table 13 : Cat. Humerus
one specimen Context 350 (ER) early 2nd century AD

Length (GL)	117.9
Prox.width (Bp)	18.9
Min.shaft width (SD)	7.7
Dist.width (Bd)	20.5

Table 14 : Roe deer. Mandibular ramus
one specimen Context 286 (ER) early 2nd century AD

Age (years)[a]	Measurement[b]									
	(1)	(3)	(7)	(8)	(9)	(12)	(14)	(15a)	(15b)	(15c)
less than 1	-	-	-	-	-	-	-	-	15.9	14.2

Key: a. Age: Based on method of Aitken (1975)

b. Measurement: see von den Driesch (1976,p.57)

15b. Height of mandible in region of M1
15c. Height of mandible in region of P2

TE SAXON

Period 2 Phases 2 & 3 amalgamated, late 9th/10th century AD

Context Nos.: 195, 222, 150

ER Nos.:

Table 15 : Ox. Mandibular ramus
one specimen Context 222 (ER) late 9th century AD

(1)	(3)	(7)*	(11)	(15a)	(15b)	(15c)
314.5	91.8	123.1	81.8	61.3	42.2	31.0

Key:
1. Length: Gonion caudale - Infradentale
3. Length: Gonion caudale - posterior edge of M3 alveolus
7. Length of cheektooth row
11. Length of the diastema: oral border of P2 alveolus - aboral border of I4 alveolus
15a. Height of the mandible in region of M3
15b. Height of the mandible in region of M1
15c. Height of the mandible in region of P2

Numbers as in von den Driesch (1976, p.56)

* 3rd cusp of M_3 lacking (not developed)

Table 16 : Ox. Metacarpal bone
one specimen Context 222 (ER) late 9th century AD

Length	180.8
Prox.width	47.9
Mid shaft width	27.6
Dist.shaft width	46.3
Dist.epiphyseal width	50.7

Table 17 : Ox. Metacarpal bone

	N	M	Range
Length	-	-	-
Prox.width	4	50.6	45.6 - 58.1
Mid shaft width	-	-	-
Dist.shaft width	8	50.1	46.2 - 51.6
Dist.epiphyseal width	8	55.6	53.2 - 58.7

Table 18 : Ox. Phalanx 1 (fore)
four specimens Context 195 (ER) 10th century AD

	N	M	Range
Length of the peripheral half (GLpe)	4	55.3	53.5 - 58.1
Prox.width (Bp)	4	27.9	26.8 - 28.6
Dist.width (Bd)	4	26.3	25.5 - 27.1

Table 19 : Ox. Hoof core

	N	M	Range
Diagonal length of the sole (DLS)	5	70.1	62.0 - 74.1
Length of the dorsal surface (Ld)	5	53.3	48.8 - 57.6
Width in middle of the sole (MBS)	5	22.8	20.6 - 26.1

Table 20 : Ox. Astragalus
one specimen Context 150 (ER) 10th century AD

Length of the lateral half (GLl)	53.4
Length of the medial half (GLm)	49.3
Dist.width (Bd)	31.7

Table 21 : Ox. Metatarsal bone

	N	M	Range
Length	-	-	-
Prox.width	1	-	45.7
Mid shaft width	-	-	-
Dist.shaft width	7	48.1	44.2 - 57.2
Dist.epiphyseal width	7	49.7	46.2 - 53.2

Table 22: Sheep. Skull with horn cores attached
partially intact cranium of four-horned sheep Context 222 (ER)
late 9th century AD

Size of horn cores:-

Side	Position	LOC	BC	MnD	MxD
R	anterior	-	117	33.5	40.8
R	posterior	81	76	23.3	26.5
L	anterior	-	116	33.2	40.1
L	posterior	92	80	23.7	26.1

Key: as in Table 7

Table 23 : Sheep. Metatarsal bone
one specimen Context 150 (ER) 10th century AD

Length	125.2
Prox.width	16.8
Mid shaft width	9.4 (very slender shaft)
Dist.shaft width	20.2
Dist.epiphyseal width	21.5

Table 24 : Goat. Horn core
1 & 2 Context 150 (ER); 3 Context 195 (ER)
two specimens 10th century AD

No.	Sex[a]	Measurement[b] LOC	BC	MnD	MxD	Description
1	M/C?	240e	130	35.0	53.2	straight core, adult
2	C?	-	116	32.3	48.9	" " "
3	F	125e	90	22.3	34.8	" " "

Table 25 : Pig. Lower third molar

	N	M	Range
Length	5	27.4	24.9 - 29.3

Key: as in Table 7

Table 26 : Pig. Mandibular ramus
one specimen Context 195 (ER) 10th century AD
adult, M_3 erupted and in wear

(1)	(2)	(3)	(7)	(7a)	(13)	(14)	(15)	(16a)	(16b)	(16c)	3rd molar length	3rd molar width
235	257	77.2	115.8	98.1	101.6	96.1	104.7	41.0	42.6	42.2	28.3	14.2

Key: 1. Length: Gonion caudale - Infradentale
2. Length: aboral border of the condyle process - Infradentale
3. Length: Gonion caudale - posterior edge of M3 alveolus
7. Length of cheektooth row, M3 - P1
7a. Length of cheektooth row, M3 - P2
13. Height of vertical ramus: Gonion ventrale - condyle process
14. Middle height of the vertical ramus
15. Oral height of the vertical ramus
16a. Height of mandible in region of M3
16b. Height of mandible in region of M1
16c. Height of mandible in region of P2

Numbers as in von den Driesch (1976,p.58)

Table 27 : Pig. Ulna
immature (olecranon unfused)

	N	M	Range
Width across articular surface	4	22.7	20.5 - 24.6

Table 28 : Pig. Metapodial bones
two specimens Context 195 (ER) 10th century AD

	Metacarpus IV	Metatarsus IV
(GL)	75.0	98.7
(Bp)	15.0	13.9
(BB)	11.9	13.9
(Bd)	16.5	16.9

Key: as in Table 10

Table 29 : Dog. Ulna
one specimen Context 195 (ER) 10th century AD

Length (GL) 129.7

Table 30 : Red deer. Antler
one specimen Context 195 (ER) 10th century AD
right, incomplete (upper beam & terminal tines broken off)

Circumference of pedicel (40)	117	von den Driesch (1976,p.36)
Circumference of burr (41)	171	
Circumference around burr	206	
Circumference around lower beam	119	de Nahlik (1974,p.171)
Length of brow tine	277	
Length of trez tine	291	

SAXO-NORMAN / MEDIEVAL

11th to 13th century AD

Period 3 Phases 2 to 6 amalgamated, (not earlier than c.1050 AD to not later than c.1250 AD)

Context Nos.: 164,108,103,85,37,104,192,101,55,95,109,146,62

ER Nos.:

Table 31 : Horse. Metacarpal bone III
one specimen Context 37 (ER) 1050 - 1100 AD

Length (GL)	229.3
Lateral length (L)	221.8
Prox.width (Bp)	50.3
Prox.depth (Dp)	33.7
Min.shaft width (SD)	33.9
Dist.width (Bd)	50.4

Table 32 : Ox. Horn core
adult & sub-adult only

	N	M	Range	SD	SE
Length of outer curve	10	128.4	100 - 166	26.6	8.4
Basal circumference	21	138.4	91 - 204	30.4	6.6

Table 33 : Ox. Radius
one specimen Context 37 (ER) 1050 - 1100 AD

Length (GL)	250.4e
Prox.width (Bp)	chopped
Min shaft width (SD)	33.3
Dist.width (Bd)	62.5

Table 34 : Ox. Metacarpal bone

	N	M	Range	SD	SE
Length	18	179.8	161.6 - 197.4	9.4	2.2
Prox.width	25	50.8	45.6 - 62.0	4.8	1.0
Mid shaft width	17	27.8	24.5 - 35.0	3.2	0.8
Dist.shaft width	18	47.7	41.7 - 59.6	4.7	1.1
Dist.epiphyseal width	18	53.1	48.5 - 64.0	4.7	1.1

Table 35 : Ox. Phalanx 1 (fore)

	N	M	Range
Length of the peripheral half (GLpe)	4	51.4	50.2 - 54.1
Prox.width (Bp)	4	25.6	24.0 - 27.0
Dist.width (Bd)	4	24.6	23.3 - 26.3

Table 36 : Ox. Hoof core
one specimen Context 62 (ER) 11th to 13th century AD (not later than c.1250 AD)

Diagonal length of the sole (DLS)	69.7
Length of the dorsal surface (Ld)	49.4
Width in middle of the sole (MBS)	20.8

Table 37 : Ox. Tibia
one specimen — Context 103 (ER) 1050 - 1100 AD

Length (GL)	297.1
Prox.width (Bp)	81.2
Min.shaft width (SD)	31.6
Dist.width (Bd)	53.2

Table 38 : Ox. Astragalus

	N	M	Range	SD	SE
Length of the lateral half (GLl)	12	59.3	54.0 - 63.2	2.9	0.8
Length of the medial half (GLm)	12	53.9	48.2 - 57.6	2.8	0.8
Dist.width (Bd)	12	37.5	34.1 - 40.8	2.0	0.6

Table 39 : Ox. Calcaneum
adult only (tuber calcis fused)

	N	M	Range	SD	SE
Length (GL)	13	120.8	111.1 - 131.5	7.9	2.2

Table 40 : Ox. Metatarsal bone

	N	M	Range	SD	SE
Length	12	208.6	196.0 - 228.6	10.6	3.1
Prox.width	17	42.6	38.6 - 51.4	3.5	0.9
Mid shaft width	13	23.3	19.8 - 27.2	1.8	0.5
Dist.shaft width	18	45.9	40.9 - 55.6	4.2	1.0
Dist.epiphyseal width	18	49.4	43.6 - 62.0	5.1	1.2

Table 41 : Sheep. Horn core
adult & sub-adult only

Context	ER No.	Date	Sex[a]	Measurement[b] LOC	BC	Mnd	MxD	Description
37		1050-1100 AD	C?	96	79	19.0	29.2	-
			?	-	119	30.8	44.0	attached to skull
			?	-	92	23.0	32.6	" " "
192		early 12th cent.AD	M	-	142	43.4	54.1	resembles closely horn core of Soay ram

Key: a & b as in Table 7

Table 42 : Sheep. Mandibular ramus

two specimens Context 192 (ER) · early 12th century AD

Age class[a] (years)	Measurements[b] (1)	(2)	(3)	(7)	(8)	(9)	(12)	(15a)	(15b)	(15c)
E 2-3	145.8	153.9	43.8	69.1	47.8	23.8	60.5	35.6	20.4	13.6
F 3-4	151.5e	165.4	45.3e	69.1	47.6	23.0	68.8	34.6	19.4	13.0

Key: a. Age class: Based on method of Payne (1973)

b. Measurements:
1. Length from the angle:Gonion caudale - Infradentale
2. Length from the condyle: aboral border of the condyle process - Infradentale
3. Length: posterior edge of M3 alveolus - Gonion caudale
7. Length of the cheektooth row
8. Length of the molar row
9. Length of the premolar row
12. Aboral height of the vertical ramus
15a. Height of the mandible in region of M_3
15b. Height of the mandible in region of M_1
15c. Height of the mandible in region of P_2

Numbers as in von den Driesch (1976,p.57)

Table 43: Sheep. Radius

	N	M	Range	SD	SE
Length (GL)	9	144.3	132.6 - 160.2	10.8	3.6
Prox.width (Bp)	9	29.9	26.5 - 32.2	2.2	0.7
Min.shaft width (SD)	9	15.7	13.3 - 19.1	1.8	0.6
Dist.width (Bd)	9	26.9	24.3 - 30.7	2.1	0.7

Table 44 : Sheep. Metacarpal bone

	N	M	Range	SD	SE
Length	20	122.6	110.9 - 132.6	6.0	1.3
Prox.width	23	22.0	19.7 - 23.9	1.1	0.2
Mid shaft width	22	13.6	11.7 - 15.1	0.9	0.2
Dist.shaft width	21	24.5	21.6 - 26.5	1.2	0.3
Dist.epiphyseal width	20	24.6	21.6 - 26.3	1.2	0.3

Table 45 : Sheep. Innominate

Context	ER No.	Date	Length of acetabulum	Depth of medial rim of acetabulum	Sex
37		c. 1050-1100 AD	26.3e	9.5	M
			23.7	6.2	C?
			26.4	8.0	M
192		early 12th cent.AD	22.6	0.6	F
			22.5	1.6	F
109		early 12th cent.AD	22.3	2.8	C?
			22.3	4.7	C
146		early 13th cent.AD	23.9	6.3	M
			23.9	1.2	F
			25.2	2.5	F
			23.6	2.1	F

Table 46 : Sheep. Metatarsal bone

	N	M	Range	SD	SE
Length	15	128.1	119.0 - 139.8	6.3	1.6
Prox.width	26	19.2	17.4 - 20.8	0.9	0.2
Mid shaft width	15	11.8	9.9 - 13.9	1.1	0.3
Dist.shaft width	17	22.6	19.7 - 25.4	1.6	0.4
Dist.epiphyseal width	17	23.0	20.2 - 25.6	1.6	0.4

Table 47 : Goat. Horn core

adult & sub-adult only

Context	ER No.	Date	Sex[a]	Measurement[b] LOC	BC	MnD	MxD	Description
37		1050-1100 AD	F?	180	112	27.0	39.7	straight core
103		1050-1100 AD	F?	135e	103	27.1	35.9	straight core, attached to skull
			M?	265e	130	35.4	50.7	straight core
			?	-	122e	32.9	44.4e	straight core

Key: a & b as in Table 7

Table 48 : Pig. Lower third molar

	N	M	Range
Length	3	28.6	27.2 - 30.7

Table 49 : Pig. Scapula

two specimens, adult Context 37 (ER) 1050 - 1100 AD

No.	Measurement[a] (SLC)	(GLP)	(LG)	(BG)
1	23.9	35.3	30.3	24.5
2	21.2	34.3	31.6	23.8

Key: a. Measurement: SLC Minimum length of neck
GLP Length of the glenoid process
LG Length of the glenoid cavity
BG Width of the glenoid cavity

see von den Driesch (1976,p.75)

Table 50 : Pig. Ulna immature (olecranon unfused)

	N	M	Range	SD	SE
Width across articular surface	19	19.5	16.4 - 21.7	1.6	0.4

Table 51 : Pig. Tibia

one specimen, adult Context 101 (ER) early 12th century AD

Length	165.4
Prox.width	40.2
Min.shaft width	18.3
Dist.width	27.4e

Table 52 : Pig. Meatacarpus III

Context	ER No.	Date	(GL)	(Bp)	(BB)	(Bd)
103		1050-1100 AD	67.8e	12.3e	11.9	15.4
101		early 12th cent.AD	65.5	16.5	14.0	16.2
			68.5	16.5	12.9	15.7

Key: GL Length
Bp Prox.width
BB Mid shaft width
Bd Dist.width

see von den Driesch (1976,p.94)

Table 53 : Pig. Metacarpus IV

Context	ER No.	Date	(GL)	(Bp)	(BB)	(Bd)
103		1050-1100 AD	69.6	14.3	11.4	15.3
192		early 12th cent.AD	68.1	13.0	deformed	14.9
95		early 12th cent.AD	69.1	12.1	11.0	13.2

Key: as in Table 10

Table 54 : Pig. Metatarsus III

Context	ER No.	Date	(GL)	(Bp)	(BB)	(Bd)
85		1050-1100 AD	71.5	14.2	12.4	15.0
37		1050-1100 AD	92.9e	16.2	15.0	19.0
101		early 12th cent.AD	75.5	13.8	11.4	15.0

Key: as in Table 10

Table 55 : Pig. Metatarsus IV

Context	ER No.	Date	(GL)	(Bp)	(BB)	(Bd)
37		1050-1100 AD	79.5	14.5	12.7	15.7
101		early 12th cent.AD	77.0	14.0	12.0	15.1

Key: as in Table 10

Table 56 : Fallow deer. Radius
one specimen Context 146 (ER) early 13th century AD

Prox.width	40.6

Table 57 : Roe deer. Humerus
one specimen Context 192 (ER) early 12th century AD

Length	gnawed by dog
Min.shaft width	12.9
Width of the trochlea(BT)	22.4
Max.dist.width (Bd)	27.3

Table 58 : Hare. Tibia
two specimens, possibly from same animal Context 55 (ER)
early 12th century AD

	1 (right)	2 (left)
Dist.width	15.8	16.0

LATER MEDIEVAL

Period 4 Phases 1 to 3 amalgamated, late 13th to mid 14th century AD (not earlier than c.1275 AD to not later than c.1350 AD)

Context Nos.: 4, 91, 99, 163, 100

ER Nos.:

Table 59 : Ox. Horn core
adult & sub-adult only

	N	M	Range	SD	SE
Length of outer curve	3	173.0	108 - 270	-	-
Basal circumference	10	146.5	94 - 210	38.6	12.2

Table 60 : Ox. Calcaneum
two specimens, adult (tuber calcis fused)

	1	2
Length (GL)	110.0	133.5

Table 61 : Sheep. Mandibular ramus
two specimens Context 99 (ER) 1300 - 1350 AD

Age class[a] (years)	Measurements[b] (1)	(2)	(3)	(7)	(8)	(9)	(12)	(15a)	(15b)	(15c)
G 4 - 6	150.3	150.0	46.1	62.5	43.6	18.8	58.7	32.8	21.2	13.4
H 6 - 8 **	-	-	55.8	59.2	41.5	18.7	68.6	35.3	22.3	16.8

Key: a & b as in Table 42
** shows evidence of periodontal disease

Table 62 : Goat. Horn core
one specimen Context 91 (ER) 1300 - 1350 AD

Sex[a]	Measurement[b] LOC	BC	MnD	MxD	Description
M	-	149	38.3	66.5	straight core, attached[c] to small portion of frontal bone. Adult

Key: as in Table 7

Table 63 : Cat. Radius
one specimen, adult Context 163 (ER) c.1275 - 1350 AD

Length (GL)	88.1
Prox.width (Bp)	8.4
Min. shaft width (SD)	6.1
Dist.epiphyseal width (Bd)	12.2

EARLY MODERN

Period 4 Phase 5 late 16th - 17th century AD

Context No.: 36

ER No.:

Table 64 : Pig. Radius

one specimen, adult (both epiphyses fused)

Length	121.7
Prox.width	25.7
Min.shaft width	15.5
Dist.epiphyseal width	27.9

ADDITIONAL INFORMATION

Pig. Mandibular ramus

Values for wear stages based on method of Grant (1975)

Period		Values recorded
ROMAN	1st - 2nd cent.AD	1,2,4,4,7,27e,28,38e,39,39e
LATE SAXON	9th - 10th cent.AD	20,20,21,21,35,38.38
SAXO-NORMAN	late 10th - 11th cent.AD	12,17,20,25,30e,30e,38e,40,45
MEDIEVAL	early 12th - 13th cent.AD	9,10,13e,19,20,21e,23
LATER MEDIEVAL	12th - mid 14th cent.AD	19

e - extended value

Level III report

Archive only (not for publication)

THE BIRD BONES FROM THE ROMAN, MEDIEVAL AND EARLY MODERN LEVELS, ST. MAGNUS, CITY OF LONDON.

Gillian Carey & Philip L. Armitage

Introduction

A total of 284 bird bones were recovered from layers dated between the 1st and 16th centuries AD; of these, 271 (95%) were identified to species and part of skeleton, and 13 (5%) remain as unidentified specimens.

The skeletal elements of domestic chicken Gallus gallus, domestic goose Anser anser and domestic duck Anas platyrhynchos account for 98% of the identified group, the remaining 2% being isolated bones from raven Corvus corax (Context 357; ER. ; Roman, early 2nd century AD), teal Anas crecca (Context 192; ER. ; Medieval, early 12th century AD), woodcock Scolopax rustica (Context 195; ER. ; Late Saxon, 10th century AD & Context 108; ER. ; Saxo-Norman, c.1050 - 1100 AD) and curlew Numenius arquata (Context 37; ER. ; Saxo-Norman, c.1050 - 1100 AD).

The complete collection of bird bone is held in store at the Department of Urban Archaeology, Museum of London, where it may be examined upon request. Under the British Museum (Natural History) computer-based catalogue scheme the specimens have been assigned the following registration numbers:-

Roman	DUA 1978 R5212 to DUA 1978 R5238
Late Saxon	DUA 1978 R5239 to DUA 1978 R5247
Saxo-Norman	DUA 1978 R5248 to DUA 1978 R5254
Medieval	DUA 1978 R5255 to DUA 1978 R5273
Later Medieval and Early Modern	DUA 1978 R5274 to DUA 1978 R5282

Measurement of the Bones

Preservation of the bones is good, and many are sufficiently intact to allow measurement. Measurements (in mm) were taken from the specimens using dial calipers (Mitutoyo No. 505-635, range 300mm, with dial graduation of 0.05mm), the points of

measurement following those described by von den Driesch (1976).

[Copies of the complete series of tables giving summaries of the measurements for each of the species identified are available on request from the BM(NH) and the DUA.]

The Species Represented

By far the commonest remains are those of domestic chicken Gallus gallus which maintain the same proportion of about 60% to 70% of bones in each dated level. Domestic goose Anser anser and duck Anas platyrhynchos comprise only 22% and 7% respectively of the 271 identified bones.

Unlike the Tudor site of Baynard's Castle where over 50 species of wild bird have been recorded (Bramwell, 1975), there is a paucity of remains of wild species from St.Magnus.

Skeletal elements recovered

The most frequent elements from the site are the 'meatier' limb bones (i.e. humerus, ulna, radius, femur & tibiotarsus); and in the tibiotarsus, which forms one quarter of all the finds, can be recognised the familiar 'drumstick'.

It is of interest that a relatively large number of tarsometatarsi were recovered (Fig.1), a bone with hardly any flesh on it. Only a few ribs were found, whilst skulls, vertebrae and extremity bones are noticeably absent. The lack of those parts of the skeleton that are removed during preparation of the carcass for cooking points to the possibility that the collection of bird bone from St.Magnus is mainly comprised of the refuse from the table rather than the kitchen.

Fig. 1: St.Magnus. Bird bone, numbers of bone elements identified. Roman and medieval levels combined.

Bone element	No. specimens	% of total
Furcula	4	1.4
Coracoid	13	4.6
Scapula	9	3.2
Humerus	42	14.8
Ulna	26	9.2
Radius	21	7.4
Carpometacarpus	5	1.8
Sternum	14	4.9
Rib	2	0.7
Pelvis	13	4.6
Femur	23	8.1
Tibiotarsus	72	25.4
Tarsometatarsus	27	9.5
Unidentified	13	4.6

Butchery

The following bones have marks made by a knife on them, showing evidence of butchery:-

Fig. 2: St.Magnus. Domestic chicken and goose. Evidence of butchery.

2.1 DOMESTIC CHICKEN

Context No.	ER No.	Date	Bone	Description
357		early 2nd cent. AD	1 tibiotarsus	knife score across distal epiphysis
286		" "	1 ulna	chop* across proximal epiphysis
			1 femur	chop* across distal epiphysis
			1 tibiotarsus	chop* across distal epiphysis
289		late 2nd-4th cent.AD	2 tibiotarsus	knife score across distal epiphysis
150		10th cent.AD	3 tibiotarsus	knife score across distal epiphysis
			1 tarsometatarsus	chop* across proximal epiphysis
195		10th cent.AD	2 tibiotarsus	knife score across distal epiphysis
37		c.1050-1100 AD	1 tibiotarsus	knife score across distal epiphysis
192		early 12th cent.AD	1 tibiotarsus	knife score across distal epiphysis
101		early 12th cent.AD	6 tibiotarsus	knife score across distal epiphysis
109		early 12th cent.AD	1 tibiotarsus	knife score across distal epiphysis
4		early 14th cent. AD	1 tibiotarsus	chop* across distal epiphysis

Fig. 2 (continued)

2.2 DOMESTIC GOOSE

Context No.	ER No.	Date	Bone	Description
288		late 2nd-4th cent.AD	1 humerus	knife marks on shaft**
289		" "	1 tarsometatarsus	chop marks* & knife scores across distal epiphysis
			1 tibiotarsus	superficial knife marks on shaft **
37		c.1050-1100 AD	1 humerus	chop * across distal epiphysis
192		early 12th cent.AD	1 tibiotarsus	chop* across distal epiphysis
95		" "	1 humerus	knife score across distal epiphysis

KEY: * Bone (probably) 'chopped' through with a large knife

** Showing removal of the flesh from the bone

Figures 3 and 4 show in diagramatic form the position of the knife marks recorded on the bones of domestic chicken and domestic goose. One third of chicken tibiotarsi are marked at the distal end by a knife cut. Three tibiotarsi of goose also exhibit similar marks across the distal epiphysis. All these specimens show the position of removal of the lower part of the leg from the rest of the carcass.

Gnawing of the bone

Six goose bones have marks made by teeth on them, but in each specimen the animal responsible can not be determined, and could be dog or cat, or possibly even human.

Sex ratio of the domestic chicken

The sex of the complete and partially complete tarsometatarsi of domestic chicken was established by the presence (male) or absence (female) of a spur. Using this method, the numbers of males and females are assessed as follows:-

	MALE	FEMALE
Roman levels	3	6
late Saxon	2	2
Saxo-Norman	1	1
medieval	1	1

One bone from Context 195 (ER ; late Saxon, 10th century AD) has had a small, little developed spur, and this specimen may ~~have~~ come from a capon.

Pathology

One humerus from Context 357 (ER ; Roman, early 2nd century AD) has an irregular mass of calcified tissue (callus) around the central part of the shaft. This may be the result of a traumatic fracture (?), although there seems to be no evidence of any break in the radiograph taken of this bone.

REFERENCES

Bramwell, D. (1975). Bird remains from medieval London. The London Naturalist, 54, 15-20.

von den Driesch, A. (1976). A Guide to the Measurement of Animal Bones from Archaeological Sites. Peabody Museum Bulletin No.1.

Bird Bone Measurements, St. Magnus 1975, City of London.

ROMAN

a) Period 1, phases 1 & 5 amalgamated, 1st to 2nd century AD.

Context Nos.: 357, 350, 286, 342, 341, 338, 318, 309,

ER. Nos.:

b) Period 1, phase 6, late 2nd to 4th century AD.

Context Nos.: 329, 288, 301, 289, 269

ER. Nos.:

TABLE 1: Gallus gallus Scapula

a) 1st to 2nd cent. AD; 2 specimens; Contexts 286, 342.

DiC (2) 11.9 & 12.8

b) late 2nd to 4th cent. AD; 1 specimen; Context 269.

GL 65.1
DiC 11.5

TABLE 2: Gallus gallus Coracoid

a) 1st to 2nd cent. AD; 1 specimen; Context 357.

GL 56.4
BF 11.7
Lm 54.4

b) late 2nd to 4th cent. AD; 1 specimen; Context 289.

GL 54.4
Bb 14.5
BF 11.1
Lm 51.6

TABLE 3: Gallus gallus Humerus

a) 1st to 2nd cent. AD; 8 specimens.

	N	M	Range
GL	4	69.5	63.1 - 73.4
Bp	5	18.9	17.1 - 20.6
Bd	7	14.7	13.6 - 16.2
SC	7	6.6	6.0 - 7.3

b) late 2nd to 4th cent. AD; 5 specimens.

	N	M	Range
GL	5	71.4	64.4 - 74.6
Bp	5	19.6	16.9 - 20.0
Bd	5	15.1	13.4 - 15.8
SC	5	6.9	6.1 - 7.5

TABLE 4: Gallus gallus Radius

a) 1st to 2nd cent. AD;2 specimens; context 286.

GL	(2)	61.0 & 62.8
Bp	(2)	4.5 & 5.3
Bd	(2)	6.0 & 6.9
SC	(2)	2.9 & 3.0

b) late 2nd to 4th cent. AD; 1 specimen; context 289.

GL	55.4
Bp	4.7
Bd	6.0
SC	2.7

TABLE 5: Gallus gallus Ulna

a) 1st to 2nd cent. AD; 4 specimens.

	N	M	Range
GL	1	-	64.7
Bp	1	-	11.3
Bd	3	9.5	8.4 - 10.3
SC	4	5.9	5.0 - 6.2

b) late 2nd to 4th cent. AD; 2 specimens; contexts 301, 289.

GL	77.3
Bp	14.1
Bd	10.1 & 10.3
SC	5.1 & 5.9

TABLE 6: Gallus gallus Carpometacarpus

late 2nd to 4th century AD; 1 specimen; context 288.

GL	38.0
Bp	11.3
Bd	16.6

TABLE 7: Gallus gallus Femur

1st to 2nd cent. AD; 6 specimens.

	N	M	Range
GL	4	78.5	71.1 - 82.0
Bp	6	15.5	13.8 - 18.0
Bd	3	14.9	13.3 - 16.3
SC	5	6.4	5.7 - 7.5

TABLE 8: Gallus gallus Tibiotarsus

a) 1st to 2nd cent. AD; 30 specimens.

	N	M	Range	SD	SE
GL	11	108.3	75.9 - 121.3	13.6	4.1
Bp	12	19.8	16.8 - 23.0	2.4	0.7
Bd	21	10.3	6.2 - 12.0	1.3	0.3
SC	28	6.0	4.9 - 8.8	0.8	0.2

TABLE 8: (continued)

b) late 2nd to 4th cent. AD; 6 specimens.

	N	M	Range
GL	1	-	96.1
Bp	1	-	18.1
Bd	4	10.3	9.5 - 10.8
SC	6	5.6	5.3 - 6.0

TABLE 9: Gallus gallus Tarsometatarsus

a) 1st to 2nd cent. AD; 10 specimens.

	N	M	Range
GL	6	73.2	62.6 - 81.8
Bp	8	12.7	11.5 - 14.9
Bd	6	12.2	10.9 - 13.4
SC	9	6.1	5.0 - 7.6

b) late 2nd to 4th cent. AD; 1 specimen; context 269.

Bd	12.3
SC	5.9

TABLE 10: Gallus gallus Pelvis

1st to 2nd cent. AD; 4 specimens.

	N	M	Range
LV	1	-	72.3
DiA	4	8.1	7.5 - 8.4
LS	1	-	94.9

TABLE 11: Anser anser Scapula

a) 1st to 2nd cent. AD; 1 specimen; context 318.

DiC	21.5

b) late 2nd to 4th cent. AD; 1 specimen; context 288.

DiC	19.9

TABLE 12: Anser anser Humerus

a) 1st to 2nd cent. AD; 3 specimens.

	N	M	Range
Bp	2	-	23.0 - 24.6
SC	3	11.1	10.4 - 11.7

b) late 2nd to 4th cent. AD; 3 specimens.

	N	M	Range
Bp	1	-	20.5
Bd	1	-	25.1
SC	3	10.0	7.1 - 11.9

TABLE 13 : Anser anser Radius

1st to 2nd cent. AD; 2 specimens; context 357

GL	146.1
Bp	9.2 & 9.3
Bd	10.5 &
SC	4.8 & 6.5

TABLE 14 : Anser anser Ulna

a) 1st to 2nd cent. AD; 3 specimens.

	N	M	Range
GL	1	-	155.0
Bd	1	-	15.3
SC	3	8.2	7.8 - 9.0

b) late 2nd to 4th cent. AD; 3 specimens.

	N	M	Range
Bp	1	-	20.6
Bd	1	-	16.3
SC	3	8.7	7.9 - 9.6

TABLE 15 : Anser anser Tibiotarsus

1st to 2nd cent. AD; 2 specimens; context 286.

GL	155.8
Bp	26.8
Bd	17.7
SC	9.1 & 9.8

TABLE 16 : Anser anser Tarsometatarsus

late 2nd to 4th cent. AD; 2 specimens; context 289.

GL	90.9 & 93.9
Bp	18.6
SC	7.8 & 8.2

TABLE 17 : Anas platyrhynchos Scapula

1st to 2nd cent. AD; 1 specimen; context 286.

DiC	12.3

TABLE 18 : Anas platyrhynchos Coracoid

1st to 2nd cent. AD; 3 specimens.

	N	M	Range
GL	3	52.2	47.6 - 55.8
Bb	3	20.1	20.0 - 20.2
BF	3	19.5	18.8 - 20.1
Lm	3	47.5	42.8 - 51.5

TABLE 19: Anas platyrhynchos Humerus

a) 1st to 2nd cent. AD; 1 specimen; context 357.

GL	91.3
Bp	21.2
Bd	14.9
SC	6.9

b) late 2nd to 4th cent. AD; 1 specimen; context 269.

Bd	10.6
SC	4.9

TABLE 20: Anas platyrhynchos Radius

a) 1st to 2nd cent. AD; 2 specimens; contexts 357, 350.

GL	63.9 & 73.9
Bp	5.0 & 5.6
Bd	5.6 & 6.7
SC	2.4 & 3.0

b) late 2nd to 4th cent.AD; 1 specimen; context 288.

SC	3.4

TABLE 21: Anas platyrhynchos Ulna

1st to 2nd cent. AD; 1 specimen; context 286.

GL	67.6
Bp	10.0
Bd	9.0
SC	4.3

TABLE 22: Corvus corax Ulna

1st to 2nd cent. AD; 1 specimen; context 357.

GL	99.9
Bp	13.7
Bd	11.7
SC	6.4

*@@

LATE SAXON

10th century AD.

Context Nos.: 222, 150, 195.

ER. Nos.:

TABLE 23: Gallus gallus Scapula

10th cent. AD; 2 specimens; context 150.

DiC	12.2 & 12.7

TABLE 24: Gallus gallus Coracoid

10th cent. AD; 2 specimens; contexts 150, 195.

GL	52.5 & 55.7
Bb	15.1
BF	10.7 & 12.5
Lm	50.5 & 52.9

TABLE 25: Gallus gallus Humerus

10th cent. AD; 3 specimens.

	N	M	Range
GL	2	-	66.6 & 73.4
Bp	2	-	18.0 & 20.1
Bd	3	14.7	13.3 & 15.8
SC	3	7.0	6.7 & 7.2

TABLE 26: Gallus gallus Radius

10th cent. AD; 2 specimens; context 195.

GL	59.6 & 66.0
Bp	5.0 & 5.7
Bd	6.4
SC	3.3 & 3.6

TABLE 27: Gallus gallus Ulna

10th cent. AD; 4 specimens.

	N	M	Range
GL	2	-	71.2 & 75.0
Bp	2	-	13.3 & 14.0
Bd	3	10.3	9.6 - 11.1
SC	4	5.8	5.4 - 6.4

TABLE 28: Gallus gallus Femur

10th cent. AD; 1 specimen; context 150.

GL	73.4
Bp	13.6
Bd	13.3
SC	5.9

TABLE 29: Gallus gallus Tibiotarsus

10th cent. AD; 13 specimens.

	N	M	Range	SD	SE
GL	2	-	96.1 & 119.4	-	-
Bp	5	20.1	17.9 - 22.1	-	-
Bd	5	12.5	9.3 - 18.6	-	-
SC	11	6.1	5.2 - 7.0	0.6	0.2

TABLE 30 : Gallus gallus Tarsometatarsus

10th cent. AD; 5 specimens.

	N	M	Range
GL	4	76.0	66.0 - 86.7
Bp	2	-	11.1 & 12.9
Bd	4	12.4	11.1 - 13.5
SC	5	5.9	5.2 - 6.8

TABLE 31 : Gallus gallus Pelvis

10th cent. AD; 2 specimens; context 150.

LV	77.7
DiA	7.8

TABLE 32 : Anser anser Humerus

10th cent. AD; 2 specimens; contexts 222, 150.

Bp	21.6 & 35.6

TABLE 33 : Anser anser Ulna

10th cent. AD; 1 specimen; context 150.

Bp	21.3
SC	9.0

TABLE 34 : Anser anser Carpometacarpus

10th cent. AD; 1 specimen; context 195.

GL	95.8
Bp	21.9
Bd	12.1

TABLE 35 : Anser anser Femur

10th cent. AD; 2 specimens; context 150.

Bp	20.0
Bd	19.9 & 20.0
SC	18.1 & 18.5

TABLE 36 : Anser anser Tibiotarsus

10th cent. AD; 3 specimens.

	N	M	Range
GL	1	-	149.8
Bp	1	-	27.0
Bd	2	-	16.6 & 18.1
SC	3	8.7	8.5 - 9.2

TABLE 43: *Gallus gallus* Tarsometatarsus

c.1050 - 1100 AD; 2 specimens; Context 37.

GL	(2)	82.5 & 62.4
Bp	(1)	14.9
Bd	(2)	13.9 & 11.0
SC	(2)	7.6 & 5.3

TABLE 44: *Gallus gallus* Pelvis

c.1050 - 1100 AD; 1 specimen; Context 37.

LV 67.3

TABLE 45: *Anser anser* Scapula

c.1050 - 1100 AD; 1 specimen; Context 103.

DiC 21.5

TABLE 46: *Anser anser* Humerus

c.1050 - 1100 AD; 1 specimen; Context 37.

Bd	25.0
SC	12.5

TABLE 47: *Scolopax rustica* Femur

c.1050 - 1100 AD; 1 specimen; Context 108.

GL	46.9
Bp	9.1
Bd	8.4
SC	3.7

TABLE 48: *Numenius arquata* Humerus

c.1050 - 1100 AD; 1 specimen; Context 37.

GL	105.2
Bd	15.9
SC	6.9

@

MEDIEVAL 12th century AD

Context Nos.: 192, 55, 95, 101, 109, 146, 62

ER. Nos.:

TABLE 49: *Gallus gallus* Coracoid

12th cent. AD; 2 specimens; Contexts 55, 101.

GL	(2)	54.2 & 55.4
Bp	(1)	14.7
BF	(2)	10.5 & 11.1
Lm	(2)	52.1 & 53.2

TABLE 37: Anser anser Tarsometatarsus

10th cent.AD; 1 specimen; context 150.

GL	92.0
Bp	19.3
Bd	20.8
SC	9.0

TABLE 38: Anas platyrhynchos Scapula

10th cent. AD; 1 specimen; context 150.

DiC	12.8

TABLE 39: Anas platyrhynchos Humerus

10th cent. AD; 1 specimen; context 150.

GL	57.8
Bp	13.9
Bd	9.4
SC	4.3

TABLE 40: Scolopax rustica Radius

10th cent. AD; 1 specimen; context 195.

Bp	3.9
SC	2.1

@

SAXO-NORMAN c.1050 - 1100 AD

Context Nos.: 37, 85, 103, 104, 108, 164, 184

ER. Nos.:

TABLE 41: Gallus gallus Femur

c.1050 - 1100 AD; 5 specimens.

	N	M	Range
GL	4	71.9	67.1 - 81.6
Bp	4	14.6	13.8 - 16.0
Bd	5	13.5	12.2 - 15.6
SC	5	6.3	5.8 - 7.7

TABLE 42: Gallus gallus Tibiotarsus

c.1050 - 1100 AD; 2 specimens; Context 37.

GL	(1)	102.5
Bp	(2)	17.9 & 20.2
Bd	(1)	10.2
SC	(2)	5.7 & 5.8

TABLE 43: Gallus gallus Tarsometatarsus

c.1050 - 1100 AD; 2 specimens; Context 37.

GL	(2)	82.5 & 62.4
Bp	(1)	14.9
Bd	(2)	13.9 & 11.0
SC	(2)	7.6 & 5.3

TABLE 44: Gallus gallus Pelvis

c.1050 - 1100 AD; 1 specimen; Context 37.

LV 67.3

TABLE 45: Anser anser Scapula

c.1050 - 1100 AD; 1 specimen; Context 103.

DiC 21.5

TABLE 46: Anser anser Humerus

c.1050 - 1100 AD; 1 specimen; Context 37.

Bd	25.0
SC	12.5

TABLE 47: Scolopax rustica Femur

c.1050 - 1100 AD; 1 specimen; Context 108.

GL	46.9
Bp	9.1
Bd	8.4
SC	3.7

TABLE 48: Numenius arquata Humerus

c.1050 - 1100 AD; 1 specimen; Context 37.

GL	105.2
Bd	15.9
SC	6.9

@

MEDIEVAL 12th century AD

Context Nos.: 192, 55, 95, 101, 109, 146, 62

ER. Nos.:

TABLE 49: Gallus gallus Coracoid

12th cent. AD; 2 specimens; Contexts 55, 101.

GL	(2)	54.2 & 55.4
Bp	(1)	14.7
BF	(2)	10.5 & 11.1
Lm	(2)	52.1 & 53.2

TABLE 50 : Gallus gallus Humerus

12th cent. AD; 4 specimens.

	N	M	Range
GL	2	-	64.0 & 69.6
Bp	2	-	17.4 & 17.8
Bd	4	13.7	13.2 - 14.2
SC	4	6.1	6.0 - 6.3

TABLE 51 : Gallus gallus Radius

12th cent. AD; 3 specimens.

	N	M	Range
GL	2	-	58.9 & 66.4
Bp	3	5.1	4.7 - 5.6
Bd	2	-	6.1 & 7.1
SC	3	2.9	2.6 - 3.1

TABLE 52 : Gallus gallus Carpometacarpus

12th cent. AD; 1 specimen; Context 55.

GL	50.9
Bp	14.9
Bd	8.4

TABLE 53 : Gallus gallus Femur

12th cent. AD; 4 specimens.

	N	M	Range
GL	1	-	70.6
Bp	2	-	13.5 & 13.7
Bd	3	12.7	12.6 - 12.8
SC	3	6.1	5.8 - 6.6

TABLE 54 : Gallus gallus Tibiotarsus

12th cent. AD; 11 specimens.

	N	M	Range	SD	SE
GL	4	109.6	95.7 - 120.3	-	-
Bp	6	19.7	17.5 - 21.4	-	-
Bd	9	11.0	9.2 - 12.3	-	-
SC	11	6.1	4.9 - 7.0	0.7	0.2

TABLE 55 : Gallus gallus Tarsometatarsus

12th cent. AD; 1 specimen; Context 101.

GL	62.7
Bp	11.3
Bd	11.3
SC	5.4

TABLE 56 : Anser anser Humerus

12th cent. AD; 2 specimens; Context 93.

Bp	32.1
Bd	23.7

TABLE 57 : Anser anser Ulna

12th cent. AD; 2 specimens; Context 101.

GL	(1)	142.6
Bd	(1)	15.2
SC	(2)	8.1 & 8.5

TABLE 58 : Anser anser Femur

12th cent. AD; 1 specimen; Context 101.

GL	75.6
Bp	19.2
Bd	29.9
SC	8.4

TABLE 59 : Anser anser Tibiotarsus

12th cent. AD; 1 specimen; Context 192.

Bd	17.6
SC	19.2

TABLE 60 : Anser anser Tarsometatarsus

12th cent. AD; 2 specimens; Contexts 192, 101.

Bd	(1)	18.2
SC	(2)	18.0 & 18.1

TABLE 61 : Anas platyrhynchos Ulna

12th cent. AD; 1 specimen; Context 192.

Bd	10.7
SC	5.4

TABLE 62 : Anas platyrhynchos Carpometacarpus

12th cent. AD; 1 specimen; Context 101.

GL	59.9
Bp	13.5
Bd	7.3

TABLE 63 ; Anas crecca Ulna

12th cent. AD; 1 specimen; Context 192.

Bd	6.6
SC	3.3

MEDIEVAL 13th century AD

Context Nos.: 146, 62

ER. Nos.:

TABLE 64 ; Gallus gallus Humerus

13th cent. AD; 1 specimen; Context 62.

SC	6.5

TABLE 65 ; Gallus gallus Radius

13th cent. AD; 1 specimen; Context 62.

GL	60.6
Bp	4.9
Bd	6.2
SC	2.9

TABLE 66 ; Gallus gallus Ulna

13th cent. AD; 2 specimens; Context 62.

Bd	(2)	8.4 & 9.3
SC	(2)	5.0 & 5.2

TABLE 67 ; Gallus gallus Femur

13th cent. AD; 2 specimens; Context 62.

GL	(1)	67.8
Bp	(1)	13.6
Bd	(1)	13.0
SC	(2)	5.7 & 6.4

TABLE 68 ; Gallus gallus Tibiotarsus

13th cent. AD; 1 specimen; Context 62.

SC	5.9

TABLE 69 ; Gallus gallus Tarsometatarsus

13th cent. AD; 1 specimen; Context 146.

GL	74.3
Bp	13.5
Bd	13.7
SC	7.4

TABLE 70: Anser anser Humerus

13th cent. AD; 2 specimens; Contexts 146, 62.

GL	(2)	157.5 & 171.7
Bp	(2)	33.3 & 33 1
Bd	(1)	23.3
Sc	(2)	11.2 & 11.5

TABLE 71: Anser anser Radius

13th cent. AD; 1 specimen; Context 146.

GL	154.6
Bp	9.6
Bd	11.0
SC	4.8

TABLE 72: Anser anser Ulna

13th cent. AD; 1 specimen; Context 62.

Bd	16.1
SC	7.6

TABLE 73: Anser anser Tibiotarsus

13th cent. AD; 2 specimens; Context 62.

GL	(1)	138.4
Bp	(1)	27.7
Bd	(2)	16.7 & 16.8
SC	(2)	8.0 & 8.6

*@

LATE MEDIEVAL 14th century AD

Context Nos.: 4, 91, 99, 163, 100

ER. Nos.:

TABLE 74: Gallus gallus Humerus

14th cent. AD; 1 specimen; Context 99.

GL	73.9
Bp	20.4
Bd	16.4
SC	7.5

TABLE 75: Gallus gallus Tibiotarsus

14th cent. AD; 1 specimen; Context 4.

Bp	22.1
SC	6.8

TABLE 76: Anser anser Radius

14th cent. AD; 2 specimens; Contexts 99, 163.

GL	(1)	142.8
Bp	(2)	9.0 & 9.2
Bd	(1)	9.9
SC	(2)	5.5 & 5.9

TABLE 77: Anser anser Carpometacarpus

14th cent. AD; 1 specimen; Context 163.

GL	82.7
Bp	19.7
Bd	10.7

TABLE 78: Anser anser Femur

14th cent. AD; 1 specimen; Context 163.

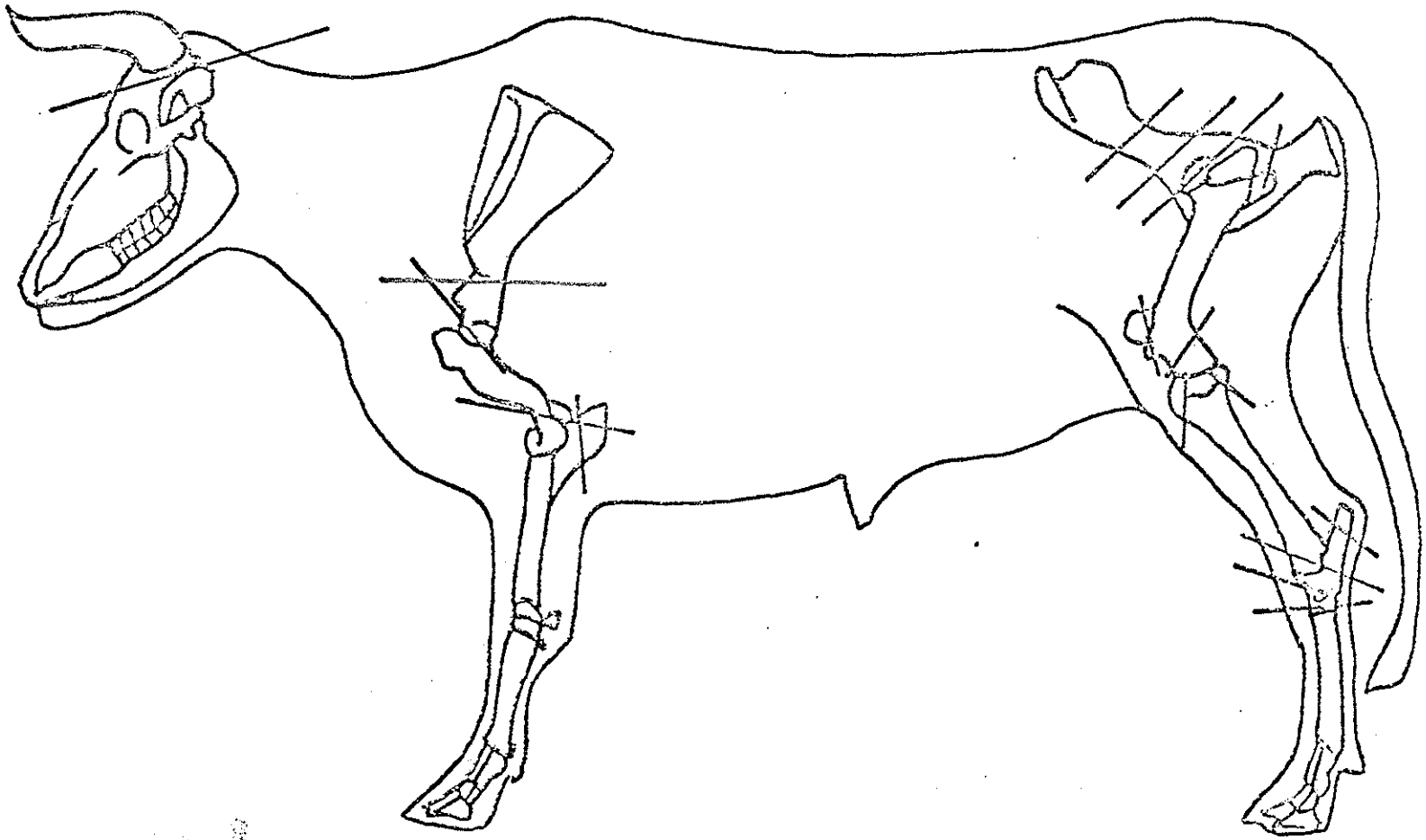
GL	77.0
Bp	19.3
Bd	19.2
SC	18.3

TABLE 79: Anser anser Tibiotarsus

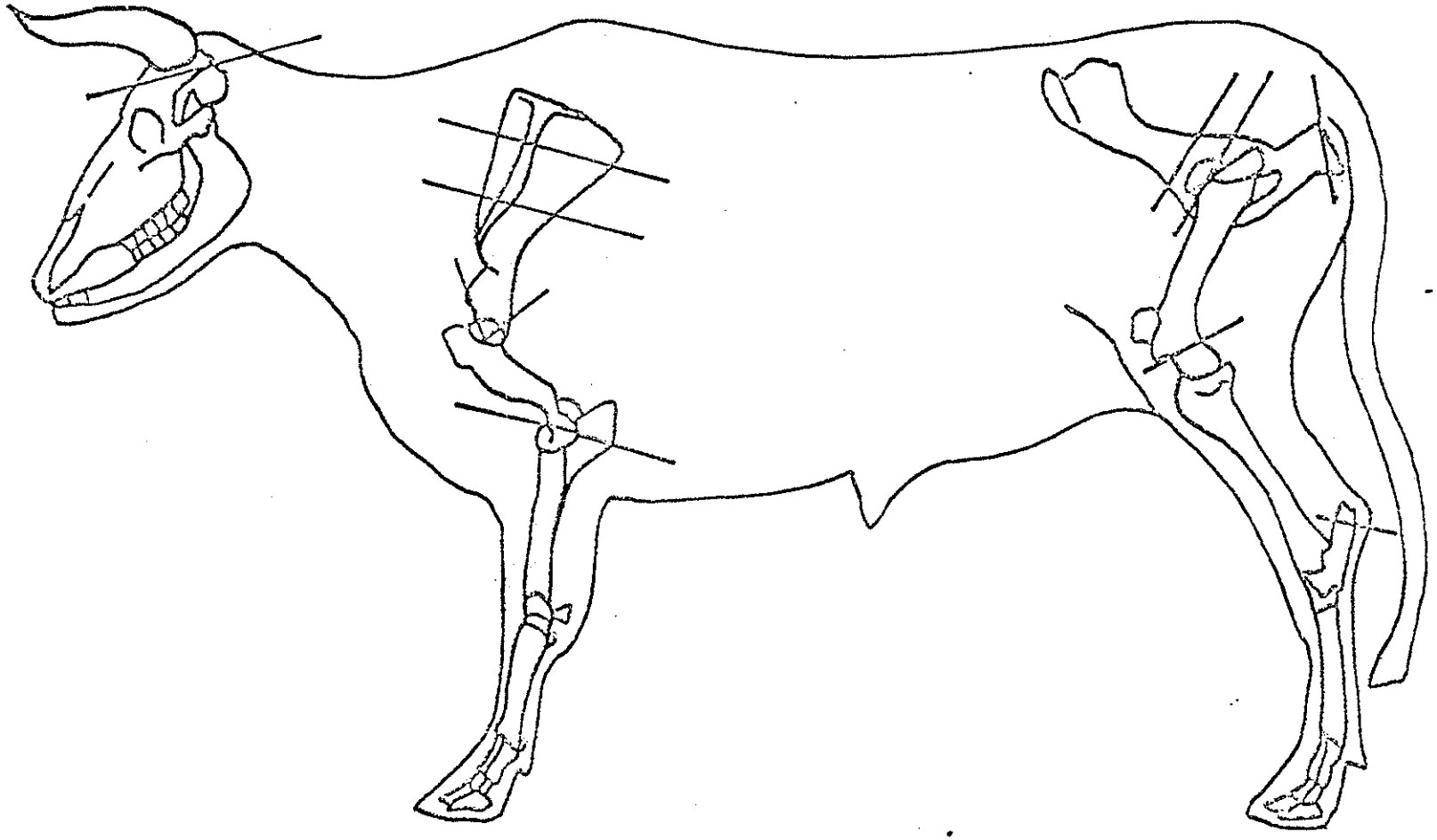
14th cent. AD; 1 specimen; Context 99.

GL	144.2
Bp	26.1
Bd	17.9
SC	8.4

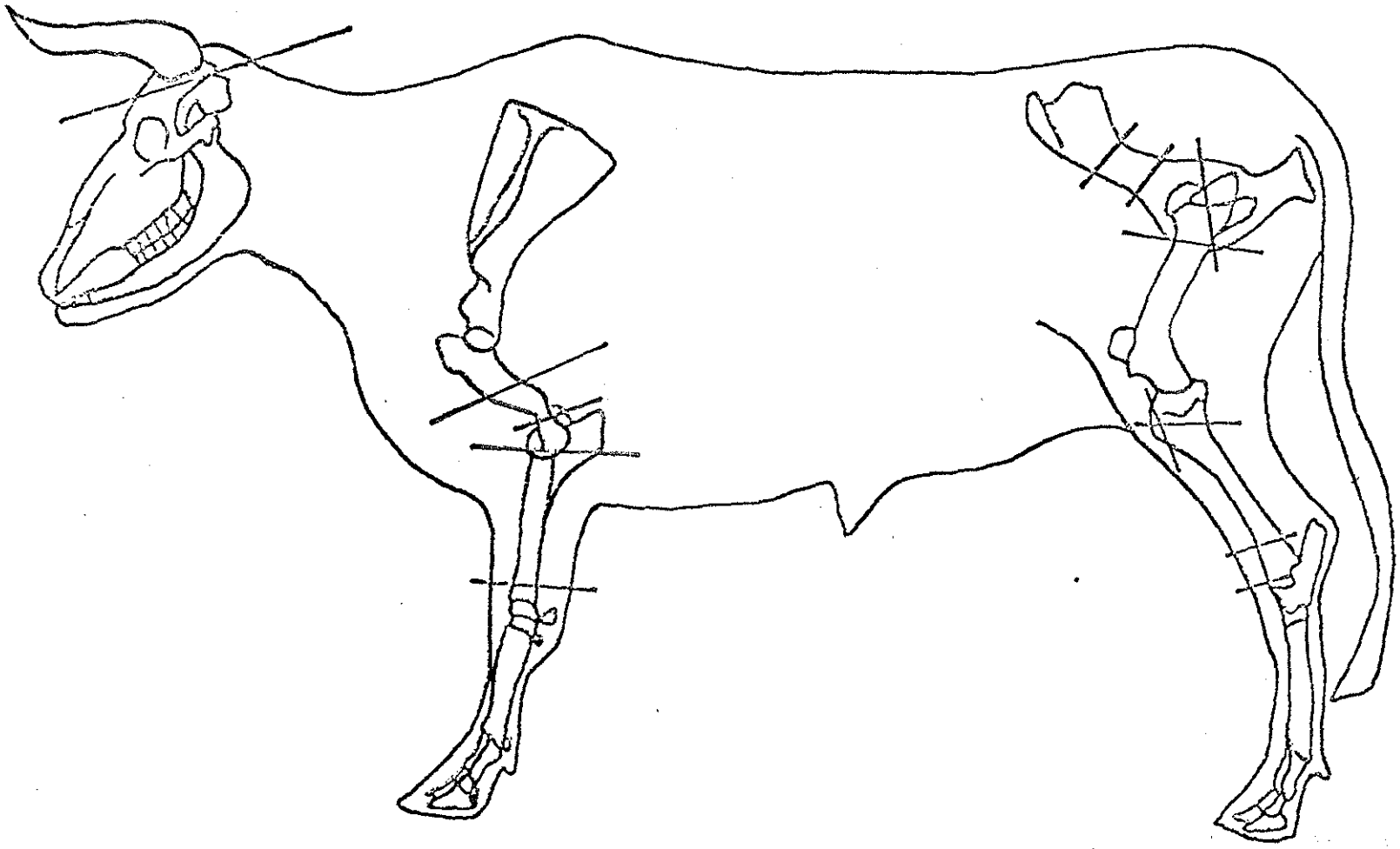
Fig.17: St. Magnus. Domestic ox.
Butchery, position of chop marks on skull and limb bones



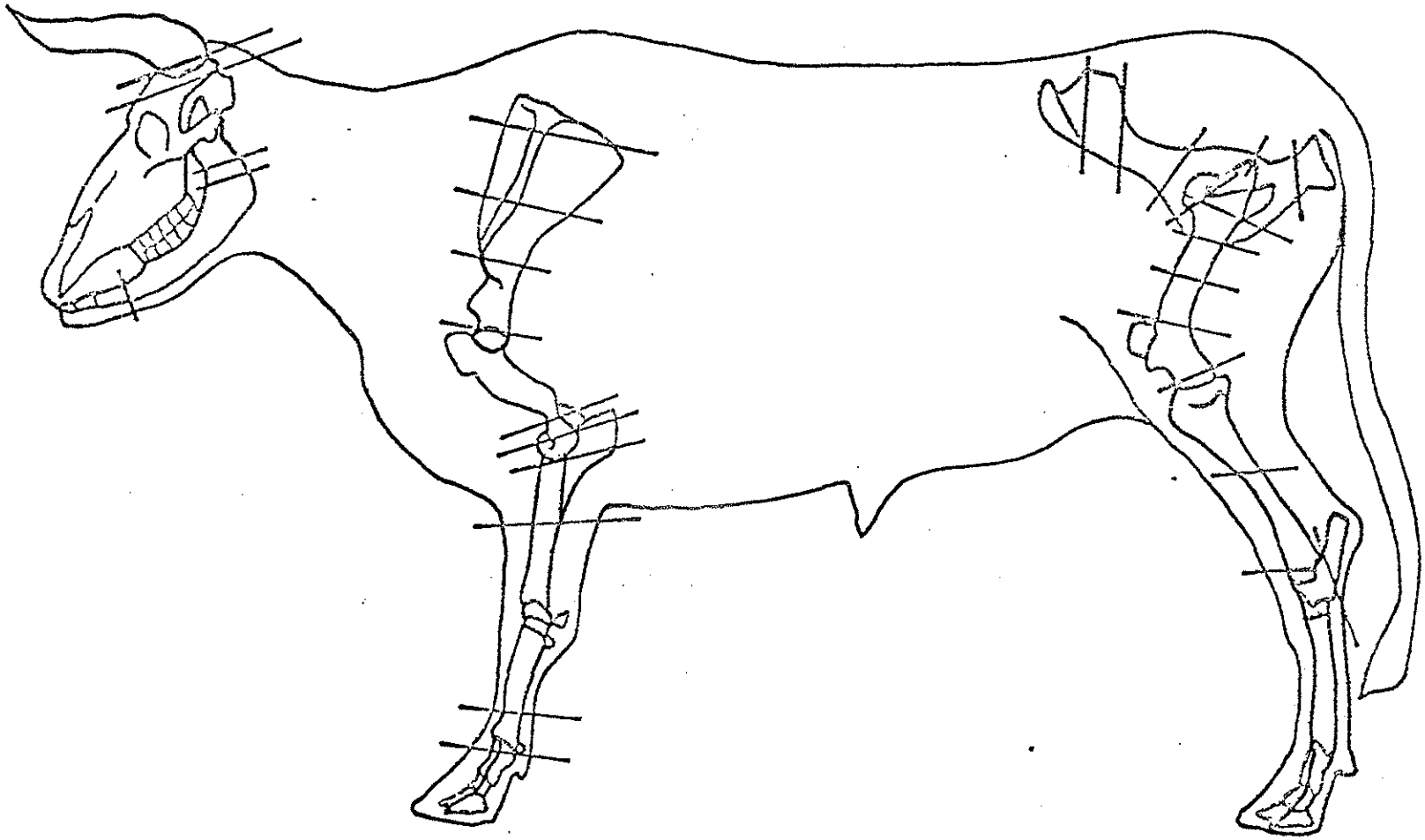
17.1 Roman, 1st to 4th century AD



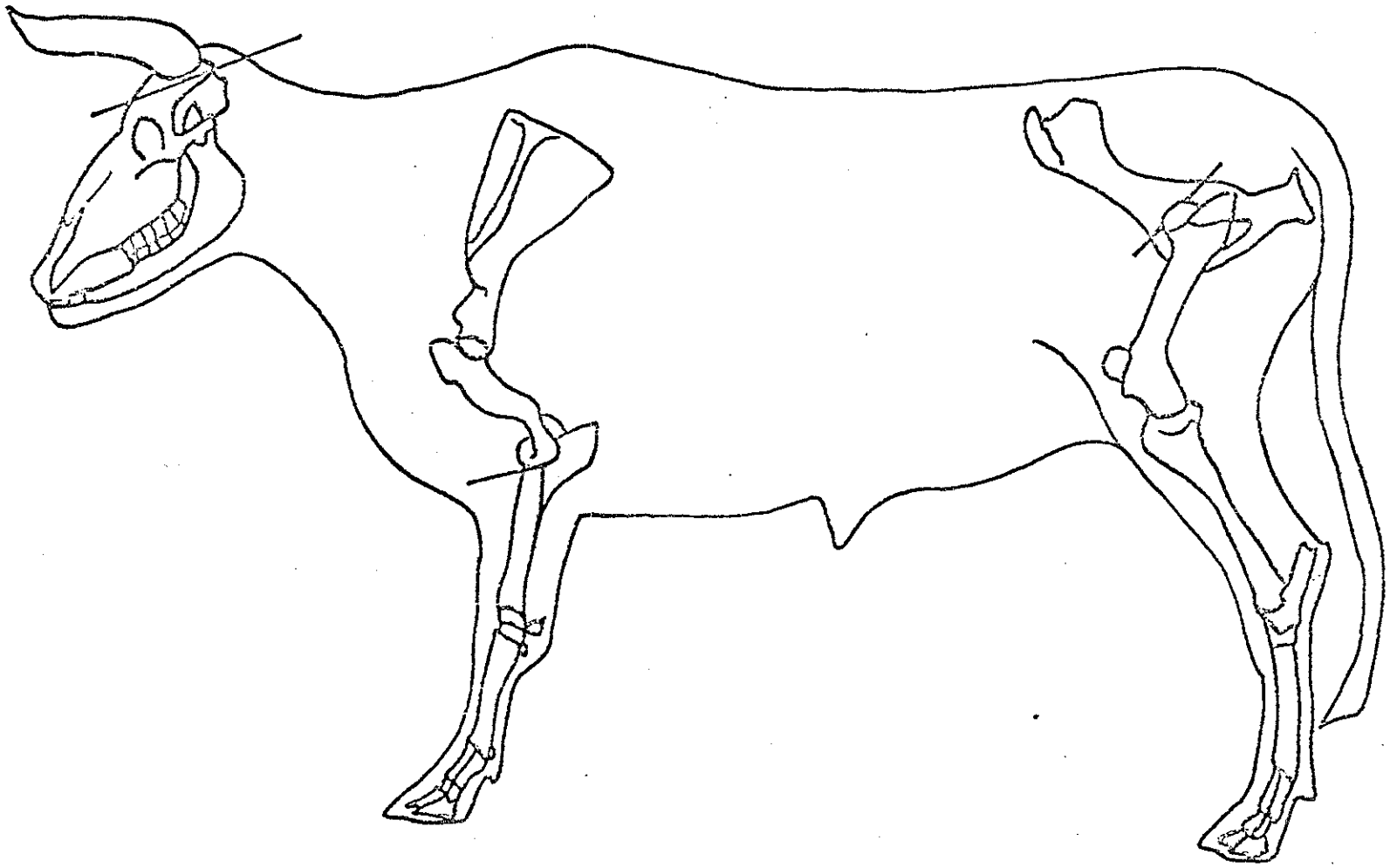
17.2 Late Saxon, late 9th/10th century AD



17.3 Saxo-Norman, c. 1050 - 1100 AD

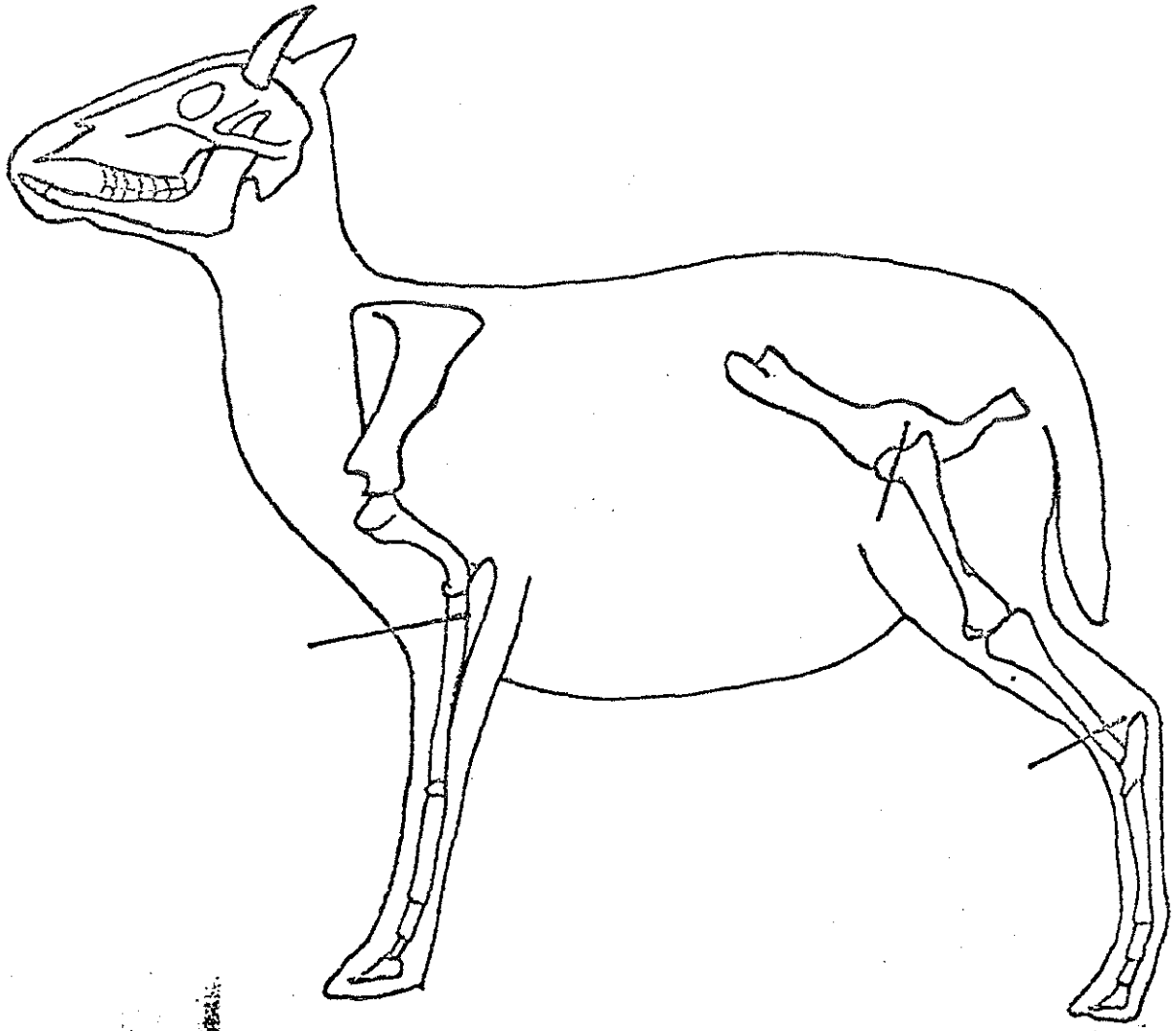


17.4 Medieval, early 12th to early 13th century AD

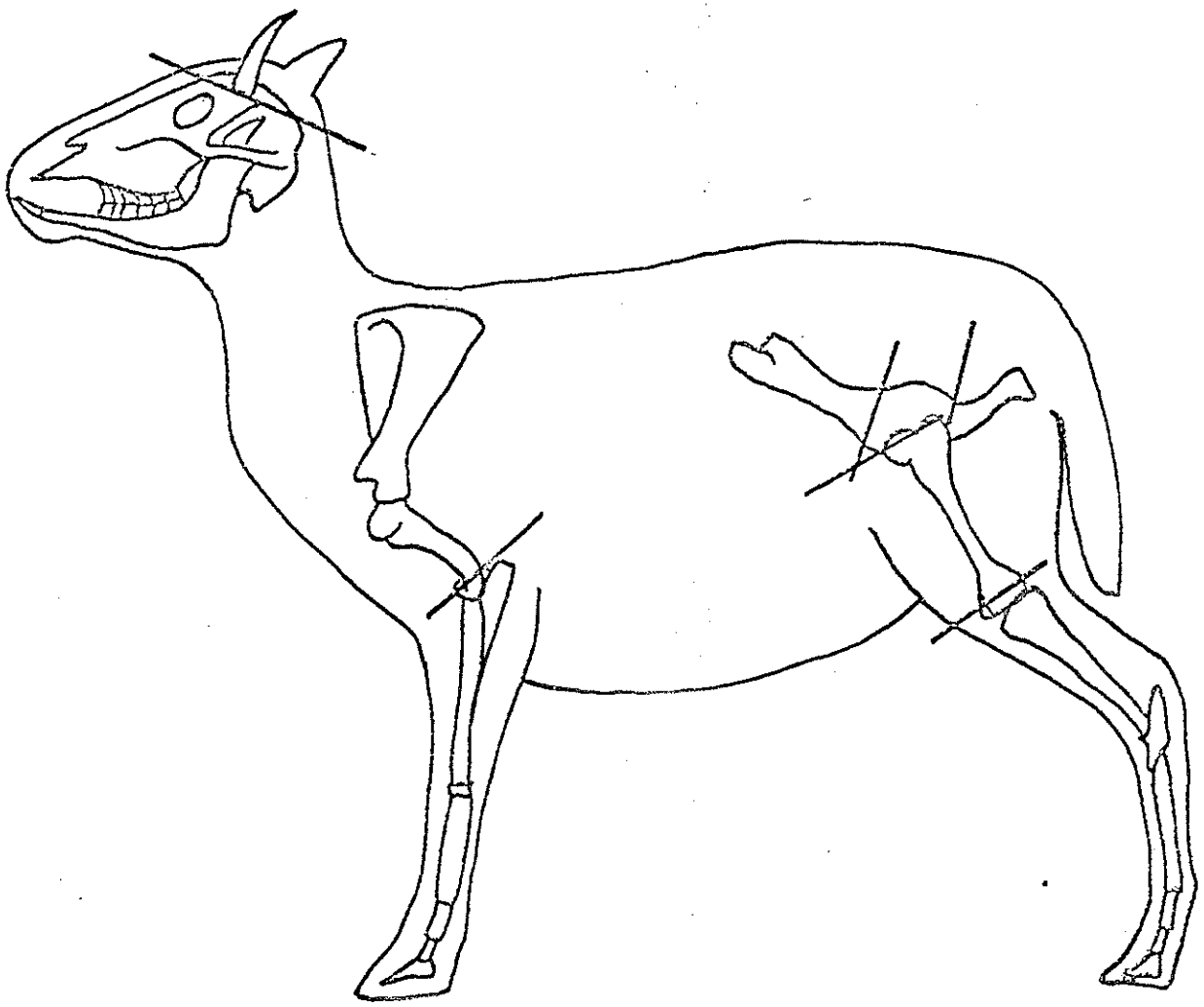


17.5 Later Medieval, late 13th to mid 14th century AD

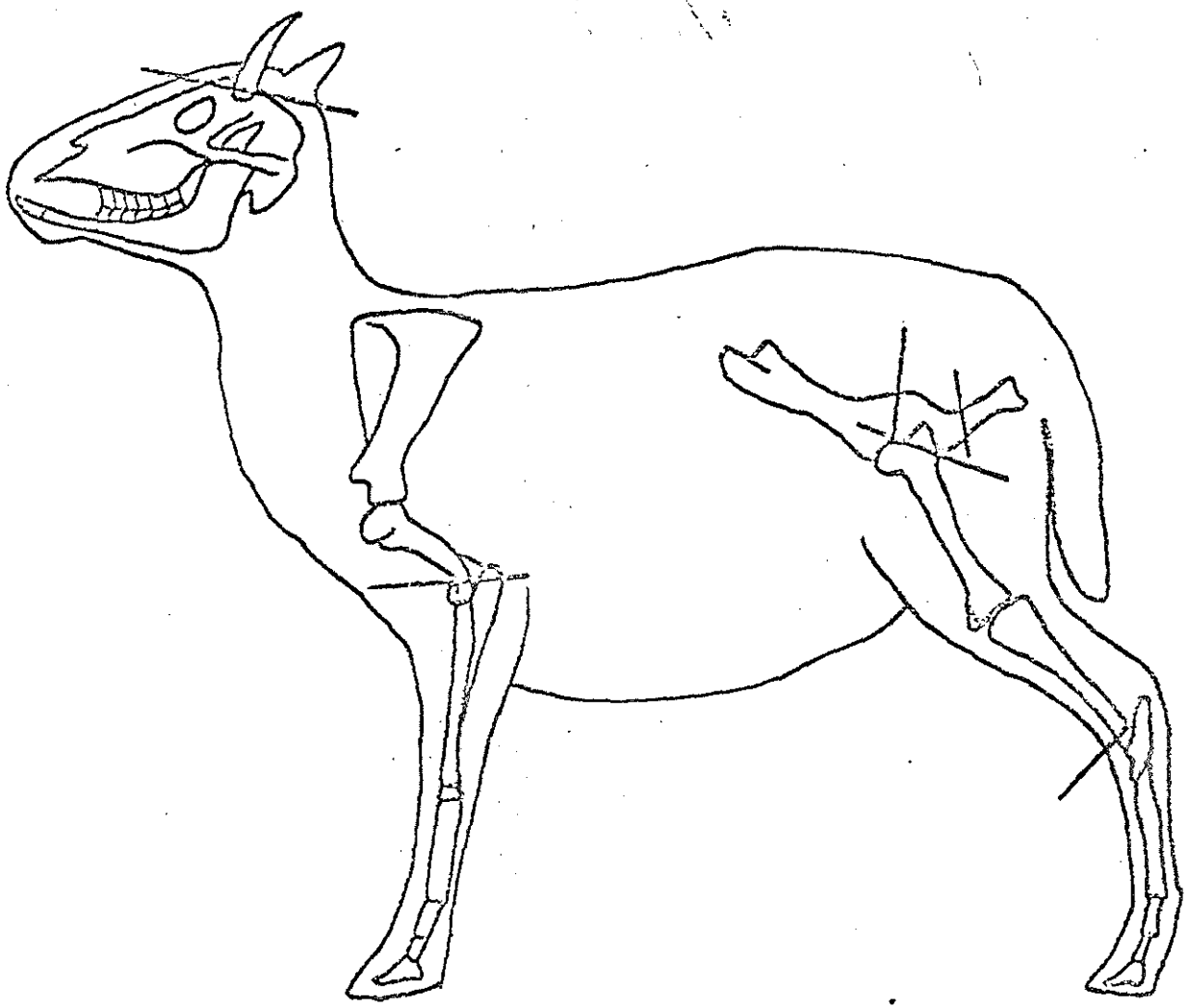
Fig. 18 : St. Magnus. Domestic sheep.
Butchery, position of chop marks on skull and limb bones.



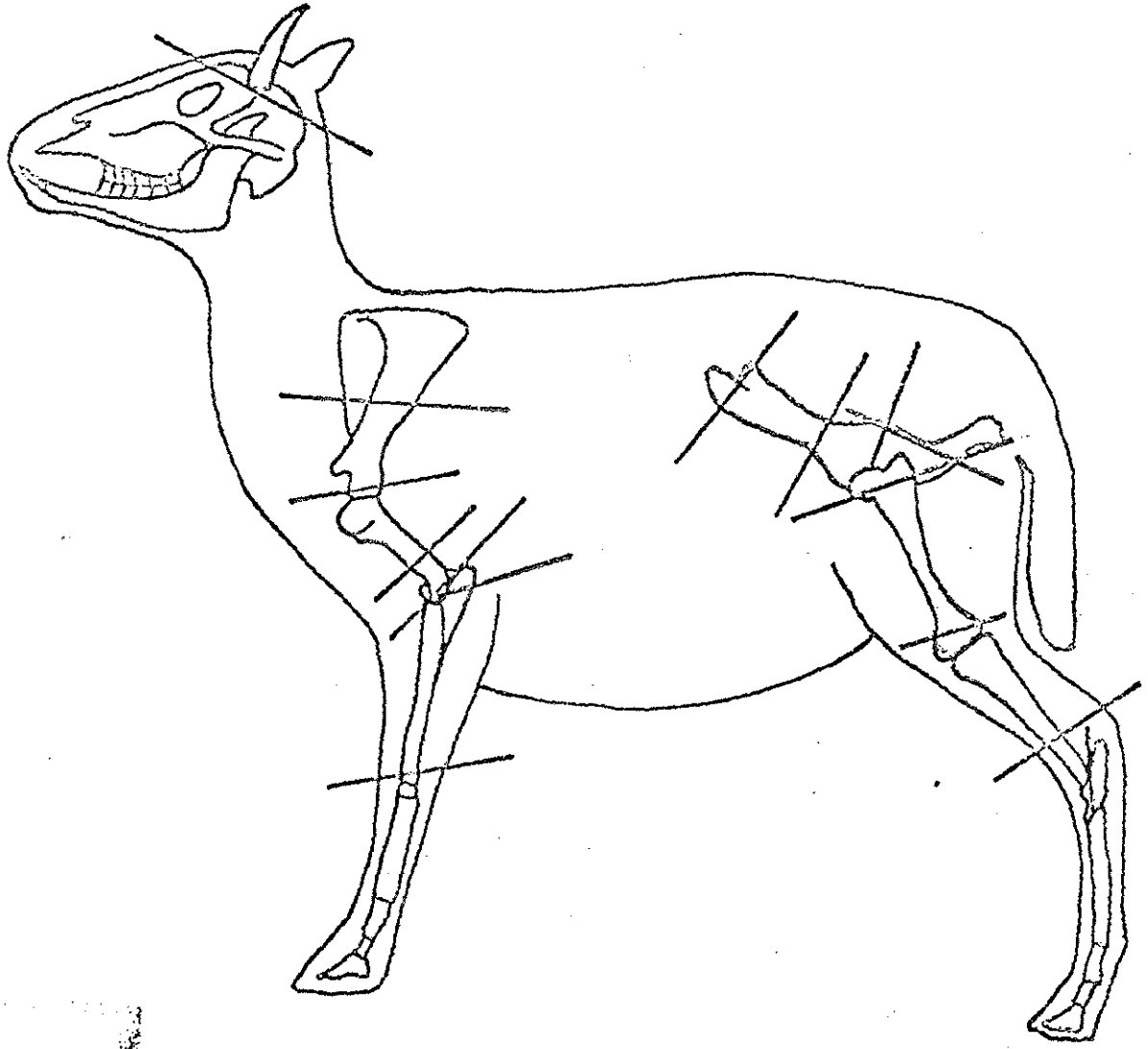
18.1 Roman, 1st to 4th century AD



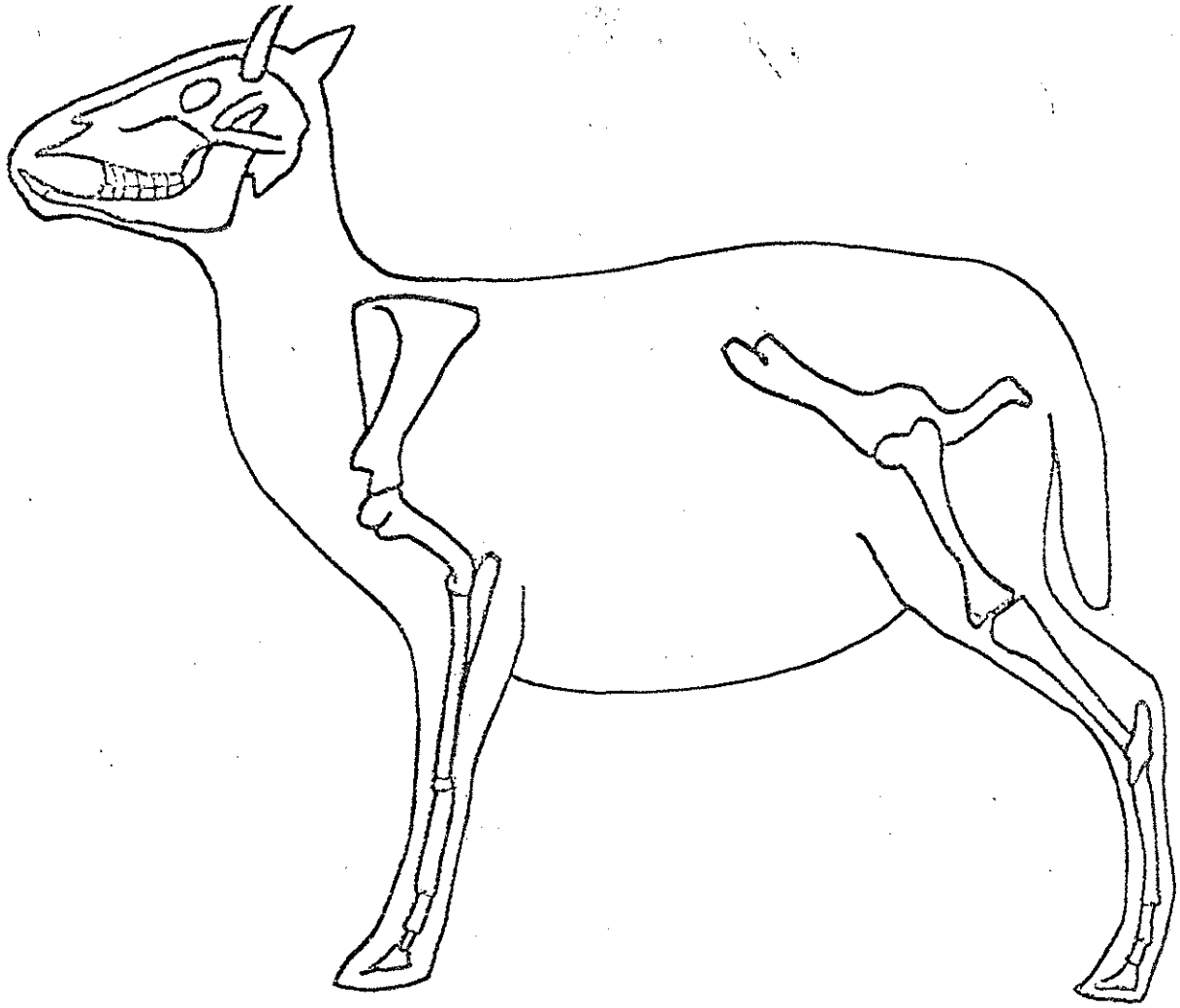
18.2 Late Saxon, late 9th/10th century AD



18.3 Saxo-Norman, c. 1050-1100 AD



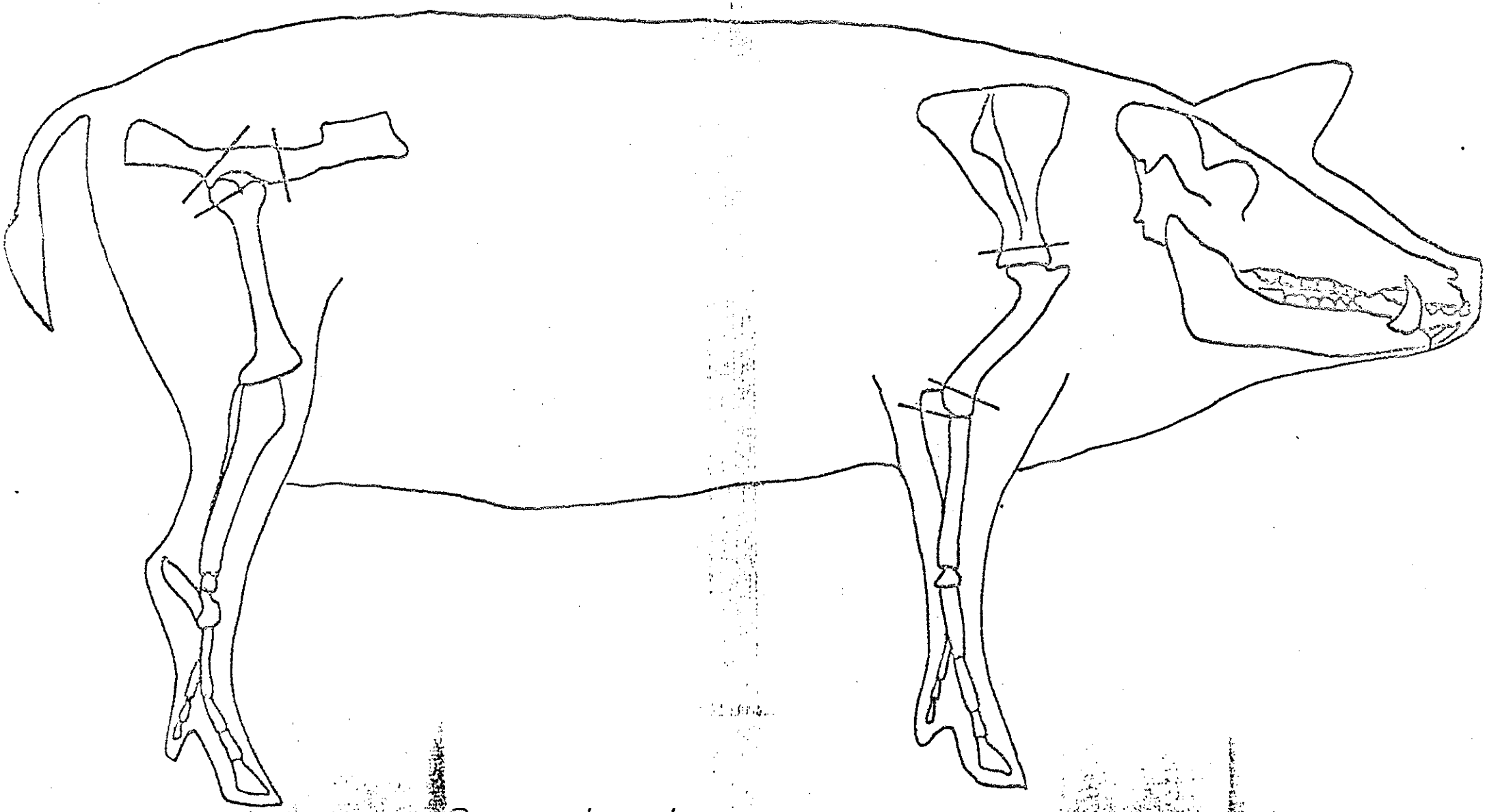
18.4 Medieval, early 12th to early 13th century AD



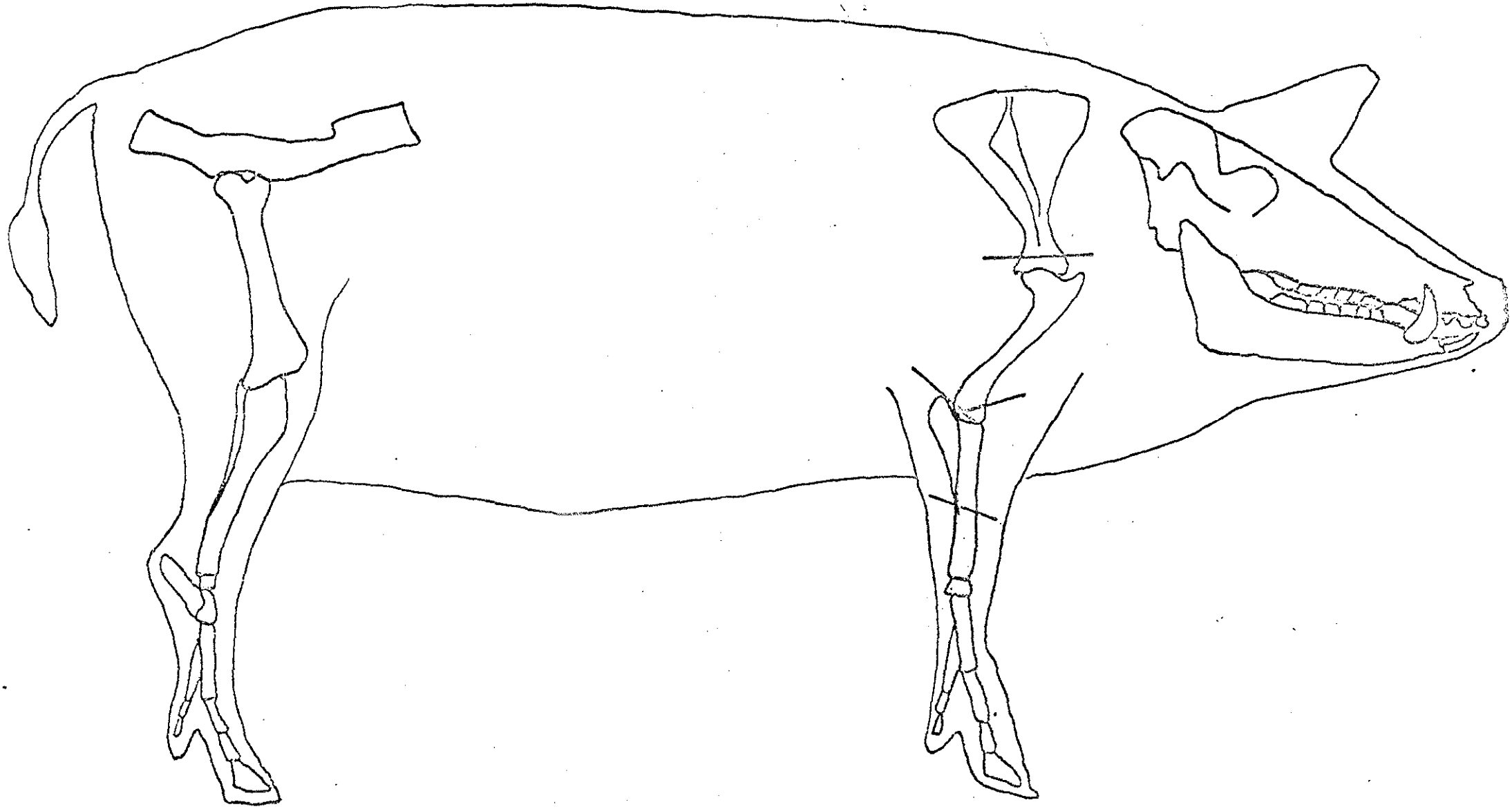
18.5 Later Medieval, late 13th to mid 14th century AD

Fig. 19 : St. Magnus. Domestic Pig.

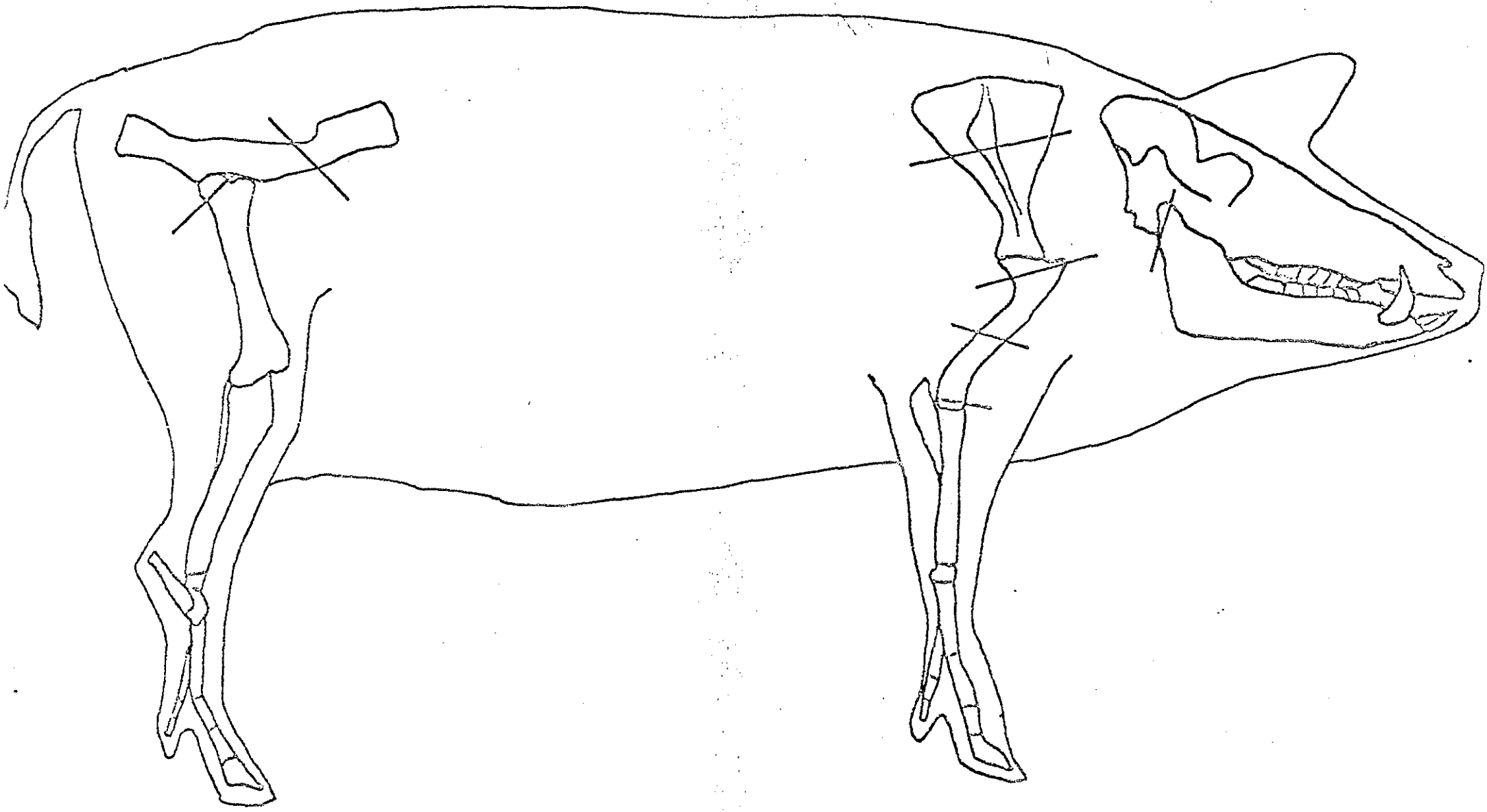
Butchery, position of chop marks on skull and limb bones



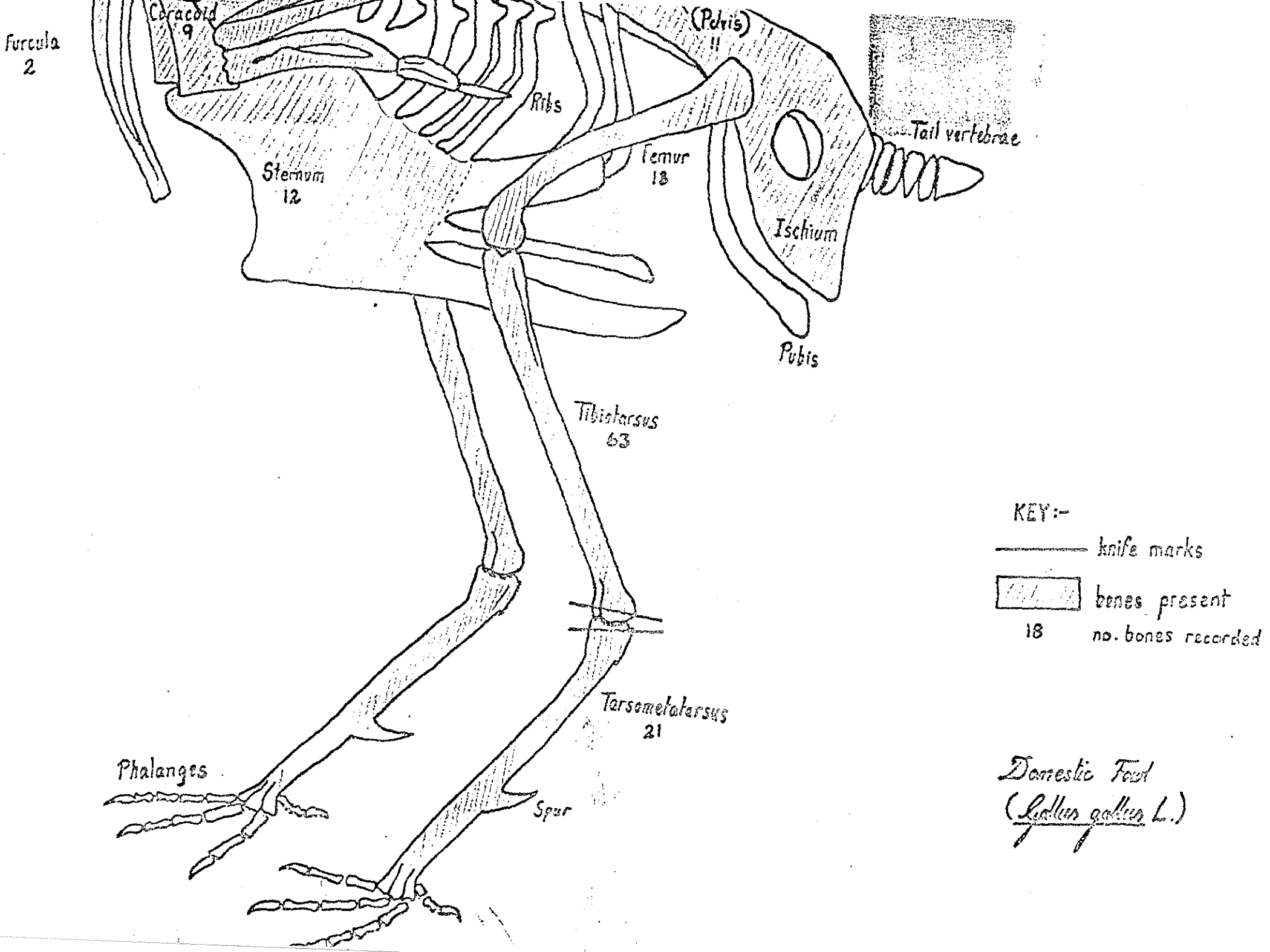
19.1 Roman, 1st to 4th century AD.



19.2 Late Saxon, late 9th/10th century AD



19.4 Medieval, early 12th to early 13th century AD



KEY:-

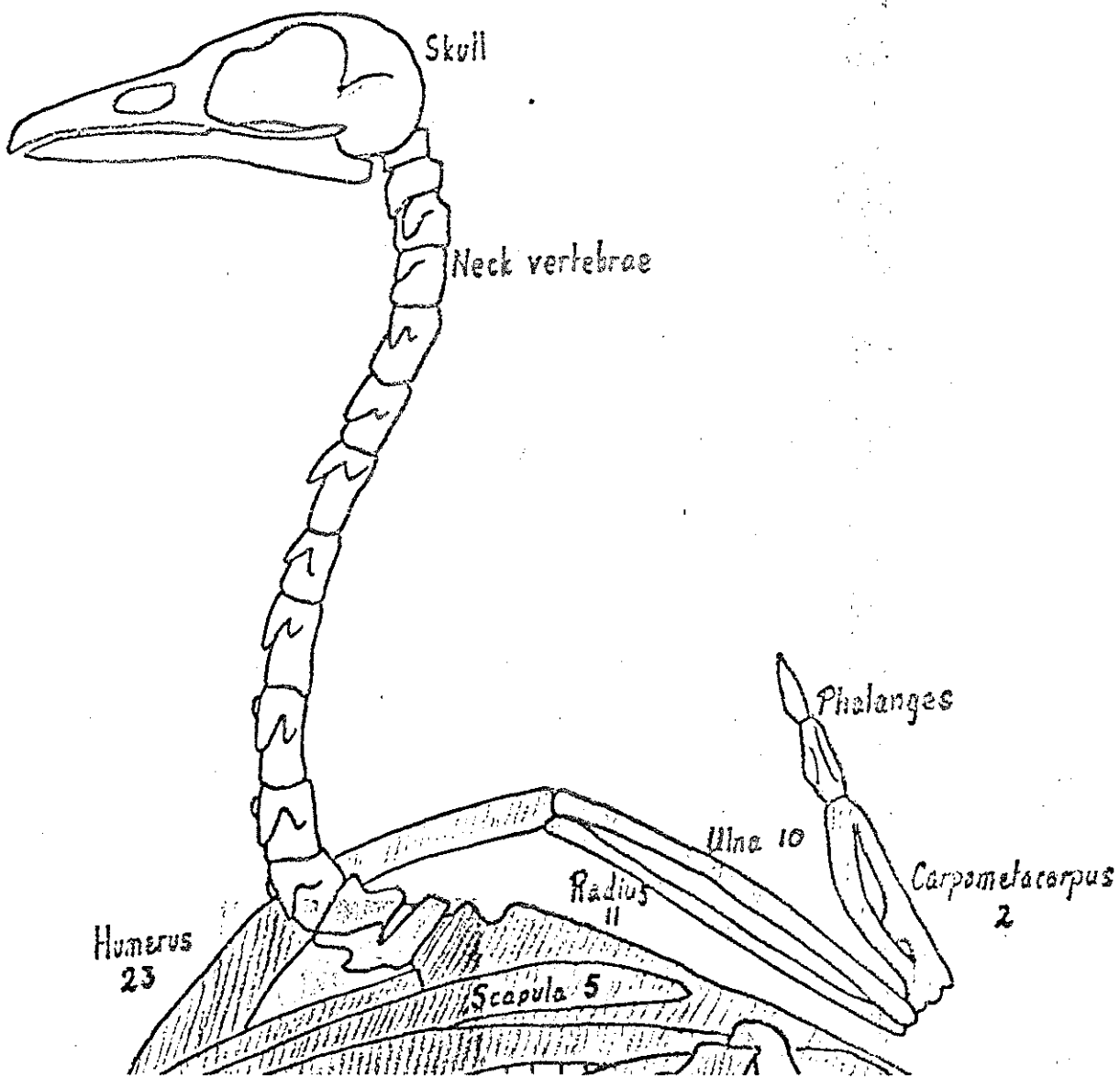
——— knife marks

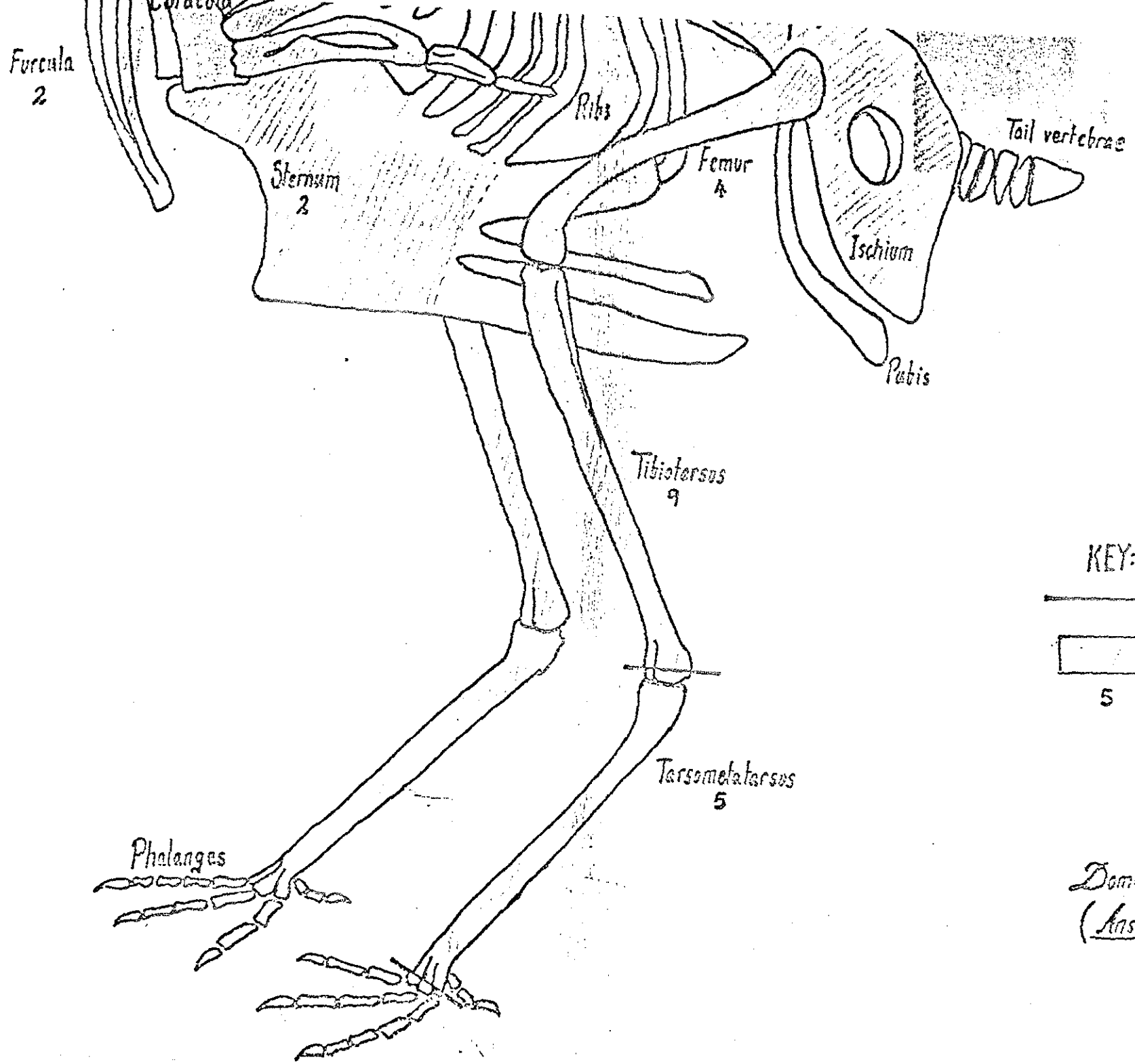
bones present

18 no. bones recorded

Domestic Fowl
(Gallus gallus L.)

Fig. 3


Skull
Neck vertebrae
Phalanges
Ulna 10
Radius 11
Carpometacarpus 2
Humerus 23
Scapula 5



KEY:—

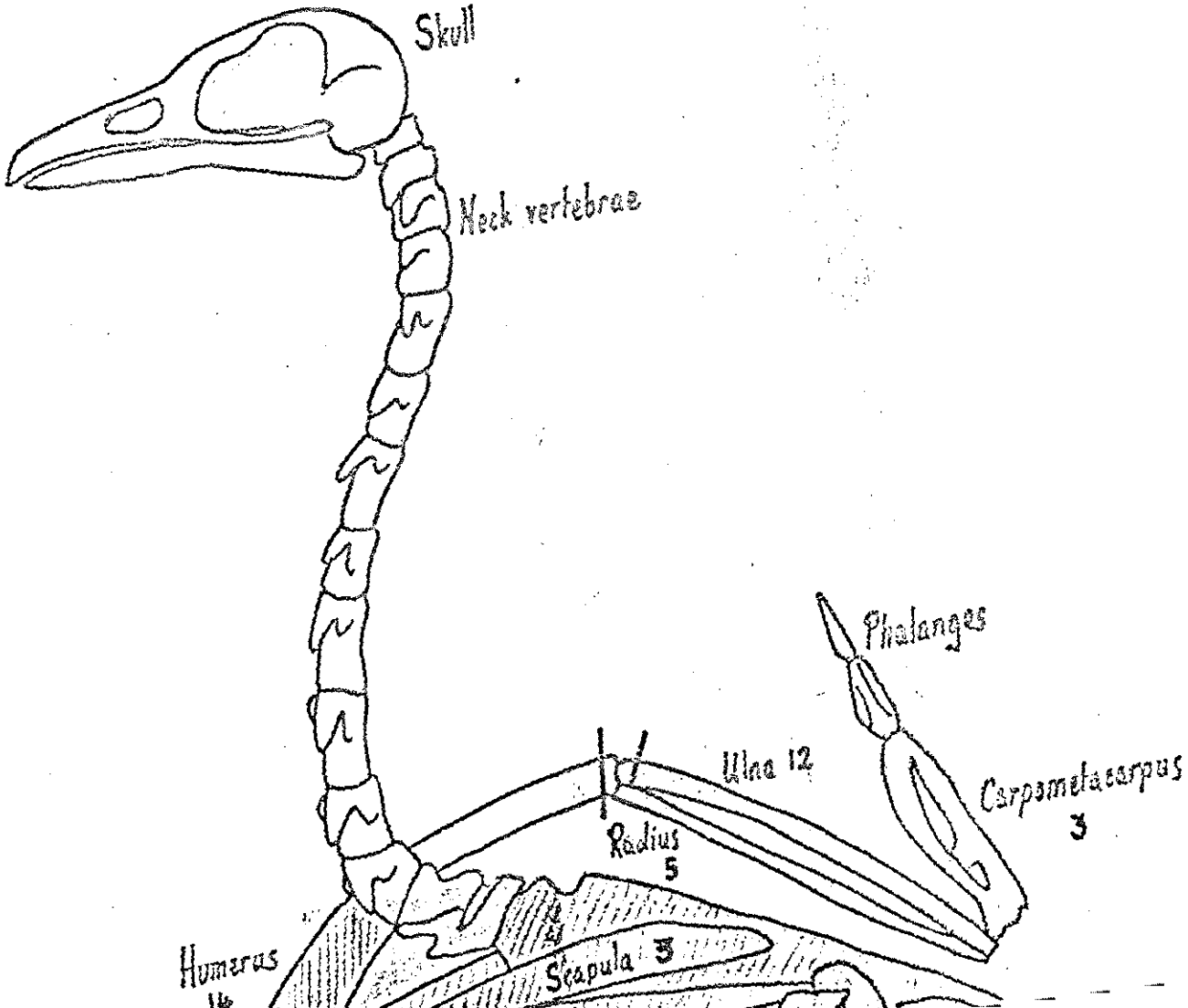
knife marks

bones preser

5 no. bones re

Domestic Goose
(Anser anser L.)

Fig. 4


Skull
Neck vertebrae
Phalanges
Ulna 12
Carpometacarpus
3
Radius
5
Humerus
Scapula 3