

Animal Bone

Jessica M. Grimm

Introduction and methods of analysis

The bone assemblage discussed here amounts to over 5000 bones; this figure is based on analysis of selected contexts. Bone from contexts with a high level of residual pottery was not analysed, resulting in a selection of *c.* 81% of the total assemblage. Analysed contexts can be divided into three chronological periods (see **Table 1**): Saxon (fills of an SFB), 10th-12th century AD (fills of ditches, graves, pits, wells and a posthole) and 13th-14th century AD (fills of a ditch, graves, pits and postholes).

Table 1: Number of identified bones (NISP) per period

Period	Contexts	N	NISP
Saxon SFB	184, 550, 553	1195	756
10 th -12 th century	132, 138, 145, 153, 157, 183, 197, 200, 205, 231, 252, 260, 288, 290, 292, 293, 303, 305, 312, 316, 318, 330, 343, 344, 345, 359, 361, 376, 380, 383, 389, 394, 395, 404, 405, 423, 433, 434, 435, 440, 443, 445, 450, 473, 475, 534, 563, 621, 685	3180	1286
13 th -14 th century	150, 159, 170, 174, 184, 189, 207, 266, 271, 273, 298, 336, 363, 366, 368, 370, 416, 418, 468, 494, 503, 510, 550, 553, 593, 689	847	487
	TOTAL	5222	2529

For each animal bone fragment, the following characteristics were recorded where applicable: species, bone element and side, fusion, mandible wear stages (following Grant 1982), sex and measurements (following Von den Driesch 1976). The positions of butchery marks were recorded according to the pictorial system of Lauwerier (1988). To establish the degree of burning the data published by Wahl (1981) was used. Evidence of gnawing and condition (on a scale of 1 to 5) were recorded. The zone system of Serjeantson (1996) was used to record completeness. For the distinction between sheep and goat, the data published by Prummel and Frisch (1986) and Hilson (1986) were used. To identify foetal bones of the domesticates the atlas published by Prummel (1987) was used. Withers heights were calculated using Von den Driesch and Boessneck (1974, cows), Teichert (1975, sheep) and ages estimated using Habermehl (1975) and Jones (2006).

Conjoining fragments were counted as one bone in order to minimise distortion. Fragments that could not be identified to species or family were recorded as small, medium or large mammal, bird, amphibian or fish. The fish bones were analysed with the help of the publications by Brinkhuizen (1989), Lepiksaar (1981) and Morales & Rosenlund (1979). Wessex Archaeology holds a database with full details of each bone.

Taphonomy

The bone preservation was good and only differed slightly between individual features (**Table 2**). This is to be expected as every feature is likely to have its own sequence of infilling and micro-environment. In general, and regardless of period, ditches contained material which is less well preserved and wells contained the best preserved material, indicating a higher degree of reworking and redeposition amongst the bone from the ditches.

Table 2: Characteristics of the period assemblages

Assemblage	Number of	Preservation	NISP	Average	Gnawed	Loose	Burnt
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	fragments	index		weight (g)*	%	Teeth %	%
Saxon	1195	3.9	756	18.0	3.0	2.9	5.7
10 th -12 th C	3180	3.8	1286	14.1	1.7	2.7	5.0
13 th -14 th C	847	3.8	487	10.8	1.7	5.0	1.8

*hand collected only; Preservation Index = (preservation stage x number of bones) / total number of bones in the assemblage)

Scavenger gnawing by canids had marked only 2.0% of all the bones and indicates that gnawing was probably not a significant taphonomic bias. Bones from graves were slightly more affected which probably reflects their provenance as incidental backfill finds. Sheep/goat and pig bones were more affected than the bones of cattle. Generally, there was a strong preference for the joints. This might be explained by the fact that joints are hard to deflesh completely during butchery or food preparation and thus would have been favourites with scavengers.

The proportion of loose teeth is low, at 3.1%. Together with the presence of part of a cattle spinal column (atlas, epistropheus and two cervical vertebrae) in pit 260 (10th to 12th century) and one instance of loose but matching epiphyses, this is seen as an indication that the Saxon and 10th to 12th century assemblages in particular were not extensively reworked. With only 5.3% complete bones, which includes many long bones, the assemblage was not heavily fragmented and no great differences were seen between the assemblages. Carcasses were thus not heavily used.

About 5% of all the bones were burnt. Bones originating from 13th-14th century contexts were least affected. Generally, most identifiable fragments were of cattle, but affected bones of sheep/goat and pig were also seen. The majority of the bones were scorched which indicates temperatures of *c.* 300-400° C (Wahl 1981, 159). Bone does not discolour when meat is cooked or roasted. This means that the discoloured fragments are the result of throwing bones deliberately into the fire (burning waste) or bone sticking out during roasting and so making direct contact with the fire.

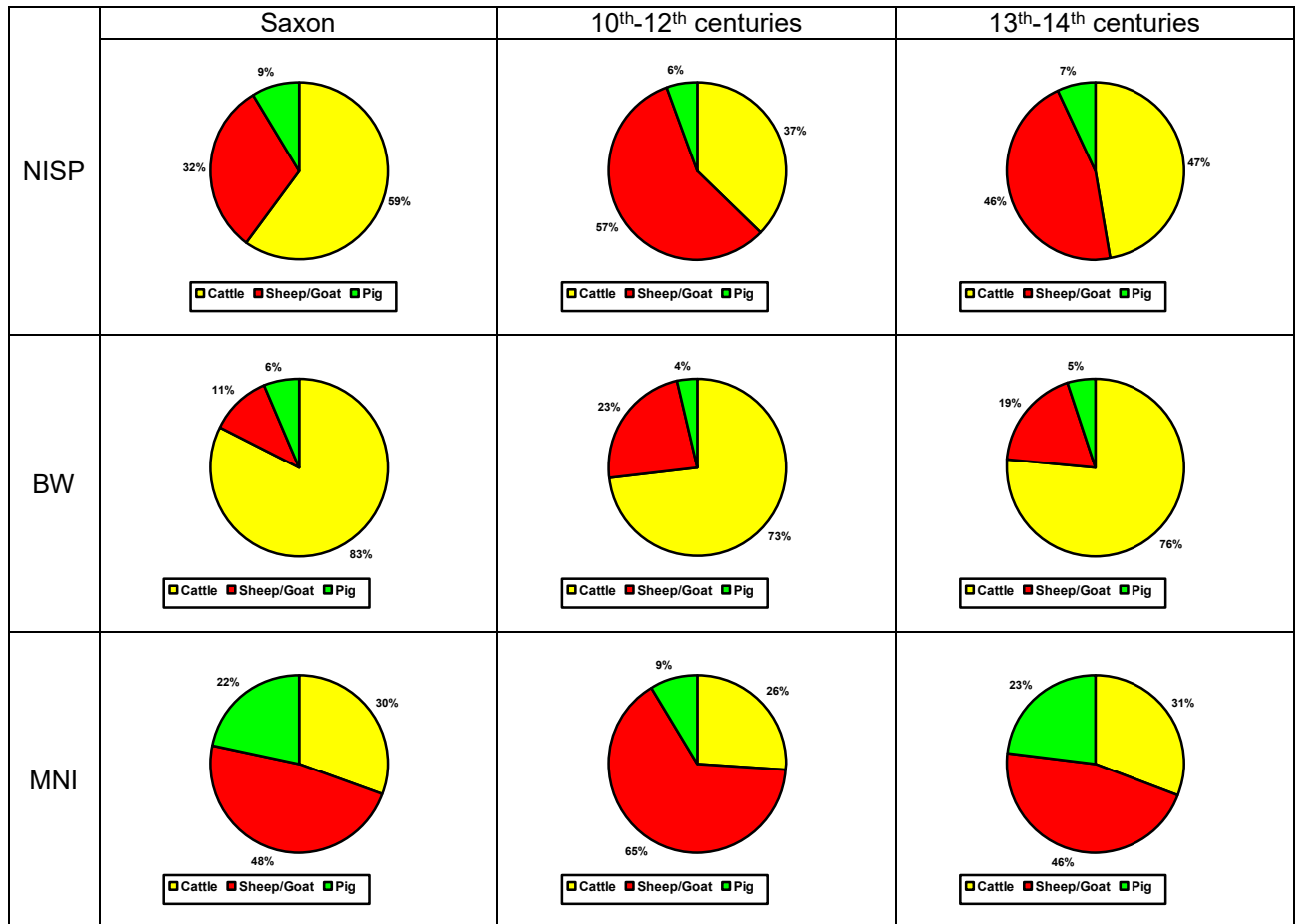
Species proportions

Species proportions were calculated using NISP, Bone Weight (BW) and Minimum Number of Individuals (MNI) (**Figure 1**). using NISP, cattle bones were most common in the Saxon period, followed by sheep/goat and a small proportion of pig. This changed in the 10th-12th centuries, when sheep/goat were more numerous than cattle. In the 13th-14th centuries the proportions of cattle and sheep/goat were balanced. As cattle and horse bones are much heavier than sheep/goat or pig bones; cattle, followed by sheep/goat and pig lead the ranking according to the Bone Weight method in all periods. As Bone Weight is correlated to live weight, beef was probably more important than mutton or pork in all periods.

It is likely that the smaller and less resilient bones of the smaller animals survived less well than the more robust bones of the larger animals. Therefore, the MNI was calculated taking into account zonation, body side, sex and age. The MNI suggests that sheep/goat were the most numerous animals kept in all periods, followed by cattle and pig. The fact that the mandibles in particular are responsible for the high MNI values for sheep/goat and pig indicates that other parts of the skeleton survived less well. A different explanation, in which large quantities of loose mandibles were transported to the site, is unlikely. Moreover, the observed phenomenon is quite common in archaeozoological assemblages from different periods, areas and type (e.g. Legge and Durrington 1985, 124, 127). To summarise, beef was

probably most frequently consumed, whereas sheep/goats were kept in greater numbers as livestock.

Figure 1: Cattle, sheep/goat and pig proportions through time using NISP, BW and MNI



Of the ovicaprid assemblage, 22 horn core fragments, 15 crania fragments and 15 milk fourth premolars could be assigned to sheep upon the morphological criteria given by Prummel and Frisch (1986) and Hillson (1986, 101). One positive goat horncore was also identified in the Saxon assemblage. It thus seems that virtually all of the sheep/goat bones are in fact sheep.

Domestic fowl was kept during all periods. As bird bones are less resilient and quite small, their proportion in relation to the mammal bones cannot be accurately assessed. The other possible domestic poultry species is goose. Since the modern size difference between domestic goose and greylag goose is fairly recent and morphological differences are absent, the domestic nature of the bones can not be confirmed (Prummel and Zeiler 1993, 39). The same holds true for domestic duck versus mallard. Historical sources however seem to indicate that true duck husbandry was a late medieval or post-medieval invention (Benecke 2004, 174; Albarella 2005). Other bird species include a small species of duck in the 10th-12th century assemblage (i.e. teal) and woodpigeon (*Columba palumbus*) in the 13th-14th century assemblage.

The wild mammal species present consist of deer and hare (*Lepus europaeus*) in the Saxon assemblage and red deer (*Cervus elaphus*), rabbit (*Oryctolagus cuniculus*), field vole (*Microtus agrestis*) and mouse in the 10th-12th century assemblage. Since the deer bone consisted exclusively of antler, hunting for venison cannot be proven, as shed antlers could

have been collected. The small proportion of edible wild mammal species suggests that the inhabitants of Saxon and medieval Wilton relied mainly on their livestock for their protein needs.

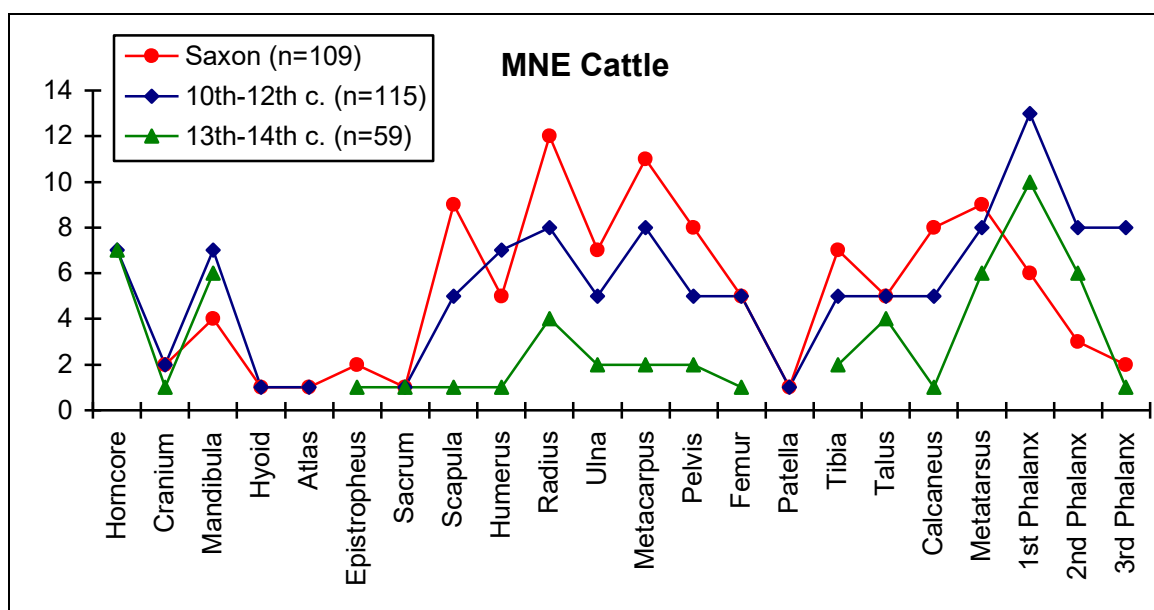
The wet-sieving (5.6 and 2 mm) of soil samples resulted in the recovery of a moderate quantity of fish remains. Species present include cod (*Gadus morhua*), eel (*Anguilla anguilla*), flatfish, mackerel (*Scomber scombrus*) and herring/sprat (*Clupea harengus/Sprattus sprattus*). Their low numbers do not necessarily mean that fish were only seldom eaten as experiments by Jones (1986) show that a large number of bones from medium-sized fish are likely to have been lost to the archaeological record. Medieval trading networks would have been sufficient to ensure that Wilton received a regular supply of marine fish from the coast. Moreover, the religious avoidance of meat on many days of the year (Fridays, Lent, Advent etc.) led to a huge demand in meat substitutes.

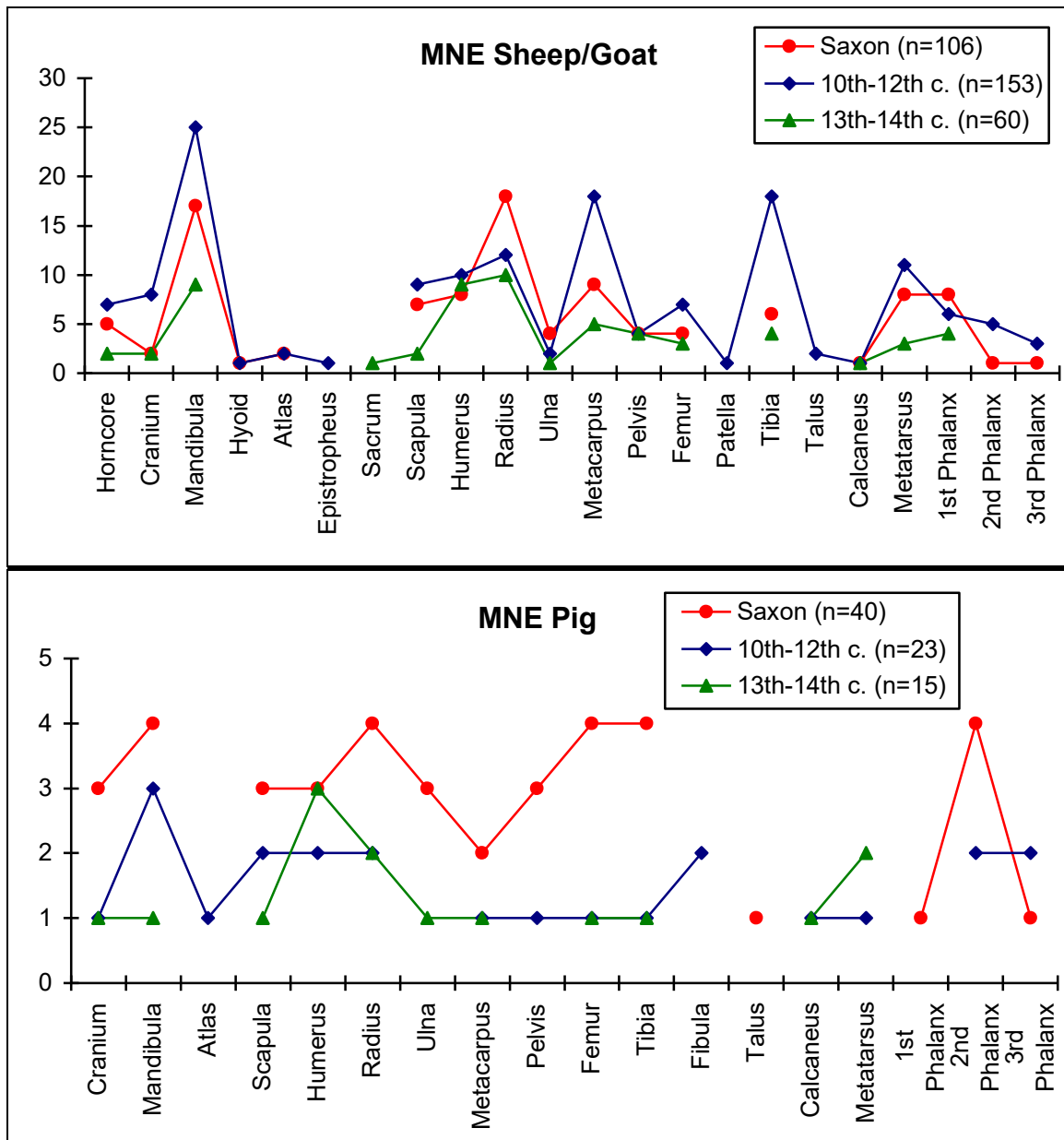
Species richness is greatest in the 10th-12th century assemblage with 21 species, compared to 11 in the Saxon period and ten in the 13th-14th century. Although species richness increases with sample size, it seems that the difference between the periods is independent of this. Being able to obtain a varied diet probably indicates affluence. The greater species richness in the 10th-12th centuries coincides with Wilton's most prosperous period.

Element representation

Using the Minimum Number of Elements method (MNE) for the cattle, sheep/goat and pig assemblages showed that these animals were processed on or near the site during all periods as most of their skeletal elements are present. Interestingly, **Figure 2** also shows some similarities and differences in the distribution of skeletal elements between the species, probably the result of taphonomic mechanisms and anthropogenic behaviour. For instance, elements of the head (more precisely the mandibula) are well represented in all three species, but most clearly in the smaller sheep and pig. This is a well-known phenomenon and usually attributed to taphonomy (bone density and butchery practice) and easy identification of the mandibula even when it is fragmented. Due to time constraints, no zones were recorded for vertebrae and costae.

Figure 2: Distribution of skeletal elements per animal using MNE





Although the assemblages are small, it seems that they contain more kitchen waste (meat-rich parts such as upper limbs) than pure butchery offal (heads and feet). This holds less true for pig where all elements are evenly represented. This might indicate that these animals were prepared whole (i.e. roasted) and not prepared as cuts, as beef probably was. In sheep/goat, mandibula, radius, tibia and metapodials were better preserved as these elements are more resilient.

Table 3: Fish remains by period

Context	Feature	Period	Species	Element	Side	Amount	Comments
184		Saxon	cod	precaudal vertebra	N/A	4	
184		Saxon	cod	precaudal vertebra	N/A	1	
157	Well	C10/C12	flatfish	precaudal vertebra	N/A	1	
157	Well	C10/C12	flatfish	caudal vertebra	N/A	1	
157	Well	C10/C12	mackerel	caudal vertebra	N/A	2	one crushed
197	Ditch	C10/C12	flatfish	caudal vertebra	N/A	1	
197	Ditch	C10/C12	mackerel	caudal vertebra	N/A	1	

231	Well	C10/C12	eel	cleithrum		1	chord length 13.0 mm
231	Well	C10/C12	eel	precaudal vertebra	N/A	1	
231	Well	C10/C12	flatfish	quadratum		1	qu.gr.b. = 5 mm
231	Well	C10/C12	flatfish	caudal vertebra	N/A	1	
231	Well	C10/C12	flatfish	precaudal vertebra	N/A	1	
231	Well	C10/C12	gadid	precaudal vertebra	N/A	1	
231	Well	C10/C12	herring	caudal vertebra	N/A	3	
288	Pit	C10/C12	eel	dentale	L	1	
290	Pit	C10/C12	flatfish	urohyale		1	
290	Pit	C10/C12	flatfish	precaudal vertebra	N/A	1	
330	Pit	C10/C12	eel	precaudal vertebra	N/A	1	
343	Pit	C10/C12	eel	precaudal vertebra	N/A	1	
433	Pit	C10/C12	eel	cleithrum		1	chord length 13.6 mm
433	Pit	C10/C12	eel	precaudal vertebra	N/A	2	
189	Ditch	C13/C14	mackerel	caudal vertebra	N/A	1	

The fish material (**Table 3**) contains both elements of the head and elements of the trunk, showing that complete fish were processed at the spot.

Age & Sex

Analysis of the age and sex of the population hints at the husbandry strategies employed for each species. The only ageable Saxon cattle jaw indicates an animal of 5-6 months. Several bone fragments clearly belonged to perinatal casualties. Reichstein (1994) sees the presence of foetal bone as an indicator of animal keeping on the spot as the meat of unborn animals is normally discarded as unpalatable (Habermehl 1975). As most soil conditions do not favour the survival of these very soft bones, the original proportion of perinatal casualties was probably much higher.

Although age patterns obtained from dental data are more reliable as it is thought that the different stages of tooth eruption differ less between animals than does epiphysal fusion, no detailed data can be obtained once all teeth are in wear. Therefore the epiphysal fusion data were also analysed (after Habermehl 1975). Uerpmann (1972) describes a method of transforming the epiphysal fusion data into proportions of animals killed at a particular age. The data in the last column of **Table 4** is an interval: the relative number of animals who died between this and the preceding age group.

Table 4: Epiphysal data of Saxon cattle (after Habermehl 1975)

Age (Months)	Epiphysis	Number fused	%	Number non-fused	%	Total	Interval %
7-10	Scapula	7					
	Pelvis	7		1			
12-15	Radius p.	5					
15-18	Phalanx II p.	2					
15-20	Humerus d.	3					
sub-total		24	96	1	4	25	4
20-24	Phalanx I p.	5		1			
24-30	Tibia d.	7					
	Metapodia d.	7		4			
sub-total		19	79	5	21	24	17
c. 36	Calcaneus p.	4		4			
42	Femur p.	1		1			
42-48	Femur d.	3		3			
	Humerus p.	2					
	Tibia p.	1		2			
	Ulna p/d			2			
	Radius d.	6		4			

sub-total		17	52	16	48	33	27
48-60	Vertebra	5		14			
sub-total		5	26	14	74	19	26
Total		65	64	36	36	101	

The epiphysal fusion age data in **Table 4** shows that approximately one fifth of the cattle are butchered in their second year and a quarter each in their fourth and fifth year during the Saxon period. A quarter of all Saxon cattle lived beyond the age of five years and cattle below two years were hardly ever killed. The fairly equal proportions of cattle killed after the age of two years indicates a balanced husbandry strategy which respects meat production as well as the production of secondary products like milk, manure and traction. The fairly equal proportions of animals killed ‘each year’ might indicate autumn slaughter. Animals not producing enough milk or off-spring were probably not kept over the winter. None of the fragmentary cattle pelvises dating to the Saxon period could be sexed.

Five cattle jaws from 10th-12th century contexts could be aged as follows: one of 24-28 months and four older than three years (three with a distinctively worn third molar). In addition, the epiphysal fusion data shows the presence of calves (**Table 5**). Compared to the Saxon period, cattle were probably butchered later in the 10th-12th centuries, indicating that meat production became subordinate to traction, manure and milk. No bones from this period could be sexed.

Table 5: Epiphysal data of 10th-12th century cattle (after Habermehl 1975)

Age (Months)	Epiphysis	Number fused	%	Number non-fused	%	Total	Interval %
7-10	Pelvis	2		1			
12-15	Radius p.	8					
15-18	Phalanx II p.	6		1			
15-20	Humerus d.	5		1			
sub-total		21	88	3	12	24	12
20-24	Phalanx I p.	12		1			
24-30	Tibia d.			1			
	Metapodia d.	8		8			
sub-total		20	67	10	33	30	21
c. 36	Calcaneus p.			1			
42	Femur p.	1					
42-48	Femur d.	3		1			
	Humerus p.	1					
	Tibia p.	1		1			
	Ulna p/d			2			
	Radius d.	3		1			
sub-total		9	60	6	40	15	7
48-60	Vertebra	7		2			
sub-total		7	78	2	22	9	-
TOTAL		57	73	21	27	78	

The scarce cattle dental data for bone from 13th-14th century contexts indicates older animals over three years only. The epiphysal data in **Table 6** shows that these cattle were probably not much older than these three years. Calves were also present in the assemblage. No fragments could be sexed.

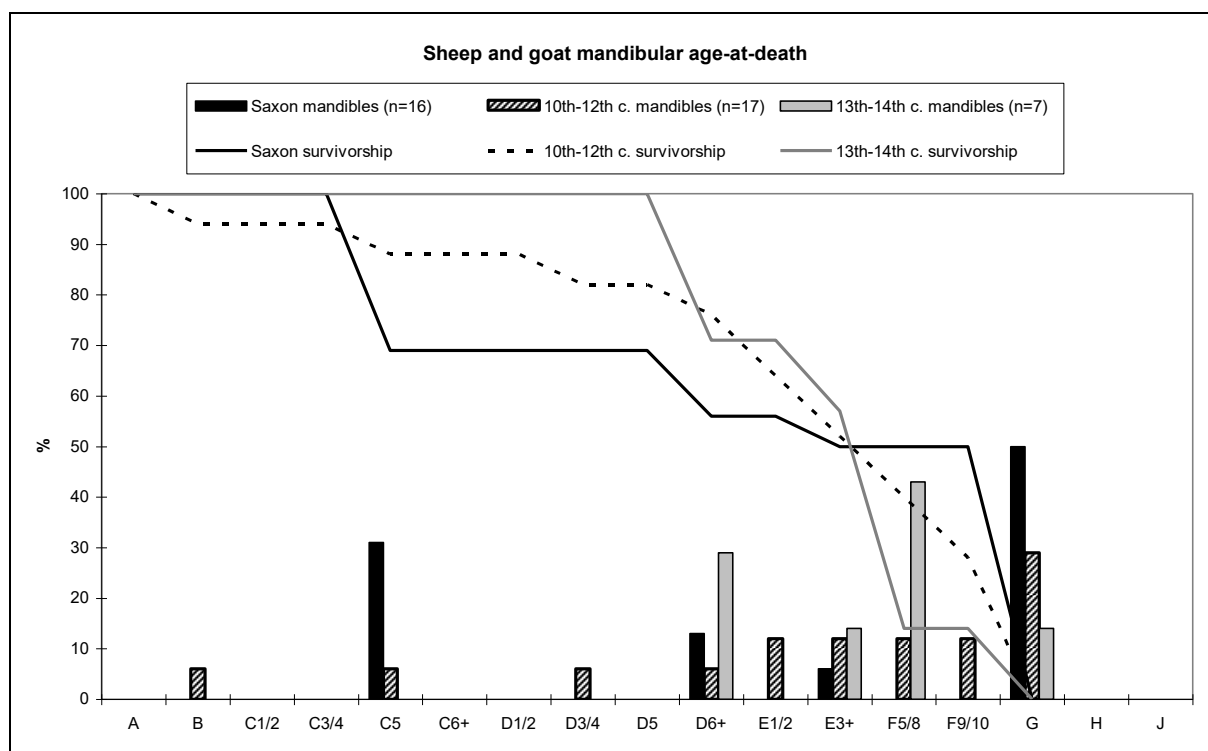
Table 6: Epiphysal data of 13th-14th century cattle (after Habermehl 1975)

Age (Months)	Epiphysis	Number fused	%	Number non-fused	%	Total	Interval %
7-10	Pelvis			1			
12-15	Radius p.	3					
15-18	Phalanx II p.	6					
sub-total		9	90	1	10	10	10
20-24	Phalanx I p.	10					

24-30	Tibia d.	1					
	Metapodia d.	2		3			
sub-total		13	81	3	19	16	9
c. 36	Calcaneus p.			2			
42	Femur p.	1					
42-48	Tibia p.			1			
	Ulna p/d			1			
	Radius d.	1		2			
sub-total		2	25	6	75	8	56
48-60	Vertebra	5		3			
sub-total		5	63	3	37	8	-
TOTAL		29	69	13	31	42	

The sheep/goat dental age data indicates mainly older animals in the Saxon period, although younger animals were also present. In contrast, the sheep/goat from the 10th-12th centuries are evenly distributed over the age classes, from very young to old. The pattern of the 13th-14th centuries resembles that of the Saxon period with mainly older animals present (**Figure 3**).

Figure 3: Classification of all the sheep mandibles (after Jones 2006)



Upon comparing the Saxon dental age pattern of sheep (**Figure 3**) with the epiphyseal data (**Table 7**), broad similarities can be seen. Examining only the dental data, it seems that sheep were mainly kept well into maturity with half of the mandibles belonging to animals being 4 to an estimated 9 years old when slaughtered. The epiphyseal data, however, indicate that none of the sheep lived beyond the age of five. Almost half of the sheep died in their second year. That this was probably not a single mass killing is seen in the dental age chart. The youngest animal was slaughtered at an age of 6-10 months whereas the oldest possibly falling within this group was slaughtered at the age of 21-54 months. It thus seems that sheep were probably mainly kept for their meat, as a large proportion is killed at an optimum weight age. None of the fragmentary horncores or pelvises could be sexed. An unfused metacarpus half had a total length of 68 mm indicating that it belonged to a foetus at 136-145 days of the 145 day gestation period – probably a stillborn animal (Habermehl 1975).

Table 7: Epiphyseal data of Saxon sheep/goat (after Habermehl 1975)

Age (Months)	Epiphysis	Number fused	%	Number non-fused	%	Total	Interval %
3-4	Humerus d.	4					
	Radius p.	9					
c. 5	Scapula	4					
	Pelvis	3		1			
7-10	1 st Phalanx	3		4			
sub-total		23	82	5	18	28	18
15-20	Tibia d.	1		1			
20-24	Metapodia d.	4		14			
sub-total		5	25	15	75	20	57
c. 36	Calcaneus	1					
42	Radius d.	1		6			
	Ulna p./d.			2			
	Femur d.	1		2			
sub-total		3	23	10	77	13	3
48-60	Vertebra			3			
sub-total		0	0	3	100	3	23
TOTAL		31	48	33	52	64	

The sheep/goat epiphysal data from the 10th-12th centuries (**Table 8**) indicates that more than half of the animals died in their third year. Smaller proportions of animals died in the first, second and after their 4th-5th year. This reflects the even distribution of the mandibles over the age classes.

Table 8: Epiphysal data of the 10th-12th century sheep/goat (after Habermehl 1975)

Age (Months)	Epiphysis	Number fused	%	Number non-fused	%	Total	Interval %
3-4	Humerus d.	5					
	Radius p.	4					
c. 5	Scapula	1					
	Pelvis	1		1			
5-7	2 nd Phalanx	8		1			
7-10	1 st Phalanx	5		3			
sub-total		24	83	5	17	29	17
15-20	Tibia d.	9		2			
20-24	Metapodia d.	20		7			
sub-total		29	76	9	24	38	7
c. 36	Calcaneus			1			
42	Radius d.	1		1			
	Humerus p.			1			
	Ulna p./d.			1			
	Tibia p.			2			
	Femur d.	1		1			
sub-total		2	22	7	78	9	54
48-60	Vertebra	2		9			
sub-total		2	18	9	82	11	4
TOTAL		57	66	30	34	87	

The dental age data from the 13th-14th centuries (**Figure 3**) already indicated mainly older animals and this is confirmed by the epiphysal age data in **Table 9**). A pelvis from the 13th-14th centuries probably belonged to a ewe, whereas a horncore from the same period indicates a ram.

Table 9: Epiphysal data of the 13th-14th century sheep/goat (after Habermehl 1975)

Age (Months)	Epiphysis	Number fused	%	Number non-fused	%	Total	Interval %
3-4	Humerus d.	5		1			
	Radius p.	5		1			
c. 5	Scapula	2					
	Pelvis	3		1			
7-10	1 st Phalanx	4					

sub-total		19	86	3	14	22	14
15-20	Tibia d.	1					
20-24	Metapodia d.	3		2			
sub-total		4	67	2	33	6	19
c. 36	Calcaneus	1					
42	Radius d.	2					
	Ulna p./d.			1			
	Tibia p.	1					
	Femur d.			1			
sub-total		4	67	2	33	6	-
48-60	Vertebra	1		2			
sub-total		1	33	2	67	3	34
TOTAL		28	76	9	24	37	

The small pig assemblages do not allow accurate observations to be made regarding age profiles. The five ageable Saxon mandibles and maxillas could be aged as follows: 10-12 months, 16-24 months and three older than two years (one third molar distinctively worn). The three ageable mandibles in the 10th-12th century assemblage belonged to animals aged 6-10 months, 10-12 months and more than two years respectively. No ageable jaws were present for the 13th-14th century assemblage. Two sows were present in the 10th-12th century assemblage.

Table 10: Epiphysal data of Saxon pig (after Habermehl 1975)

Age (Months)	Epiphysis	Number fused	%	Number non-fused	%	Total	Interval %
12	Scapula	1					
	Humerus d.	1		1			
	Radius p.	1					
	Pelvis			1			
	2 nd Phalanx	1		3			
sub-total		4	44	5	56	9	56
24	Tibia d.	2		2			
	1 st Phalanx	2					
	Metapodia	1					
sub-total		5	71	2	29	7	-
36	Ulna p.			1			
42	Femur p.	2		2			
	Radius d.			3			
	Humerus p.			1			
sub-total		2	22	7	78	9	22
Total		11	44	14	56	25	

The sparse epiphysal data for the Saxon period in **Table 10** hints at the killing of more than half of all pig before they reach two years. This is the optimum age for pigs to be slaughtered. The presence of animals older than 42 months (supported by the mandibles) might indicate breeding on the site. A very similar pattern is seen in the 10th-12th century assemblage (**Table 11**) with two-thirds of the animals being killed in their second year at optimum meat weight. However, a small proportion of older animals is also present.

Table 11: Epiphysal data of 10th-12th century pig (after Habermehl 1975)

Age (Months)	Epiphysis	Number fused	%	Number non-fused	%	Total	Interval %
12	Humerus d.	2					
	Radius p.	2					
	Pelvis	1					
sub-total		5	100	-	0	5	0
24	Tibia d.	1		1			
	Metapodia	1		2			
24-30	Calcaneus p.			1			
sub-total		2	33	4	67	6	67
42	Humerus p.			1			

48-84	Vertebra	1		3			
sub-total		1	20	4	80	5	13
TOTAL		8	50	8	50	16	

The sparse pig epiphysal data for the 13th-14th centuries indicate only the presence of immature animals (Table 12).

Table 12: Epiphysal data of 13th-14th century pig (after Habermehl 1975)

Age (Months)	Epiphysis	Number fused	%	Number non-fused	%	Total	Interval %
12	Humerus d.			1			
	Radius p.	1					
sub-total		1	50	1	50	2	50
24	Tibia d.	1					
	Metapodia	1		3			
sub-total		2	40	3	60	5	10
36	Ulna p.			1			
42	Femur p.			1			
	Humerus p.			1			
sub-total		-	0	3	100	3	40
TOTAL		3	30	7	70	10	

Other animals for which aging data was available include juvenile cat bones and a fused dog metapodial in the 10th-12th century assemblage, as well as the left femur of a horse which was distally fused, indicating an adult animal. A left tarsometatarsus of domestic fowl in the 13th-14th century assemblage had a spur and thus might have belonged to a rooster.

Phenotype

The 10th-12th centuries assemblage contains the evidence for at least three horned sheep and one naturally polled animal. Two crania in the 13th-14th century assemblage were horned.

Table 13: Withers heights estimates for cattle

Period	Element	Side	GL (mm)	factor	Withers Height (cm)
Saxon	metacarpus	L	171.0	6.15	105.2
Saxon	metacarpus	L	178.0	6.15	109.5
Saxon	metacarpus	L	185.0	6.15	113.8
Saxon	metacarpus	L	187.0	6.15	115.0
Saxon	metatarsus	R	200.0	5.45	109.0
Saxon	metatarsus	R	206.0	5.45	112.3
Saxon	metatarsus	R	206.5	5.45	112.5
				Average	111.0
C10-12	metacarpus	L	179.5	6.15	110.4
C10-12	metacarpus	L	187.0	6.15	115.0
C10-12	metatarsus	R	191.5	5.45	104.4
C10-12	metatarsus	L	212.0	5.45	115.5
C10-12	radius+ulna	R	286.0	4.30	123.0
C10-12	radius+ulna	L	294.0	4.30	126.4
				Average	115.8
C13-14	metatarsus	R	216.0	5.45	117.7

Fourteen cattle long bones permitted the estimation of a height at the withers (Table 13). The results ranged from 104-126 cm with a mean of 114 cm. In comparison, Dexter cattle range from 92-107 cm, so most of the Wilton cattle would have been slightly taller. Interestingly, if the withers height estimates are split according to period, Saxon cattle only measured 111 cm on average, whereas the 10th-12th centuries cattle stood 116 cm tall on average. If this size increase is real and not due to sample size, than it likely represents an increase in meat yield.

Seven complete sheep long bones produced height at the withers of ranging from 52 to 60 cm with a mean of 57 cm (Table 14). This is comparable to the size of Shetland sheep (Davis 1996, 596).

Table 14: Withers heights estimates for sheep/goat

Period	Element	Side	GL (mm)	factor	Withers Height (cm)
Saxon	metacarpus	R	110.0	4.89	53.8
Saxon	metacarpus	R	121.8	4.89	59.6
Saxon	metatarsus	R	127.0	4.54	57.0
				Average	57.3
C10-12	radius	R	147.5	4.02	59.3
C10-12	metacarpus	R	106.2	4.89	51.9
C10-12	metacarpus	L	116.5	4.89	57.0
C10-12	metacarpus	R	119.0	4.89	58.2
				Average	56.6

Amongst the 10th-12th century fish remains, bones of small eels¹ dominate, indicating local trapping. Cod, flatfish, herring and mackerel came from the coast. In the case of cod, these probably came from further away as the remains indicate large fish. It is likely that they were harvested in the North and reached the site as preserved fish (stockfish). A flatfish quadratum had a qu.gr.b. of 5.0 mm. The caudal vertebra of a mackerel (context 157, well) had a crushed appearance and this attests passage through the gut.

Animal health and welfare

In an attempt to assess the health of the animal population, anomalies and pathologies were recorded. Although no bones showed pathological changes, this does not mean that the animals were healthy. As the surrounding soft tissues and cartilage where the lesions possibly originated have disappeared, only the reaction of the bone to an illness can be analysed.

Although real pathologies were absent, anomalies were observed. The presence of an extra foramen below the premolar row on the buccal side of the mandible can be frequently observed in sheep (Halstead *et al.* 2002). In the Saxon assemblage, six out of a possible 15 mandibles showed this extra foramen. Of these six, five were positioned in the middle under P2/P3 and one under the P3. Metallic shiny calculus was observed on the teeth of four mandibles (out of a possible 17).

In the 10th-12th century assemblage, seven out of a possible 25 sheep/goat mandibles displayed an extra foramen on the diastema. In this case, two were positioned under the P2, three in the middle under P2/P3 and two under P3. Calculus was observed on the teeth of seven mandibles out of a possible 25 (five were metallic). Only one out of nine sheep/goat mandibles from the 13th-14th centuries had an extra foramen on the diastema (positioned below P2/P3). One out of eight mandibles had calculus on its teeth.

Extra foramina were also seen in cattle dating to the 10th-12th centuries. In one case, an extra foramen was present on the buccal side of the diastema. In the other case, an extra foramen was present on the lingual side of the diastema. It is believed that these extra foramina are genetic.

Butchery

¹ Chord lengths (Morales & Rosenlund 1979) of two eel cleithra were respectively 13.0 and 13.6 mm. This results in a total length (using the equation by Libois, Hallet-Libois & Roscoux 1987) of c 29 and c 30 cm.

Thirty-six bones with butchery marks were observed in the Saxon assemblage. The marks were mainly seen on cattle, but some sheep/goat and pig bones also showed signs of butchery. The marks on the cattle bones were mainly caused by cleavers, and knife cuts were seldom. Skinning, disarticulation, portioning and filleting of cattle carcasses was attested by the placement of the marks. Fine knife cuts on a talus indicated skinning practices. Disarticulation marks performed by knives and cleavers were seen on the mandibular hinge, a cervical vertebra, a proximal radius (elbow joint) and a distal femur (knee joint). All portioning actions were performed with a cleaver and involved mainly the pelvis and to a lesser extent the spinal column, scapula and ribs. Multiple knife cuts reminiscent of filleting were seen on a rib and a metatarsus (scraping off tendons). The butchery marks left on the sheep/goat bones were nearly all caused by cleavers. Fine knife cuts on a metacarpus probably derive from skinning, whereas the knife cuts on two atlases indicate decapitation. Knife cuts on the distal humerus and the proximal radius indicate disarticulation in the elbow joint. Portioning marks include the sagittally splitting of a cranium and the chopping of ribs into handier portions. Filleting marks were observed on a pelvis and a rib. The three pig butchered bones show the disarticulation of the ankle joint, portioning of the pelvis and filleting of a rib. The saw marks on the top and bottom of a goat horncore indicate horn working.

A total of 49 butchered bones was identified in the 10th-12th century assemblage. Cattle carcasses were processed using knives and cleavers and the actions performed probably included disarticulation, portioning and filleting. The marks show that carcasses were disarticulated at the elbow joint, hip joint and ankle. All portioning marks were performed with a cleaver and mainly involved chopping up the ribs into handier portions and dividing the spinal column. Sometimes, the snout was chopped off the rest of the head as is evidenced by a mandible chopped through in front of the premolars. Filleting marks were mainly seen on the ribs and on a hyoid. The latter indicates tongue removal. The whole range of butchery activities can be seen in the sheep/goat assemblage. Fine knife cuts on the vertical ramus of the mandibula indicated skinning. Knife cuts on the occipital condyles of the cranium indicated decapitation and a humerus bore evidence of the chopping through of the elbow joint. Chopped ribs, a sagittally split skull and vertically split elements of the spinal column indicate the portioning of the sheep/goat carcass. Filleting knife cuts were seen on the ribs and on a scapula. The horncores were probably chopped off the cranium. The only butchered pig bone is a mandibula which has been split at the symphysis indicating that pig skulls were chopped up to remove the brain. Fine knife cuts were also seen on a scapula and two tarsometatarsi of domestic fowl. All were placed near the articulations.

The 13th-14th century assemblage contained 32 bones with clear butchery marks. Skinning marks were seen on the mandible and the metatarsus. Disarticulation of the mandible, elbow and ankle joint was also evidenced. Some elements of the spinal column were split vertically and ribs were chopped into handier portions. Filleting knife cuts were seen on the ribs. The working of horn is evidenced by chops on a horncore. The butchery marks in the sheep/goat assemblage involved splitting the elements of the spinal column and chopping through an elbow joint. Skinning marks were seen on a mandibula and a tibia. Horn working is attested by a chop on a horn core. In pig, disarticulation chops were seen on a distal femur and a calcaneus. Knife cuts near the articulations of the coracoid, scapula and radius were seen in goose.

Summary

The animal bone material analysed in this report comes from an excavation of an urban area on the outskirts of Saxon and medieval Wilton. Taphonomic analysis showed that the assemblage was well preserved had not been extensively re-worked, although a small

proportion of the bones had been subject to gnawing prior to final deposition. The bulk of the bones derive from the usual domesticates (i.e. cattle, sheep/goat, pig and domestic fowl) and the consumption of wild mammal species was not important. Wild birds and fish complemented the diet.

Species proportions showed that sheep husbandry was probably important in the countryside around Wilton. On the other hand, beef would have been the main type of meat eaten. The age analysis showed that mainly older cattle were slaughtered. This is probably closely related to the number of cattle, which were needed to work the arable land to feed the increasingly specialised population in urban centres like Wilton. Pigs are also ideally suited to feed large populations as they turn waste into meat and have a fast reproduction rate. However, the lack of suitable woodland near Wilton probably limited their numbers.

Animals were not only kept for their milk, traction or meat. Their manure was certainly used to fertilize the fields. It is possible that animals were allowed on the fields to feed on the stubble and manure the fields at the same time. Manure from animals kept in byres and stables was probably collected and spread on the fields as well. The hair and skin of butchered animals would also have been used. An increase in meat yield is probably attested by an increase in height at the withers in cattle from the Saxon to the medieval period. A similar increase was not seen in the sheep/goat assemblage.

Analysis of the butchery marks showed that butchery technique was closely related to the size and anatomy of the animal. The use of the cleaver as the dominant butchery tool for cattle and knives for sheep/goat and pig attests to this. Although the numbers of butchered bone are only small, it seems that butchery techniques stayed relatively constant from the Saxon to the medieval period. Chops on the bases of cattle, sheep and goat horn cores indicate the removal of the horn sheet. As horn is very delicate and usually does not survive in the soil, chops on horn cores are the only evidence for its use. Although no particular bone-worker's waste was found on this particular site, the presence of a possible pin beater (Saxon) indicates that bone was used as a raw material.

All in all a picture emerges of a medieval town whose inhabitants probably procured animal products through a market and who partly lived from their own produce. Pigs and poultry in particular are suited to be reared in the back yard. Cattle certainly came mainly from the settlements around Wilton as they represent older animals no longer fit for traction or reproduction (milk production). The same is likely true for the sheep (and goats). However, the presence of foetal/neonate cattle and sheep indicates that at least some animals were kept nearby. These animals could provide the inhabitants with fresh milk. Trapping, fowling and fishing were activities either done by the inhabitants of the site themselves or small game and fish were procured through a market. Either way, small game and the eels were probably harvested in the vicinity, cod probably reached the site as stockfish. It is likely that most of the meat consumed on the site derived from animals butchered nearby.

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Appendix: Supporting tables (retain for archive only)

Species	NISP		BW		MNI	
	n	%	g	%	n	%
Horse (<i>Equus caballus</i>)	3	0.3	303	1.5	1	3.3
Cattle (<i>Bos Taurus</i>)	442	37.0	15441	75.8	7	23.3
Sheep (<i>Ovis aries</i>)	14	1.2	350	1.7	11	36.8
Goat (<i>Capra hircus</i>)	1	0.1	113	0.6		
Sheep/Goat (<i>Ovis/Capra</i>)	218	18.1	1675	8.2		
Pig (<i>Sus domesticus</i>)	63	5.3	1171	5.8	5	16.7
Dog (<i>Canis familiaris</i>)	1	0.1	5	0.0	1	3.3
Deer (<i>Cervidae</i>)	3	0.3	52	0.3	-	-
Hare (<i>Lepus europaeus</i>)	1	0.1	3	0.0	1	3.3
Birds						
Domestic fowl (<i>Gallus gallus dom.</i>)	2	0.2	4	0.0	2	6.7
(Greylag) Goose (<i>Anser anser (dom.)</i>)	3	0.3	17	0.1	1	3.3
Fish						
Cod (<i>Gadus morhua</i>)	5	0.4	16	0.1	1	3.3
Classes						
Fish	3	0.3	2	0.0	-	-
Large mammal	154	12.8	865	4.3	-	-
Medium mammal	282	23.5	335	1.6	-	-
Total	1195	100.0	20352	100.0	30	100.0

Figure 1 Faunal list for the Saxon SFB contexts using NISP, BW and MNI.

Species	NISP		BW		MNI	
	n	%	g	%	n	%
Mammals						
Horse (<i>Equus caballus</i>)	6	0.2	371	1.8	1	2.3
Cattle (<i>Bos Taurus</i>)	481	15.2	13697	65.6	6	14.0
Sheep (<i>Ovis aries</i>)	35	1.1	1018	4.9	15	35.0
Sheep/Goat (<i>Ovis/Capra</i>)	605	19.0	3327	16.0		
Pig (<i>Sus domesticus</i>)	62	1.9	687	3.3		
Dog (<i>Canis familiaris</i>)	1	0.0	1	0.0	1	2.3
Cat (<i>Felis catus</i>)	2	0.1	5	0.0	1	2.3
Red Deer (<i>Cervus elaphus</i>)	1	0.0	42	0.2	1	2.3
Rabbit (<i>Oryctolagus cuniculus</i>)	1	0.0	1	0.0	1	2.3
Field vole (<i>Microtus agrestis</i>)	2	0.1	0	0.0	1	2.3
Mouse (<i>Muridae</i>)	1	0.0	0	0.0	-	-
Birds						
Domestic fowl (<i>Gallus gallus dom.</i>)	27	0.8	46	0.2	3	7.0
(Greylag) Goose (<i>Anser anser (dom.)</i>)	3	0.1	12	0.1	1	2.3
Mallard/Duck (<i>Anas platyrhynchos (dom.)</i>)	1	0.0	0	0.0	1	2.3
Small duck	1	0.0	0	0.0	1	2.3
Fish						
Eel (<i>Anguilla anguilla</i>)	8	0.3	0	0.0	2	4.7
Flatfish (<i>Pleuronectes</i>)	8	0.3	0	0.0	1	2.3
Gadid (<i>Gadidae</i>)	1	0.0	0	0.0	1	2.3
Herring (<i>Clupea harengus</i>)	3	0.1	0	0.0	1	2.3
Mackerel (<i>Scomber scombrus</i>)	3	0.1	0	0.0	1	2.3
Amphibian						
Frog (<i>Rana temporaria</i>)	34	1.1	1	0.0	2	4.7
Classes						
Anura	15	0.5	0	0.0	-	-
Bird	8	0.3	1	0.0	-	-
Fish	125	3.9	0	0.0	-	-
Large mammal	306	9.6	999	4.8	-	-
Medium mammal	1440	45.3	649	3.1	-	-
Total	3180	100.0	20857	100.0	43	100.0

Figure 2 Faunal list for 10th-12th century contexts using NISP, BW and MNI.

Species	NISP		BW		MNI	
	n	%	g	%	n	%
Mammals						
Cattle (<i>Bos Taurus</i>)	212	25.0	5267	68.0	4	18.2
Sheep (<i>Ovis aries</i>)	6	0.7	212	2.7	6	27.4
Sheep/Goat (<i>Ovis/Capra</i>)	200	23.7	1073	13.9		
Pig (<i>Sus domesticus</i>)	31	3.7	335	4.3		
Birds						

Domestic fowl (<i>Gallus gallus dom.</i>)	27	3.2	40	0.5	3	13.6
(Greylag) Goose (<i>Anser anser (dom.)</i>)	7	0.8	26	0.3	2	9.1
Mallard/Duck (<i>Anas platyrhynchos (dom.)</i>)	1	0.1	2	0.0	1	4.5
Woodpigeon (<i>Columba palumbus</i>)	2	0.2	1	0.0	2	9.1
Fish						
Mackerel (<i>Scomber scombrus</i>)	1	0.1	0	0.0	1	4.5
Classes						
Anura	2	0.2	0	0.0	-	-
Bird	6	0.7	3	0.0	-	-
Fish	4	0.5	1	0.0	-	-
Large mammal	126	14.9	597	7.7	-	-
Medium mammal	221	26.1	200	2.6	-	-
Small mammal	1	0.1	0	0.0	-	-
Total	847	100.0	7757	100.0	22	100.0

Figure 3 Faunal list for 13th-14th century contexts using NISP, BW and MNI.

Cranial measurements												
Period	Context	Species	Element	Side	Age	Sex	3	7	8	9	10l	10b
Saxon	184	pig	mandibula	R	7						34.4	15.1
Saxon	553	pig	mandibula	R	7+						36.6	15.2
Saxon	184	sheep/goat	dens inf	L	G						19.0	7.5
Saxon	184	sheep/goat	dens inf	L	G						17.7	7.5
Saxon	184	sheep/goat	mandibula	R	E3+		49.4	68.7	43.8	23.8	18.6	6.2
Saxon	184	sheep/goat	mandibula	R	G			67.0	44.6	21.5	21.4	8.4
Saxon	184	sheep/goat	mandibula	L	G						20.9	8.3
Saxon	184	sheep/goat	mandibula	L	G				45.4		21.0	8.0
Saxon	184	sheep/goat	mandibula	R	adult					21.9		
Saxon	184	sheep/goat	mandibula	L	G			67.1	44.6	21.4	20.8	7.5
Saxon	184	sheep/goat	mandibula	L	G						18.8	7.9
Saxon	184	sheep/goat	mandibula	R	adult					21.8		
Saxon	550	sheep/goat	mandibula	R	G		50.7	67.6	46.4	21.5	21.3	8.1
C10-12	343	cattle	mandibula	L	9++			122.6	77.4	45.4	33.1	13.4
C10-12	443	cattle	mandibula	R	adult					43.9		
C10-12	423	cattle	mandibula	L	9++				76.9		30.1	11.0
C10-12	260	cattle	mandibula	R	9+						32.1	11.1
C10-12	260	cattle	mandibula	L	9++						33.6	11.0
C10-12	345	sheep/goat	dens inf	R	F9/10						18.1	7.1
C10-12	157	sheep/goat	dens inf	R	subadult						17.5	5.9
C10-12	157	sheep/goat	dens inf	L	G						19.4	7.3
C10-12	231	sheep/goat	dens inf	L	G						19.9	7.4
C10-12	157	sheep/goat	mandibula	L	E3+					41.4	15.9	6.7
C10-12	443	sheep/goat	mandibula	L	G						20.4	7.9
C10-12	157	sheep/goat	mandibula	R	F5/8						18.3	6.8
C10-12	330	sheep/goat	mandibula	L	F9/10			60.3	40.3	19.9	17.5	6.7
C10-12	405	sheep/goat	mandibula	L	adult					23.5		
C10-12	260	sheep/goat	mandibula	R	G			64.2	42.6	22.1	18.7	7.5
C10-12	380	sheep/goat	mandibula	R	E3+		45.2	64.6	43.4	21.3	18.2	7.1
C10-12	389	sheep/goat	mandibula	L	F5/8			67.4	43.8	21.3	17.1	7.1
C10-12	405	sheep/goat	mandibula	L	G						21.0	2.9
C13-14	159	cattle	dens inf	L	9						30.9	11.3
C13-14	159	cattle	dens inf	L	9+						32.2	11.5
C13-14	363	cattle	mandibula	L	9+++			120.3	75.9	45.6	34.5	14.2
C13-14	271	cattle	mandibula	L	adult					47.6		
C13-14	159	sheep	cranium	R	adult							
C13-14	503	sheep/goat	dens inf	R	G						21.1	8.1
C13-14	159	sheep/goat	mandibula	R	F5/8			67.0	44.0	22.1	20.1	7.1

C13-14	159	sheep/goat	mandibula	L	F5/8				42.4		19.1	7.4
C13-14	159	sheep/goat	mandibula	R	adult					23.5		
C13-14	159	sheep/goat	mandibula	L	F5/8			62.0	40.0	21.0	16.9	7.5
C13-14	418	sheep/goat	mandibula	L	adult					21.8		
C13-14	189	sheep/goat	mandibula	L	E3+						19.5	7.3
Period	Context	Species	Element	Side	Age	Sex	12	13	14	15a	15b	15c
Saxon	184	sheep/goat	mandibula	R	E3+		60.9	57.8	87.7	35.4	19.0	14.1
Saxon	184	sheep/goat	mandibula	L	G					35.8		
Saxon	184	sheep/goat	mandibula	L	G						22.6	
Saxon	184	sheep/goat	mandibula	R	adult						21.0	14.6
Saxon	184	sheep/goat	mandibula	L	G						20.6	14.4
Saxon	184	sheep/goat	mandibula	R	adult						20.3	
Saxon	550	sheep/goat	mandibula	R	G		65.4	57.7	89.5	36.2	22.0	15.5
C10-12	343	cattle	mandibula	L	9++					67.7	44.7	31.5
C10-12	423	cattle	mandibula	L	9++						42.2	30.2
C10-12	157	sheep/goat	mandibula	L	E3+					34.6	20.8	
C10-12	157	sheep/goat	mandibula	R	F5/8					34.3		
C10-12	330	sheep/goat	mandibula	L	F9/10		59.1	55.8	81.8	32.6	17.8	14.4
C10-12	405	sheep/goat	mandibula	L	adult						21.8	15.7
C10-12	260	sheep/goat	mandibula	R	G					36.7	22.8	17.2
C10-12	380	sheep/goat	mandibula	R	E3+		66.8	62.3				
C10-12	389	sheep/goat	mandibula	L	F5/8					37.3	21.5	16.7
C13-14	363	cattle	mandibula	L	9+++						47.4	31.2
C13-14	271	cattle	mandibula	L	adult							32.5
C13-14	159	sheep/goat	mandibula	R	F5/8						20.4	15.7
C13-14	159	sheep/goat	mandibula	R	adult					16.5		
C13-14	159	sheep/goat	mandibula	L	F5/8						19.9	16.4
C13-14	418	sheep/goat	mandibula	L	adult							13.8
Period	Context	Species	Element	Side	Age	Sex	21	22	23	24	25	27
C10-12	197	sheep/goat	cranium	R	adult			52.1				
C10-12	197	sheep/goat	cranium	Both	adult							45.2
C13-14	159	cattle	cranium	R	adult		71.1					
C13-14	159	sheep	cranium	R	adult		61.2	41.1	21.6	39.6	40.0	
Period	Context	Species	Element	Side	Age	Sex	29	30	31	40	41	42
Saxon	184	pig	cranium	L	7++			28.6	17.1			
C10-12	305	sheep	horncore	R		Male				170.0	59.0	47.8
C10-12	197	sheep/goat	cranium	Both	adult		17.7	16.4				
Period	Context	Species	Element	Side	Age	Sex	44	45	46	47		
C13-14	159	cattle	horncore	R	adult		158.5	56.3	43.9			
C13-14	159	cattle	horncore	L	adult		174.0	61.8	48.8			
C13-14	159	cattle	horncore	L	adult		149.0	54.0	40.5			
C13-14	159	cattle	horncore	L	adult		171.5	59.8	45.6	200.0		
C13-14	159	cattle	horncore	L	adult		130.0	45.2	34.3			
C13-14	159	cattle	horncore	R	adult		109.0	37.9	31.1	97.0		
C13-14	370	cattle	horncore	R	adult		133.0	46.2	35.5			

Figure 4 Cranial measurements.

Post-cranial measurements												
Period	Context	Species	Element	Side	Age	Sex	Bb	Bd	BF	BFd	BFp	BG
C10-12	138	cattle	1st phalanx		>20-24			31.0				
C10-12	145	cattle	1st phalanx		>20-24			24.1				
C10-12	145	cattle	1st phalanx		>20-24			25.3				
C10-12	153	cattle	1st phalanx		>20-24			22.5				

C10-12	303	cattle	1st phalanx		>20-24		22.0				
C10-12	157	cattle	1st phalanx		>20-24		26.2				
C10-12	197	cattle	1st phalanx		>20-24		24.8				
C10-12	361	cattle	1st phalanx		>20-24		23.1				
C10-12	450	cattle	1st phalanx		>20-24		27.9				
C10-12	389	cattle	1st phalanx		>20-24		23.1				
C10-12	389	cattle	1st phalanx		>20-24		20.5				
C10-12	145	cattle	2nd phalanx		>15-18		20.7				
C10-12	153	cattle	2nd phalanx		>15-18		21.4				
C10-12	231	cattle	2nd phalanx		>15-18		22.9				
C10-12	473	cattle	2nd phalanx		>15-18		17.1				
C10-12	473	cattle	2nd phalanx		>15-18		20.6				
C10-12	359	cattle	2nd phalanx		>15-18		19.5				
C10-12	260	cattle	femur	L	>42		125.0				
C10-12	376	cattle	humerus	L	>15-20		78.5				
C10-12	231	cattle	metacarpus	L	>24-30		56.7				
C10-12	389	cattle	metacarpus	L	>24-30		55.7				
C10-12	157	cattle	metacarpus		>24-30		52.6				
C10-12	157	cattle	metatarsus	R	>24-30		42.0				
C10-12	345	cattle	radius+ulna	R	>12-15>42-48		78.1	56.6	76.7		
C10-12	343	cattle	radius+ulna	L	>12-15>42-48		78.6	58.1	75.7		
C10-12	383	cattle	scapula	L	adult						47.0
C10-12	145	cattle	talus	L	adult		40.2				
C10-12	157	cattle	talus	L	adult		35.4				
C10-12	231	cattle	talus	L	adult		35.5				
C10-12	260	cattle	talus	L	adult		35.8				
C10-12	443	domestic fowl	femur	R	adult		15.5				
C10-12	330	domestic fowl	femur	R	adult		13.3				
C10-12	473	domestic fowl	humerus	R	adult		13.7				
C10-12	292	domestic fowl	humerus	R	adult		17.2				
C10-12	389	domestic fowl	radius	L	adult		7.4				
C10-12	157	domestic fowl	tibiotarsus	L	adult		11.8				
C10-12	157	horse	talus	L	adult			51.9			
C10-12	394	horse	talus	L	adult			53.4			
C10-12	290	pig	humerus	R	>12		37.0				
C10-12	290	pig	metatarsus III	L	>24		14.8				
C10-12	290	pig	tibia	L	>24		31.1				
C10-12	205	rabbit	femur	L	adult		13.0				
C10-12	197	sheep/goat	humerus	R	subadult		27.5				
C10-12	153	sheep/goat	metacarpus		>20-24		23.9				
C10-12	157	sheep/goat	metacarpus		>20-24		22.4				
C10-12	157	sheep/goat	metacarpus		>20-24		21.8				
C10-12	290	sheep/goat	metacarpus	R	>20-24		24.0				
C10-12	231	sheep/goat	metacarpus		>20-24		22.3				
C10-12	231	sheep/goat	metacarpus		>20-24		22.4				
C10-12	260	sheep/goat	metacarpus	L	>20-24		22.3				
C10-12	389	sheep/goat	metacarpus		>20-24		22.6				
C10-12	389	sheep/goat	metacarpus		>20-24		24.5				
C10-12	534	sheep/goat	metacarpus		>20-24		23.2				
C10-12	157	sheep/goat	metatarsus	L	>20-24		22.4				
C10-12	405	sheep/goat	metatarsus		>20-24		23.7				
C10-12	231	sheep/goat	metatarsus		>20-24		21.6				
C10-12	231	sheep/goat	metatarsus		>20-24		20.7				

C10-12	260	sheep/goat	metatarsus	L	>20-24			24.9				
C10-12	389	sheep/goat	metatarsus		>20-24			22.3				
C10-12	475	sheep/goat	metatarsus		>20-24			23.2				
C10-12	288	sheep/goat	radius	R	>3-4>42			28.4		24.9	27.2	
C10-12	260	sheep/goat	radius	R	>3-4						28.9	
C10-12	293	sheep/goat	radius	L	>3-4						26.5	
C10-12	153	sheep/goat	scapula	L	>5							18.7
C10-12	288	sheep/goat	scapula	L	adult							17.7
C10-12	293	sheep/goat	talus	L	adult			19.3				
C10-12	132	sheep/goat	tibia	L	>15-20			27.0				
C10-12	345	sheep/goat	tibia	R	>15-20			24.1				
C10-12	197	sheep/goat	tibia	L	>15-20			23.2				
C10-12	330	sheep/goat	tibia	R	>15-20			25.2				
C10-12	405	sheep/goat	tibia	R	>15-20			24.8				
C10-12	252	sheep/goat	tibia	L	>15-20			22.6				
C10-12	260	sheep/goat	tibia	R	>15-20			24.3				
C10-12	293	sheep/goat	tibia	R	>15-20			23.4				
C10-12	145	small duck	radius	R	adult			5.0				
C13-14	159	cattle	1st phalanx		>20-24			24.9				
C13-14	159	cattle	1st phalanx		>20-24			20.8				
C13-14	159	cattle	1st phalanx		>20-24			21.6				
C13-14	159	cattle	1st phalanx		>20-24			22.3				
C13-14	159	cattle	2nd phalanx		>15-20			23.2				
C13-14	159	cattle	2nd phalanx		>15-18			18.6				
C13-14	159	cattle	2nd phalanx		>15-18			21.8				
C13-14	159	cattle	2nd phalanx		>15-18			20.2				
C13-14	368	cattle	2nd phalanx		>15-18			19.4				
C13-14	159	cattle	radius	R	>42			29.1		21.3		
C13-14	159	cattle	talus	L	adult			41.2				
C13-14	468	cattle	talus	L	adult			41.1				
C13-14	416	cattle	tibia	R	>24-30			53.8				
C13-14	159	domestic fowl	coracoid	L	adult		13.3			11.3		
C13-14	159	domestic fowl	femur	L	adult			13.7				
C13-14	159	domestic fowl	humerus	R	adult			12.7				
C13-14	159	domestic fowl	radius	R	adult			5.5				
C13-14	298	domestic fowl	radius	R	adult			7.0				
C13-14	159	domestic fowl	tarsometatarsus	L	adult	Female		11.0				
C13-14	159	domestic fowl	tibiotarsus	L	adult			9.6				
C13-14	159	domestic fowl	tibiotarsus	R	adult			9.8				
C13-14	159	goose	coracoid	L	adult					32.9		
C13-14	159	goose	radius	R	adult			10.4				
C13-14	159	pig	metacarpus III	L	>24			16.1				
C13-14	418	pig	tibia	R	>24			29.2				
C13-14	159	sheep/goat	1st phalanx		>7-10			11.3				
C13-14	159	sheep/goat	1st phalanx		>7-10			9.5				
C13-14	159	sheep/goat	humerus	L	>3-4			30.3				
C13-14	159	sheep/goat	humerus	L	>3-4			27.4				
C13-14	336	sheep/goat	humerus	R	>3-4			29.3				
C13-14	418	sheep/goat	humerus	R	>3-4			27.7				
C13-14	159	sheep/goat	metacarpus		>20-24			24.9				
C13-14	159	sheep/goat	metacarpus		>20-24			24.9				
C13-14	159	sheep/goat	metatarsus	R	>20-24			22.7				
C13-14	159	sheep/goat	radius	R	>42-48			27.4		22.7		

C13-14	159	sheep/goat	radius	R	>3-4					28.0	
C13-14	366	sheep/goat	radius	R	>3-4					28.1	
C13-14	368	sheep/goat	radius	R	>42			24.3	19.8		
C13-14	159	sheep/goat	scapula	L	>7-10						17.5
C13-14	363	sheep/goat	scapula	L	>5						18.2
C13-14	159	sheep/goat	tibia	L	>15-20			25.0			
C13-14	363	woodpigeon	radius	L	adult			5.9			
Saxon	184	cattle	1st phalanx		>20-24			24.7			
Saxon	184	cattle	1st phalanx		>20-24			31.6			
Saxon	184	cattle	1st phalanx		>20-24			24.5			
Saxon	184	cattle	1st phalanx		>20-24			21.7			
Saxon	184	cattle	2nd phalanx		>15-18			17.6			
Saxon	184	cattle	2nd phalanx		>15-18			19.5			
Saxon	184	cattle	femur	L	>42-48			96.5			
Saxon	184	cattle	femur	L	>42-48			86.0			
Saxon	184	cattle	metacarpus	L	>24-30			51.5			
Saxon	184	cattle	metacarpus	L	>24-30			51.1			
Saxon	184	cattle	metacarpus	L	>24-30			54.6			
Saxon	553	cattle	metacarpus	L	>24-30			52.8			
Saxon	184	cattle	metatarsus	R	>24-30			49.2			
Saxon	184	cattle	metatarsus	R	>24-30			48.4			
Saxon	184	cattle	radius	R	>12-15					68.4	
Saxon	184	cattle	radius	R	>42-48			66.8	48.9		
Saxon	550	cattle	radius	R	>42-48			63.2	45.6		
Saxon	184	cattle	radius+ulna	R	>12-15					62.4	
Saxon	184	cattle	radius+ulna	R	>12-15					70.8	
Saxon	550	cattle	radius+ulna	R	>12-15>42-48					62.0	
Saxon	184	cattle	scapula	L	>7-10						46.9
Saxon	184	cattle	scapula	L	>7-10						60.5
Saxon	184	cattle	scapula	L	>7-10						42.5
Saxon	184	cattle	scapula	R	>7-10						46.9
Saxon	553	cattle	scapula	R	>7-10						41.2
Saxon	184	cattle	talus	L	adult			38.5			
Saxon	184	cattle	talus	R	adult			44.0			
Saxon	550	cattle	talus	L	adult			36.1			
Saxon	550	cattle	talus	L	adult			40.9			
Saxon	184	cattle	tibia	R	>24-30			54.7			
Saxon	184	cattle	tibia	R	>24-30			51.8			
Saxon	184	cattle	tibia	L	>15-20			45.8			
Saxon	184	cattle	tibia	R	>24-30			54.7			
Saxon	553	cattle	tibia	R	>24-30			66.3			
Saxon	184	domestic fowl	humerus	L	adult			13.8			
Saxon	184	hare	humerus	L	adult			13.3			
Saxon	184	horse	femur	L	>42			90.0			
Saxon	184	pig	femur	L	>42			45.0			
Saxon	184	pig	femur	L	>42			49.0			
Saxon	184	pig	metacarpus III	R	>24			16.1			
Saxon	184	pig	scapula	L	>12						22.4
Saxon	184	sheep/goat	1st phalanx		adult			12.9			
Saxon	184	sheep/goat	1st phalanx		>7-10			11.3			
Saxon	184	sheep/goat	1st phalanx		>7-10			10.2			
Saxon	184	sheep/goat	humerus	L	>3-4			30.1			
Saxon	550	sheep/goat	humerus	L	>3-4			29.9			

Saxon	553	sheep/goat	metacarpus	R	>20-24			24.0				
Saxon	184	sheep/goat	metatarsus	R	>20-24			21.8				
Saxon	184	sheep/goat	radius	L	>3-4						28.4	
Saxon	184	sheep/goat	radius	R	>3-4						26.6	
Saxon	553	sheep/goat	radius	L	>42			27.0		21.0		
Saxon	184	sheep/goat	scapula	L	>5							18.4
Saxon	184	sheep/goat	scapula	L	>5							18.9
Saxon	550	sheep/goat	scapula	R	>7-10							14.1
Saxon	550	sheep/goat	scapula	L	>7-10							11.8
Saxon	184	sheep/goat	tibia	L	>15-20			26.2				
Period	Context	Species	Element	Side	Age	Sex	Bp	BPC	BT	DC	Dd	DiA
C10-12	138	cattle	1st phalanx		>20-24		32.2					
C10-12	145	cattle	1st phalanx		>20-24		26.7					
C10-12	153	cattle	1st phalanx		>20-24		24.7					
C10-12	303	cattle	1st phalanx		>20-24		22.6					
C10-12	157	cattle	1st phalanx		>20-24		27.6					
C10-12	197	cattle	1st phalanx		>20-24		25.1					
C10-12	450	cattle	1st phalanx		>20-24		27.1					
C10-12	389	cattle	1st phalanx		>20-24		24.4					
C10-12	389	cattle	1st phalanx		>20-24		21.7					
C10-12	145	cattle	2nd phalanx		>15-18		25.7					
C10-12	153	cattle	2nd phalanx		>15-18		24.0					
C10-12	231	cattle	2nd phalanx		>15-18		28.9					
C10-12	473	cattle	2nd phalanx		>15-18		21.8					
C10-12	473	cattle	2nd phalanx		>15-18		25.4					
C10-12	359	cattle	2nd phalanx		>15-18		25.0					
C10-12	290	cattle	femur	R	>42					38.3		
C10-12	260	cattle	femur	R	>42					47.3		
C10-12	260	cattle	femur	L	>42					42.9		
C10-12	376	cattle	humerus	L	>15-20				74.2			
C10-12	231	cattle	metacarpus	L	>24-30		54.0					
C10-12	153	cattle	metatarsus	L	adult		47.9					
C10-12	345	cattle	metatarsus	L	>24-30		48.8					
C10-12	443	cattle	metatarsus	R	adult		43.1					
C10-12	197	cattle	metatarsus	L	adult		50.8					
C10-12	260	cattle	metatarsus	L	adult		41.4					
C10-12	260	cattle	radius	L	>12-15		68.9					
C10-12	383	cattle	radius	L	>12-15		64.5					
C10-12	345	cattle	radius+ulna	R	>12-15>42-48		84.4	44.9				
C10-12	343	cattle	radius+ulna	L	>12-15>42-48		82.9	46.6				
C10-12	383	cattle	tibia	R	>42-48		95.0					
C10-12	443	domestic fowl	femur	R	adult		16.5				13.3	
C10-12	330	domestic fowl	femur	R	adult		13.8				11.2	
C10-12	473	domestic fowl	femur	L	adult		16.7					
C10-12	473	domestic fowl	humerus	R	adult		17.3					
C10-12	292	domestic fowl	humerus	R	adult		23.1					
C10-12	157	domestic fowl	tibiotarsus	L	adult						13.1	
C10-12	330	domestic fowl	ulna	L	adult		7.8					
C10-12	389	goose	carpometacarpus	L	adult		21.0					
C10-12	343	pig	radius	R	>12		25.6					
C10-12	443	pig	radius	R	>12		30.6					
C10-12	197	sheep/goat	humerus	R	subadult				27.3			
C10-12	293	sheep/goat	humerus	R	>3-4				28.9			

C10-12	404	sheep/goat	humerus	L	>3-4				28.0			
C10-12	153	sheep/goat	metacarpus	R	adult		23.7					
C10-12	290	sheep/goat	metacarpus	R	>20-24		22.7					
C10-12	405	sheep/goat	metacarpus	R	>20-24		23.9					
C10-12	231	sheep/goat	metacarpus	L	adult		20.2					
C10-12	260	sheep/goat	metacarpus	L	>20-24		20.6					
C10-12	389	sheep/goat	metacarpus	R	adult		20.8					
C10-12	389	sheep/goat	metacarpus	R	adult		22.7					
C10-12	157	sheep/goat	metatarsus	R	adult		19.6					
C10-12	200	sheep/goat	metatarsus	L	adult		19.9					
C10-12	288	sheep/goat	radius	R	>3-4>42		30.5					
C10-12	260	sheep/goat	radius	R	>3-4		28.1					
C10-12	260	sheep/goat	radius	R	>3-4		30.7					
C10-12	293	sheep/goat	radius	L	>3-4		29.5					
C13-14	159	cattle	1st phalanx		>20-24		30.3					
C13-14	159	cattle	1st phalanx		>20-24		24.0					
C13-14	159	cattle	1st phalanx		>20-24		22.3					
C13-14	159	cattle	1st phalanx		>20-24		23.4					
C13-14	336	cattle	1st phalanx		>20-24		22.5					
C13-14	159	cattle	2nd phalanx		>15-20		28.1					
C13-14	159	cattle	2nd phalanx		>15-18		23.7					
C13-14	159	cattle	2nd phalanx		>15-18		25.3					
C13-14	159	cattle	2nd phalanx		>15-18		24.6					
C13-14	368	cattle	2nd phalanx		>15-18		23.6					
C13-14	159	cattle	metatarsus	L	adult		48.0					
C13-14	370	cattle	metatarsus	R	>24-30		48.2					
C13-14	159	domestic fowl	femur	L	adult		14.3				11.8	
C13-14	494	domestic fowl	humerus	R	adult		16.5					
C13-14	418	domestic fowl	pelvis	N/A	adult							12.4
C13-14	159	domestic fowl	tarsometatarsus	L	adult	Female	10.9					
C13-14	159	domestic fowl	tibiotarsus	L	adult						10.9	
C13-14	159	domestic fowl	tibiotarsus	R	adult						10.8	
C13-14	159	domestic fowl	ulna	R	adult		7.4					
C13-14	593	domestic fowl	ulna	L	adult		8.2					
C13-14	159	goose	ulna	R	adult		17.2					
C13-14	174	pig	radius	R	>12		26.0					
C13-14	159	sheep/goat	1st phalanx		>7-10		12.4					
C13-14	159	sheep/goat	1st phalanx		>7-10		11.3					
C13-14	159	sheep/goat	humerus	L	>3-4				28.3			
C13-14	159	sheep/goat	humerus	L	>3-4				25.8			
C13-14	336	sheep/goat	humerus	R	>3-4				27.8			
C13-14	418	sheep/goat	humerus	R	>3-4				25.6			
C13-14	366	sheep/goat	metacarpus	L	adult		22.1					
C13-14	159	sheep/goat	metatarsus	L	adult		17.0					
C13-14	159	sheep/goat	radius	R	>3-4		30.1					
C13-14	366	sheep/goat	radius	R	>3-4		31.5					
C13-14	368	sheep/goat	radius	L	>3-4		29.8					
Saxon	184	cattle	1st phalanx		>20-24		24.0					
Saxon	184	cattle	1st phalanx		>20-24		33.3					
Saxon	184	cattle	1st phalanx		>20-24		25.5					
Saxon	184	cattle	1st phalanx		>20-24		18.9					
Saxon	184	cattle	2nd phalanx		>15-18		22.8					
Saxon	184	cattle	2nd phalanx		>15-18		21.5					

Saxon	184	cattle	metacarpus	L	>24-30		51.6					
Saxon	184	cattle	metacarpus	L	>24-30		50.6					
Saxon	553	cattle	metacarpus	L	>24-30		51.9					
Saxon	184	cattle	metatarsus	R	adult		47.2					
Saxon	184	cattle	metatarsus	R	>24-30		44.4					
Saxon	184	cattle	metatarsus	R	>24-30		46.6					
Saxon	184	cattle	radius	R	>12-15		74.7					
Saxon	184	cattle	radius+ulna	R	>12-15		68.7					
Saxon	184	cattle	radius+ulna	R	>12-15		79.0	47.9				
Saxon	550	cattle	radius+ulna	R	>12-15>42-48		66.9	45.0				
Saxon	184	cattle	tibia	L	>42-48		77.8					
Saxon	184	sheep/goat	1st phalanx		>7-10		11.7					
Saxon	184	sheep/goat	1st phalanx		>7-10		11.1					
Saxon	184	sheep/goat	humerus	L	>3-4				28.6			
Saxon	550	sheep/goat	humerus	L	>3-4				28.1			
Saxon	553	sheep/goat	metacarpus	R	>20-24		22.4					
Saxon	184	sheep/goat	metatarsus	R	>20-24		19.6					
Saxon	553	sheep/goat	metatarsus	R	adult		20.2					
Saxon	184	sheep/goat	radius	L	>3-4		31.1					
Saxon	184	sheep/goat	radius	R	>3-4		29.0					
Period	Context	Species	Element	Side	Age	Sex	Dic	Did	Dip	DI	DLS	Dm
C10-12	445	cattle	3rd phalanx		adult						69.1	
C10-12	389	cattle	3rd phalanx		adult						54.1	
C10-12	145	cattle	talus	L	adult					33.3		33.8
C10-12	157	cattle	talus	L	adult					30.3		30.5
C10-12	231	cattle	talus	L	adult					30.5		31.7
C10-12	260	cattle	talus	L	adult					31.6		32.4
C10-12	197	domestic fowl	scapula	R	adult		12.9					
C10-12	153	domestic fowl	ulna	R	adult			8.8	11.7			
C10-12	330	domestic fowl	ulna	L	adult				11.0			
C10-12	293	sheep/goat	talus	L	adult					15.5		15.4
C13-14	159	cattle	talus	L	adult					34.0		33.6
C13-14	468	cattle	talus	L	adult					33.7		35.8
C13-14	366	domestic fowl	scapula	L	adult		13.6					
C13-14	159	domestic fowl	tibiotarsus	R	adult				17.5			
C13-14	159	domestic fowl	ulna	R	adult			8.2	11.2			
C13-14	159	domestic fowl	ulna	R	adult			10.6				
C13-14	593	domestic fowl	ulna	L	adult			9.4	11.8			
C13-14	159	goose	carpometacarpus	R	adult			6.1				
C13-14	366	goose	scapula	L	adult		20.8					
C13-14	159	goose	ulna	R	adult			17.2	20.5			
Saxon	184	cattle	3rd phalanx		adult						83.2	
Saxon	184	cattle	talus	R	adult					37.5		37.1
Saxon	550	cattle	talus	L	adult					30.5		31.3
Saxon	550	cattle	talus	L	adult					35.6		34.8
Period	Context	Species	Element	Side	Age	Sex	Dp	DPA	GB	GH	GL	GLI
C10-12	145	cattle	2nd phalanx		>15-18						36.0	
C10-12	153	cattle	2nd phalanx		>15-18						32.5	
C10-12	231	cattle	2nd phalanx		>15-18						41.0	
C10-12	473	cattle	2nd phalanx		>15-18						31.5	
C10-12	473	cattle	2nd phalanx		>15-18						34.0	
C10-12	359	cattle	2nd phalanx		>15-18						35.0	
C10-12	157	cattle	centrotarsal	R	adult				49.0			

C10-12	475	cattle	centrotarsal	R	adult			50.7			
C10-12	231	cattle	metacarpus	L	>24-30					179.5	
C10-12	389	cattle	metacarpus	L	>24-30					187.0	
C10-12	345	cattle	metatarsus	L	>24-30					212.0	
C10-12	260	cattle	metatarsus	R	>24-30					191.5	
C10-12	345	cattle	radius+ulna	R	>12-15>42-48			72.3		286.0	
C10-12	343	cattle	radius+ulna	L	>12-15>42-48					294.0	
C10-12	145	cattle	talus	L	adult						61.7
C10-12	157	cattle	talus	L	adult						52.6
C10-12	231	cattle	talus	L	adult						53.9
C10-12	260	cattle	talus	L	adult						57.6
C10-12	443	domestic fowl	femur	R	adult		11.2			79.9	
C10-12	330	domestic fowl	femur	R	adult		8.8			65.6	
C10-12	473	domestic fowl	femur	L	adult		11.3				
C10-12	473	domestic fowl	humerus	R	adult					62.8	
C10-12	292	domestic fowl	humerus	R	adult					79.4	
C10-12	153	domestic fowl	ulna	R	adult					63.1	
C10-12	157	horse	talus	L	adult			65.0	55.0		
C10-12	394	horse	talus	L	adult			56.5	56.5		
C10-12	290	pig	metatarsus III	L	>24					71.6	
C10-12	290	sheep/goat	metacarpus	R	>20-24					119.0	
C10-12	405	sheep/goat	metacarpus	R	>20-24					106.2	
C10-12	260	sheep/goat	metacarpus	L	>20-24					116.5	
C10-12	288	sheep/goat	radius	R	>3-4>42					147.5	
C10-12	293	sheep/goat	talus	L	adult						27.8
C10-12	145	small duck	radius	R	adult					48.0	
C13-14	159	cattle	2nd phalanx		>15-20					38.5	
C13-14	159	cattle	2nd phalanx		>15-18					34.5	
C13-14	159	cattle	2nd phalanx		>15-18					37.0	
C13-14	159	cattle	2nd phalanx		>15-18					37.0	
C13-14	368	cattle	2nd phalanx		>15-18					33.1	
C13-14	370	cattle	metatarsus	R	>24-30					216.0	
C13-14	159	cattle	talus	L	adult						61.3
C13-14	468	cattle	talus	L	adult						61.1
C13-14	159	domestic fowl	coracoid	L	adult					48.0	
C13-14	159	domestic fowl	femur	L	adult		10.0			68.9	
C13-14	159	domestic fowl	radius	R	adult					54.3	
C13-14	298	domestic fowl	radius	R	adult					67.4	
C13-14	159	domestic fowl	tarsometatarsus	L	adult	Female				62.3	
C13-14	159	domestic fowl	tibiotarsus	R	adult					96.3	
C13-14	159	domestic fowl	ulna	R	adult					60.0	
C13-14	593	domestic fowl	ulna	L	adult					64.6	
C13-14	159	goose	radius	R	adult					142.5	
C13-14	159	goose	ulna	R	adult					161.5	
C13-14	159	pig	metacarpus III	L	>24					72.0	
C13-14	336	sheep/goat	calcaneus	L	>36					55.2	
C13-14	363	woodpigeon	radius	L	adult					55.2	
Saxon	184	cattle	2nd phalanx		>15-18					33.0	
Saxon	184	cattle	2nd phalanx		>15-18					35.0	
Saxon	184	cattle	calcaneus	L	>36			44.5		149.5	
Saxon	184	cattle	calcaneus	R	>36			37.5		121.0	
Saxon	184	cattle	calcaneus	R	>36			41.0		124.0	
Saxon	550	cattle	calcaneus	L	>36			37.0		122.5	

Saxon	184	cattle	metacarpus	L	>24-30							187.0
Saxon	184	cattle	metacarpus	L	>24-30							178.0
Saxon	184	cattle	metacarpus	L	>24-30							171.0
Saxon	553	cattle	metacarpus	L	>24-30							185.0
Saxon	184	cattle	metatarsus	R	>24-30							206.0
Saxon	184	cattle	metatarsus	R	>24-30							206.5
Saxon	184	cattle	metatarsus	R	>24-30							200.0
Saxon	184	cattle	patella	R	adult				43.0			55.1
Saxon	550	cattle	radius+ulna	R	>12-15>42-48			58.2				
Saxon	184	cattle	talus	R	adult							66.4
Saxon	550	cattle	talus	L	adult							55.7
Saxon	550	cattle	talus	L	adult							63.8
Saxon	184	pig	metacarpus III	R	>24							74.1
Saxon	184	pig	talus	L	adult							46.2
Saxon	184	sheep/goat	calcaneus	L	>36				11.0			50.9
Saxon	184	sheep/goat	metacarpus	R	>20-24							110.0
Saxon	553	sheep/goat	metacarpus	R	>20-24							121.8
Saxon	184	sheep/goat	metatarsus	R	>20-24							127.0
Period	Context	Species	Element	Side	Age	Sex	GLm	GLP	Glpe	LA	LAR	Ld
C10-12	138	cattle	1st phalanx		>20-24				61.4			
C10-12	145	cattle	1st phalanx		>20-24				47.8			
C10-12	153	cattle	1st phalanx		>20-24				49.7			
C10-12	303	cattle	1st phalanx		>20-24				50.8			
C10-12	157	cattle	1st phalanx		>20-24				52.9			
C10-12	197	cattle	1st phalanx		>20-24				51.0			
C10-12	361	cattle	1st phalanx		>20-24				48.9			
C10-12	450	cattle	1st phalanx		>20-24				59.7			
C10-12	389	cattle	1st phalanx		>20-24				49.2			
C10-12	389	cattle	1st phalanx		>20-24				46.6			
C10-12	445	cattle	3rd phalanx		adult							49.8
C10-12	389	cattle	3rd phalanx		adult							43.7
C10-12	153	cattle	pelvis	R	>7-10					59.0	44.8	
C10-12	305	cattle	pelvis	R	>7-10					57.0	52.8	
C10-12	145	cattle	talus	L	adult		55.1					
C10-12	157	cattle	talus	L	adult		48.7					
C10-12	231	cattle	talus	L	adult		49.1					
C10-12	260	cattle	talus	L	adult		53.6					
C10-12	343	pig	pelvis	R	>12							30.3
C10-12	157	sheep/goat	pelvis	R	>5					27.3	23.9	
C10-12	153	sheep/goat	scapula	L	>5			32.7				
C10-12	293	sheep/goat	talus	L	adult		26.6					
C13-14	159	cattle	1st phalanx		>20-24				55.2			
C13-14	159	cattle	1st phalanx		>20-24				49.9			
C13-14	159	cattle	1st phalanx		>20-24				50.2			
C13-14	159	cattle	1st phalanx		>20-24				51.7			
C13-14	336	cattle	1st phalanx		>20-24				46.1			
C13-14	159	cattle	talus	L	adult		55.1					
C13-14	159	cattle	talus	L	adult		52.2					
C13-14	468	cattle	talus	L	adult		56.1					
C13-14	159	domestic fowl	tibiotarsus	R	adult					93.1		
C13-14	159	sheep/goat	1st phalanx		>7-10				34.9			
C13-14	159	sheep/goat	1st phalanx		>7-10				34.0			
C13-14	159	sheep/goat	pelvis	R	>5					23.0	20.7	

C13-14	368	sheep/goat	pelvis	L	>5	Female				21.9	24.0	
C13-14	159	sheep/goat	scapula	L	>7-10			28.8				
C13-14	363	sheep/goat	scapula	L	>5			29.1				
Saxon	184	cattle	1st phalanx		>20-24				53.4			
Saxon	184	cattle	1st phalanx		>20-24				56.4			
Saxon	184	cattle	1st phalanx		>20-24				50.9			
Saxon	184	cattle	1st phalanx		>20-24				52.0			
Saxon	184	cattle	1st phalanx		>20-24				48.0			
Saxon	184	cattle	3rd phalanx		adult							65.6
Saxon	184	cattle	pelvis	L	>7-10					62.0	55.0	
Saxon	184	cattle	pelvis	R	>7-10					63.3	53.0	
Saxon	550	cattle	pelvis	R	>7-10					52.2	48.2	
Saxon	184	cattle	scapula	L	>7-10			63.9				
Saxon	184	cattle	scapula	L	>7-10			70.1				
Saxon	184	cattle	scapula	L	>7-10			63.0				
Saxon	184	cattle	scapula	L	>7-10			59.9				
Saxon	184	cattle	scapula	R	>7-10			69.9				
Saxon	553	cattle	scapula	R	>7-10			57.3				
Saxon	184	cattle	talus	L	adult		58.4					
Saxon	184	cattle	talus	R	adult		61.1					
Saxon	550	cattle	talus	L	adult		51.1					
Saxon	550	cattle	talus	L	adult		57.2					
Saxon	184	pig	scapula	L	>12			33.9				
Saxon	184	pig	talus	L	adult		42.4					
Saxon	184	sheep/goat	1st phalanx		>7-10				33.0			
Saxon	184	sheep/goat	1st phalanx		>7-10				30.0			
Saxon	184	sheep/goat	scapula	L	>5			29.3				
Saxon	184	sheep/goat	scapula	L	>5			32.8				
Saxon	550	sheep/goat	scapula	R	>7-10			30.5				
Saxon	550	sheep/goat	scapula	L	>7-10			23.0				
Period	Context	Species	Element	Side	Age	Sex	LG	Lm	LmT	MBS	SB	SC
C10-12	445	cattle	3rd phalanx		adult					20.0		
C10-12	389	cattle	3rd phalanx		adult					17.6		
C10-12	383	cattle	scapula	L	adult		58.3					
C10-12	443	domestic fowl	femur	R	adult							7.4
C10-12	330	domestic fowl	femur	R	adult							6.2
C10-12	473	domestic fowl	humerus	R	adult							6.4
C10-12	292	domestic fowl	humerus	R	adult							8.5
C10-12	389	domestic fowl	radius	L	adult							3.0
C10-12	157	domestic fowl	tibiotarsus	L	adult							7.0
C10-12	153	domestic fowl	ulna	R	adult							4.1
C10-12	157	horse	talus	L	adult				55.8			
C10-12	394	horse	talus	L	adult				57.0			
C10-12	153	sheep/goat	scapula	L	>5		24.7					
C13-14	159	domestic fowl	coracoid	L	adult			46.0				
C13-14	159	domestic fowl	femur	L	adult							5.5
C13-14	494	domestic fowl	humerus	R	adult							5.9
C13-14	159	domestic fowl	radius	R	adult							2.5
C13-14	298	domestic fowl	radius	R	adult							3.5
C13-14	159	domestic fowl	tarsometatarsus	L	adult	Female						5.0
C13-14	159	domestic fowl	tibiotarsus	L	adult							5.1
C13-14	159	domestic fowl	tibiotarsus	R	adult							5.0
C13-14	159	domestic fowl	ulna	R	adult							3.9

C13-14	159	domestic fowl	ulna	R	adult							6.0
C13-14	593	domestic fowl	ulna	L	adult							4.3
C13-14	159	goose	coracoid	L	adult			73.5				
C13-14	159	goose	radius	R	adult							4.7
C13-14	159	goose	ulna	R	adult							8.9
C13-14	159	sheep/goat	pelvis	R	>5						8.2	38.5
C13-14	368	sheep/goat	pelvis	L	>5	Female					8.6	
C13-14	159	sheep/goat	scapula	L	>7-10		23.0					
C13-14	363	sheep/goat	scapula	L	>5		24.0					
C13-14	159	woodpigeon	radius	L	adult							2.8
C13-14	363	woodpigeon	radius	L	adult							2.8
Saxon	184	cattle	3rd phalanx		adult						25.8	
Saxon	184	cattle	scapula	L	>7-10		53.7					
Saxon	184	cattle	scapula	L	>7-10		51.7					
Saxon	184	cattle	scapula	R	>7-10		60.4					
Saxon	553	cattle	scapula	R	>7-10		46.7					
Saxon	184	domestic fowl	humerus	L	adult							1.4
Saxon	184	pig	scapula	L	>12		29.9					
Saxon	184	sheep/goat	scapula	L	>5		22.9					
Saxon	184	sheep/goat	scapula	L	>5		25.4					
Saxon	550	sheep/goat	scapula	R	>7-10		20.1					
Saxon	550	sheep/goat	scapula	L	>7-10		17.8					
Period	Context	Species	Element	Side	Age	Sex	SD	SDO	SH	SLC		
C10-12	138	cattle	1st phalanx		>20-24		27.6					
C10-12	145	cattle	1st phalanx		>20-24		22.9					
C10-12	145	cattle	1st phalanx		>20-24		21.5					
C10-12	153	cattle	1st phalanx		>20-24		20.9					
C10-12	303	cattle	1st phalanx		>20-24		19.3					
C10-12	157	cattle	1st phalanx		>20-24		23.7					
C10-12	197	cattle	1st phalanx		>20-24		23.1					
C10-12	361	cattle	1st phalanx		>20-24		20.8					
C10-12	450	cattle	1st phalanx		>20-24		23.5					
C10-12	389	cattle	1st phalanx		>20-24		20.6					
C10-12	145	cattle	2nd phalanx		>15-18		20.1					
C10-12	153	cattle	2nd phalanx		>15-18		19.8					
C10-12	231	cattle	2nd phalanx		>15-18		22.4					
C10-12	473	cattle	2nd phalanx		>15-18		17.0					
C10-12	473	cattle	2nd phalanx		>15-18		20.5					
C10-12	359	cattle	2nd phalanx		>15-18		20.8					
C10-12	231	cattle	metacarpus	L	>24-30		28.7					
C10-12	389	cattle	metacarpus	L	>24-30		31.7					
C10-12	345	cattle	metatarsus	L	>24-30		24.9					
C10-12	157	cattle	metatarsus	R	>24-30		21.3					
C10-12	260	cattle	metatarsus	R	>24-30		21.1					
C10-12	345	cattle	radius+ulna	R	>12-15>42-48		43.5					
C10-12	343	cattle	radius+ulna	L	>12-15>42-48		43.5					
C10-12	383	cattle	scapula	R	adult					58.5		
C10-12	383	cattle	scapula	R	adult					40.5		
C10-12	290	pig	scapula	R	adult					24.2		
C10-12	290	sheep/goat	metacarpus	R	>20-24		13.2					
C10-12	231	sheep/goat	metacarpus		>20-24		12.4					
C10-12	405	sheep/goat	metacarpus	R	>20-24		15.4					
C10-12	231	sheep/goat	metacarpus	L	adult		13.0					

C10-12	231	sheep/goat	metacarpus		>20-24		13.8					
C10-12	260	sheep/goat	metacarpus	L	>20-24		12.2					
C10-12	389	sheep/goat	metacarpus		>20-24		13.0					
C10-12	157	sheep/goat	metatarsus	L	>20-24		11.0					
C10-12	231	sheep/goat	metatarsus		>20-24		12.1					
C10-12	231	sheep/goat	metatarsus		>20-24		9.8					
C10-12	288	sheep/goat	radius	R	>3-4>42		15.2					
C10-12	260	sheep/goat	radius	R	>3-4		16.2					
C10-12	293	sheep/goat	radius	L	>3-4		16.1					
C10-12	153	sheep/goat	scapula	L	adult					18.4		
C10-12	153	sheep/goat	scapula	L	>5					20.2		
C10-12	288	sheep/goat	scapula	L	adult					15.8		
C10-12	290	sheep/goat	scapula	R	adult					20.4		
C10-12	132	sheep/goat	tibia	L	>15-20		14.7					
C10-12	345	sheep/goat	tibia	R	>15-20		13.5					
C10-12	197	sheep/goat	tibia	L	>15-20		12.3					
C10-12	405	sheep/goat	tibia	R	>15-20		14.2					
C10-12	260	sheep/goat	tibia	R	>15-20		12.9					
C10-12	293	sheep/goat	tibia	R	>15-20		12.8					
C13-14	159	cattle	1st phalanx		>20-24		24.8					
C13-14	159	cattle	1st phalanx		>20-24		19.7					
C13-14	159	cattle	1st phalanx		>20-24		19.3					
C13-14	159	cattle	1st phalanx		>20-24		19.3					
C13-14	336	cattle	1st phalanx		>20-24		19.2					
C13-14	159	cattle	2nd phalanx		>15-20		22.8					
C13-14	159	cattle	2nd phalanx		>15-18		18.6					
C13-14	159	cattle	2nd phalanx		>15-18		20.2					
C13-14	159	cattle	2nd phalanx		>15-18		19.4					
C13-14	368	cattle	2nd phalanx		>15-18		18.3					
C13-14	370	cattle	metatarsus	R	>24-30		26.7					
C13-14	159	cattle	radius	R	>42		15.0					
C13-14	174	pig	radius	R	>12		15.4					
C13-14	418	pig	tibia	R	>24		17.6					
C13-14	159	sheep/goat	1st phalanx		>7-10		10.4					
C13-14	159	sheep/goat	1st phalanx		>7-10		3.3					
C13-14	159	sheep/goat	humerus	L	>3-4		13.5					
C13-14	418	sheep/goat	humerus	R	>3-4		13.5					
C13-14	159	sheep/goat	pelvis	R	>5					14.8		
C13-14	368	sheep/goat	pelvis	L	>5	Female				13.0		
C13-14	159	sheep/goat	radius	R	>42-48		15.1					
C13-14	363	sheep/goat	scapula	L	>5					17.2		
C13-14	159	sheep/goat	tibia	L	>15-20		14.2					
Saxon	184	cattle	1st phalanx		>20-24		22.0					
Saxon	184	cattle	1st phalanx		>20-24		29.2					
Saxon	184	cattle	1st phalanx		>20-24		21.8					
Saxon	184	cattle	1st phalanx		>20-24		17.6					
Saxon	184	cattle	2nd phalanx		>15-18		18.5					
Saxon	184	cattle	2nd phalanx		>15-18		17.5					
Saxon	184	cattle	metacarpus	L	>24-30		30.8					
Saxon	184	cattle	metacarpus	L	>24-30		27.4					
Saxon	553	cattle	metacarpus	L	>24-30		28.9					
Saxon	184	cattle	metatarsus	R	>24-30		22.9					
Saxon	184	cattle	metatarsus	R	>24-30		24.0					

Saxon	184	cattle	metatarsus	R	>24-30		23.7				
Saxon	550	cattle	radius+ulna	R	>12-15>42-48			44.8			
Saxon	184	cattle	scapula	L	>7-10					44.6	
Saxon	184	cattle	scapula	L	>7-10					46.3	
Saxon	184	cattle	scapula	L	>7-10					47.8	
Saxon	184	cattle	scapula	R	adult					35.9	
Saxon	184	cattle	scapula	R	>7-10					48.5	
Saxon	553	cattle	scapula	R	>7-10					41.5	
Saxon	184	cattle	tibia	R	>24-30		35.0				
Saxon	184	cattle	tibia	R	>24-30		31.9				
Saxon	184	cattle	tibia	R	>24-30		32.9				
Saxon	184	hare	humerus	L	adult		7.7				
Saxon	184	pig	scapula	L	>12					23.4	
Saxon	184	sheep/goat	1st phalanx		adult		11.3				
Saxon	184	sheep/goat	1st phalanx		>7-10		10.0				
Saxon	184	sheep/goat	1st phalanx		>7-10		8.7				
Saxon	184	sheep/goat	humerus	L	>3-4		14.8				
Saxon	184	sheep/goat	metacarpus	R	>20-24		11.2				
Saxon	553	sheep/goat	metacarpus	R	>20-24		13.5				
Saxon	184	sheep/goat	metatarsus	R	>20-24		11.3				
Saxon	553	sheep/goat	metatarsus	R	adult		13.2				
Saxon	553	sheep/goat	radius	L	>42		15.2				
Saxon	184	sheep/goat	scapula	L	>5					17.9	
Saxon	184	sheep/goat	scapula	L	adult					19.3	
Saxon	184	sheep/goat	scapula	L	>5					19.9	
Saxon	550	sheep/goat	scapula	R	>7-10					14.1	
Saxon	550	sheep/goat	scapula	L	>7-10					10.3	
Saxon	184	sheep/goat	tibia	L	>15-20		14.0				

Figure 5 Post-cranial measurements.