Kentish Sites and Sites of Kent

A miscellany of four archaeological excavations

Animal bone from the route of the Weatherlees - Margate - Broadstairs wastewater pipeline

By Jessica M. Grimm

Archaeological sites along the Weatherlees – Margate – Broadstairs wastewater pipeline route, arranged from north to south (= Table 2.1)

Ref. in this report	Fieldwork Area Codes	NGR	Site/features	Date	Civil parish
Foreness Point	**1–D**	638400 171400	World War II defences	Modern	Margate
Kingsgate	**D**	639277 171006	Flint	Mixed, (discussed in Bronze Age chapter)	Broadstairs and St Peter's
Broadley Road	**3**	637697 169796	Mortuary enclosure (and ring-ditch)	Neolithic (and Bronze Age)	Margate (Northdown)
Star Lane	**8**	636007 167857	Bakery - Sunken Featured Building	Early Medieval (12th-13th century)	Manston
	8	636073 167915	Vessel 'burial' – mortuary-related?	Late Bronze Age	Manston
Coldswood Road	**9**	635585 166828	Casket cremation cemetery	Late Iron Age to early Romano-British	Manston
Cottington Road	**14**	634011 164328	Dual-rite cemetery	Romano-British	Minster
	14	633997 164324	Saxon sunken-featured building	Anglo-Saxon	Minster
	14	634072 164367	Pits	Neolithic	Minster
Cottington Hill	**15**	633845 164106	Inhumation graves	Romano-British	Minster
	15	633851 163986	Ditch terminus burial	Anglo-Saxon	Minster
Ebbsfleet Lane	**16**	633372 163331	Ditches and burials	Late Iron Age to early Romano-British	Minster
Weatherlees WTW (Ebbsfleet Lane)	**Compound 16**	633325 163082 633334 163088	Ditches and burials	Late Iron Age to early Romano-British	Minster (Marshes)
	Compound 16	633360 162976	'Midden deposit'	Late Bronze Age	Minster (Marshes)
	Compound 16	633360 162976	Ebbsfleet hoards	Late Bronze Age	Minster (Marshes)

Concordance of context numbers to fieldwork area codes and fieldwork area codes to context numbers

Context numbers	Fieldwork area code	Area	Context numbers
1000 – 1926	16	1-2	7600 – 7609
2000 – 2021	Manston Airport	3	7000 – 7115
3000 – 3767	Compound 16	3	7139 – 7145
5000 – 5340	15	3	7160 – 7166
6000 – 6438	14	3	7173 – 7175
7000 – 7115	3	3	7189 – 7193
7116 – 7138	7	3	7427 – 7462
7139 – 7145	3	7	7116 – 7138
7146 – 7159	7	7	7146 – 7159
7160 – 7166	3	7	7167 – 7172
7167 – 7172	7	7	7182
7173 – 7175	3	7	7463 – 7478
7176 – 7181	8	8	7176 – 7181
7182	7	8	7183 – 7188
7183 – 7188	8	8	7194 – 7426
7189 – 7193	3	8	7479 – 7539
7194 – 7426	8	9	8000 – 8479
7427 – 7462	3	Manston Airport	2000 – 2021
7463 – 7478	7	14	6000 – 6438
7479 – 7539	8	15	5000 – 5340
7600 – 7609	1-2	16 (car park)	8700 – 8769
7700 – 7946	1-D	16	1000 – 1926
8000 – 8479	9	Compound 16	3000 – 3767
8500 – 8630	D	Compound 16 (final bit)	8900 – 8915
8700 – 8769	16 (car park)	1-D	7700 – 7946
8861 – 8899	Joss Bay	D	8500 – 8630
8900 – 8915	Compound 16 (final bit)	Joss Bay	8861 – 8899
8920 – 8923	Joss Bay	Joss Bay	8920 – 8923

Animal bone from the route of the Weatherlees – Margate – Broadstairs wastewater pipeline

Jessica M. Grimm

Methodology

The bone material described in this report comes from several excavations along the course of the wastewater pipeline running from Margate to Weatherlees Hill. The excavated areas are called: 3–4, 7, 8, 9–10, 14, 15, 16 and Compound 16 (the areas are here referred to by their fieldwork area codes; a concordance to the site names used in the publication is given at the beginning of the online specialist reports and Table 2.1 in the publication). The nature of the investigation ('a slice through the land') results in finds from many chronological periods situated over a large area (Table AB 1). Of special interest are:

- Area 8: a cremation from the Late Bronze Age/Early Iron Age, field system ditches and pits from the Romano-British period and a medieval bakery structure;
- Area 9: field system and pits dating to the Romano-British period and a small cremation cemetery dating to the same period;
- Area 14: an inhumation and a cremation cemetery dating to the Romano-British period and a sunken-featured building dating to the 6-7th century;
- Area 15: two inhumations dating to the Romano-British period and a field system from the same period;
- Area 16: two inhumations dating to the Romano-British period and field systems of prehistoric and Romano-British date;
- Compound 16: Bronze Age midden deposits and two possible Romano-British inhumation graves as well as a dog burial.

Table AB 1. Species (NISP) per period

Spot date	Horse	Cattle	Sheep/Goat	Pig	Dog	Bird	Fish	Other	Indet	Total
Late Neolithic									1	1
MBA		2	1						1	4
LBA	3	1		1						5
LBA/EIA		5	4						29	38
Late Prehistoric	10	66	53	17	4	1		5	77	233
Iron Age	2	50	17	5	138	1	1	20	55	289
EIA		12	9	1					5	27
MIA/LIA	8	75	62	6	3				113	267
MIA	1	2	1						3	7
LIA	8	144	164	22	10	1			81	430
LIA/ER	60	379	284	32	61	8		5	327	1156
Early Roman	12	258	124	78	7	12	1	2	353	847
Roman	9	72	30	167	12	79	39	4	167	579
Late Roman	1	4	2		1				1	9
Saxon		6	8	16		1			145	176
Early Medieval									2	2
Medieval	8	37	29	13	1	1	2	1	134	226
Late Medieval		2							4	6
Post-medieval		1	2	3	1				7	14
Unknown	5	89	84	53	73	26	5	1	391	727

As the majority of the features encountered in the different excavations dates to the Romano-British period, it would make sense to treat the animal bone material from these features as

one assemblage. This assemblage includes all bone pottery-dated as Late Iron Age, Late Iron Age/Early Roman, Early Roman, Late Roman and Roman. Furthermore, special attention was paid to the grave fills and interesting undated bone assemblages or such dating to other periods. No distinction was made between hand recovered and sieved materials as the overall identified numbers are relatively small.

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 also recorded. The zone system of Dobney and Reilly (1988) 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), Clark (1995, dogs), Harcourt (1974, dogs), Vitt (1952, horses) and May (1985, horses) and ages estimated using Habermehl (1975) and Jones (2006, sheep).

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 or fish. The fish bones were analysed with the help of Sheila Hamilton-Dyer (Southampton).

Measurement tables are included in the appendix (Tables AB 9–31).

Wessex Archaeology holds a database with full details for each bone as well as pictures of worked and pathological bone.

Results

Taphonomy

The overall condition of the bones was fair with many newly occurred breaks. Whenever possible, bones were pieced together with masking tape in order to be able to take the necessary measurements. The majority of the LIA/RB bones (n=3310) were in fair (82%) to good (11%) condition, with a small proportion in poor or very poor condition (7%). Bone preservation was best for Area 15, Area 16 and Compound 16. Worst bone preservation was encountered in Area 3, Area 8, Area 9 and Area 14. The differences in bone preservation are the result of the differences in underlying geology of the sites.

5% of all the bone had a heavily eroded appearance. The bone surface was deeply pitted and powdery. The colour of the bone was creamy. Especially bone from Area 3, Area 8 and Area 9 was modified in this way. 7% of all the bone had a root-etched surface. Particularly bones from Area 14 had a root-etched surface. This indicates that the bone from this area was in a general closer range to the surface.

Gnawing by canids, and to a lesser extend felids, had marked only 4% of all the bones. The bones affected reflect roughly the proportions of the different species in the assemblage. There was an overall strong preference for the joints. Area 16 has a slightly higher percentage of gnawed bone. 6% of the LIA/RB bones showed signs of gnawing.

The proportion of loose teeth was with 5% quite low. No area was particularly affected. The percentage of identified bones was with 61% average. The assemblage seems relatively unfragmented at resp. 13% complete bones. However, many of these complete bones are teeth and other small compact bones. If we only include long bones, scapula, pelvis, cranium and mandibula, the number falls below 2% (still including complete skeletons). The high fragmentation points to the intensive use of the animal carcass.

About 10% of all the bones show signs of contact with fire. As the burnt fragments were all very small, most bones were assigned to the large or medium sized mammal categories. Furthermore, burnt fragments of birds, cattle, sheep/goat and pig were found. A significantly higher proportion of burnt bone fragments was encountered in Area 14 (33%) and Compound 16 (14%). Area 14 contains a human cremation cemetery and it likely that most calcined bones represent pyre goods.

Summarising the above results it becomes apparent that bone from different sites was subject to different taphonomic factors. The presence of complete burials and loose but matching epiphysis shows that at least some bone came from primary depositions. The low overall proportion of loose teeth is in line with this.

Faunal lists

The identifiable remains of all of the Margate bone were of mammals, birds, fish and amphibians. Most of the remains belong to domesticates: cattle, horse, sheep/goat, pig and dog (Table AB 1). Where possible, a distinction between sheep and goat was made, indicating only one goat horn core from Roman context 5080. A fragmented subadult cat skull with corresponding mandibula fragment was found in Late Prehistoric context 3276. The context is dated as probably Late Iron Age The domesticated cat is thought to be present from the Middle Iron Age onwards (Yalden 1999). The specimen is smaller than the modern cat skull

from the reference collection and thus wildcat is probably not an option. It is also possible that the remains are intrusive as people of later periods tend to bury their pets.

The wild mammals consist of bank/field vole (*Clethrionomys glareolus*/*Microtus agrestis*), mole (*Talpa europaea*) and hare (*Lepus europaeus*). As voles and moles are burrowing animals, their remains might be intrusive. Sporadic hare remains were found in Early Roman context 1800 and medieval context 5226.

Apart from bones of domestic fowl found in Iron Age context 3463, Early Roman context 1029, Roman context 6014 and Saxon context 6312, as well as in several undated contexts (5120, 8241 and 8242), remains of wild birds were found as well. Undated, but probable Romano-British context 8242 contained the remains of at least three chickens of which one was a juvenile female and one was an adult female. This context also contained a fragment of a left tibiotarsus of a buzzard (*Buteo buteo*). Roman context 5084 contained a heron (*Ardea cinerea*) ulna fragment. A further possible mandibula fragment of heron was found in Roman context 6024. Duck bones (*Anatidae* sp.) of mallard and larger size were found in Late Iron Age/Early Roman context 3129 and 3139, Early Roman context 1380 and undated context 5155. A right ulna fragment of a gannet (*Morus bassanus*) was found in medieval context 5197. Late Iron Age context 1796, Late Iron Age/Early Roman context 1792 and Early Roman context 1029 yielded a raven (*Corvus corax*) bone each. Roman context 6017 contained a carpometacarpus fragment of a small corvid.

Although none of the bird bones showed any cut marks, it is likely that chicken and duck were eaten. The gannet is a resident bird on the coast of most of the UK. The buzzard is a winter guest in Kent, whereas the raven is nowadays absent from the area. Both wild birds are scavengers and might have been attracted by the rubbish pits on the site and died. Although, heron, raven and gannet might not sound edible to us; they might have been eaten as Schuster (2001, 91-92) states that the breast meat of grey-heron and the young-ones were quite commonly eaten until rather recently. Corvids are associated with death and black magic. They play an important part in mythology and legends. In some regions, ravens on your property meant that somebody would die soon (Schuster 2001, 389). The meat of raven can be eaten but was done so mainly by poorer people. People in eastern Germany, Slavonic areas in Upper-Austria and Romania, think of it as a delicatessen (Schuster 2001, 393).

The overall assemblage contained 49 fish remains of which 20 could be identified to species. Most remains belonged to cod (*Gadus morhua*) due to a find of a medium-sized (c. 60 cm) cod head and first vertebrae in Roman context 5202. Furthermore, cod remains were found in Roman context 8244 and undated context 5061. A caudal vertebra of a cod or whiting (*Merlangius merlangus*) was found in Roman context 5202. A left quadratum of a flat fish (*Pleuronectes*) was found in Early Roman context 1029. Undated context 5059 contained a possible piece of the neurocranium of gurnard (*Aspitrigla cuculus*). All fish remains belong to marine species and were likely caught of the coast of Kent and transported to the site. The presence of head bones of cod and flat fish indicates that at least some fish was transported whole and likely fresh.

Remains of the common frog (*Rana temporaria*) were found in a variety of contexts dating to the Late Iron Age/Romano-British period. Cod and vole were the only species only represented in the sieved material.

Table AB 2. Species list for the Late Iron Age/Romano-British assemblage using NISP, BW and MNI

Species	NISP		BW		MNI	
	n	%	g	%	n	%
Cattle (*Bos Taurus*)	907	27	29912	65	13	18
Horse (*Equus caballus*)	92	3	5191	11	4	6
Sheep (*Ovis aries*)	36	1	621	1	26	36
Goat (*Capra hircus*)	1	0	33	0		
Sheep/Goat (*Ovis*/*Capra*)	584	18	4255	9		
Pig (*Sus domesticus*)	304*	9	2631	6	9	13
cf. Pig (*Sus domesticus*)	18	1	3	0		
Dog (*Canis familiaris*)	229*	7	1355	3	8	11
Bank/Field vole	1	0	0	0	1	1
Hare (*Lepus europaeus*)	1	0	4	0	1	1
Birds						
Corvid	1	0	0	0	-	
Ducks (Anatidae sp.)	3	0	3	0	1	1
cf Anatidae sp.	2	0	0	0	-	
Domestic fowl (*Gallus gallus* dom.)	5	0	5	0	1	1
cf. Domestic fowl (*Gallus gallus* dom.)	7	0	1	0	-	
Heron (*Ardea cinerea*)	1	0	3	0	1	1
cf. Heron (*Ardea cinerea*)	1	0	0	0	-	
Raven (*Corvus corax*)	3	0	5	0	1	1
Fish						
Cod (*Gadus morhua*)	15	0	7	0	2	3
Cod/Whiting	1	0	0	0	-	
Flat fish (Pleuronectidae)	1	0	0	0	1	2
Amphibian						
Common frog (*Rana temporaria*)	29	1	1	0	3	4
Classes						
Bird	81	2	0	0	-	
Fish	25	1	3	0	-	
Large mammal	303	9	1245	3	-	
Medium mammal	656	20	463	1	-	
Small mammal	3	0	0	0	-	
Total	**3310**	**99**	**45741**	**99**	**72**	**99**

Table AB 2 shows that according to the NISP method, cattle were the most important species in the LIA/RB period followed by sheep/goat and pig. Horse and dog are sufficiently represented as well. According to the BW method, beef contributed most to the diet followed by mutton and horsemeat and a small proportion of pork. As the assemblage contains partial skeletons and part of the sites were demonstrably affected by unfavourable bone preservation, the MNI method probably represents the proportions of the different animals best. It seems that sheep/goat, followed by smaller proportions of cattle and pig, dominated the LIA/RB stock. A fair number of dogs were kept as well, as were some horses.

A single hare bone proves that wild species were not important in covering the protein demand of the people. The proportion of fish and poultry to the diet is difficult to assess due to unfavourable taphonomic conditions on at least part of the site. The presence of cod and flat fish show that sea fishing took place. This was to be expected as Margate is directly on the coast. Bones of chicken indicate that this species was likely kept on the site. The keeping of chickens started slowly in the Late Iron Age and was well in place by Roman times (King 1991). The duck bones likely originate from wild forms like mallard, shoveler, wigeon or pintail. Albarella (2005) concludes on the basis of archaeozoological and historical research, that duck husbandry was only developed rather late and was not yet fully in place by Roman times. Therefore, *antanid* bones found in British Roman sites probably derive from wild rather than domestic birds.

Upon analysing the unidentified bone fragments, it becomes apparent that they mainly consist of (very) small fragments. They attest to the intensive use of the animal carcass.

Husbandry in the LIA/RB period

Representation of different anatomical elements

The analysis of the representation of different anatomical elements shows that almost all skeletal elements are present, indicating that at least some on-site slaughtering took place (Figure AB 1). The pattern for cattle shows that the elements of the front leg are better represented than those of the hind leg. This might mean that some beef trade took place in which the meat-rich upper front legs were transported to the site or the meat-rich hind legs were transported of the site. A taphonomic explanation can be excluded, as the distal part of the tibia is similarly robust as the radius or distal humerus. Horncores might have been utilised as they are underrepresented and evidence of chopping was found on a piece from context 1799. Contrary, metapodials do not seem to have been highly valued as raw material as there are still quite a lot left in the assemblage.

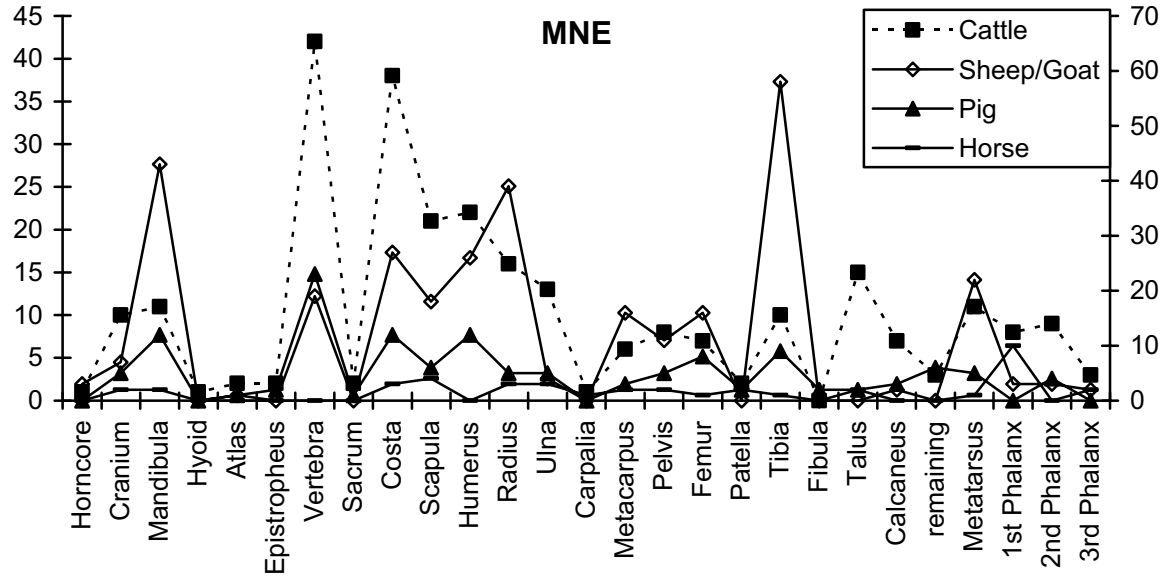


Figure AB 1. Representation of different anatomical elements using the Minimal Number of Elements

Fragments of the mandibula, radius and tibia dominate the sheep/goat assemblage. This is seen in many assemblages from different backgrounds and has most likely a taphonomical cause, as these are the more resilient elements. Possibly, the same dominance of front legs over hind legs can be seen in the sheep/goat assemblage. The pig and horse assemblages are possibly too small to draw conclusions. It might be that the same imbalance between the front and the hind leg is present in pig as well.

Age analysis

To gain insight in the age at death pattern of the Margate cattle, the jaws were classified using the data provided by Habermehl (1975; see Table AB 3).

Table AB 3. Tooth eruption stadium of cattle (after Habermehl, 1975)

Cattle		
Group	**Tooth eruption stadium**	**Age**
1	Milk premolars in eruption	0-3 weeks
2	Milk premolars have erupted	until three months
3	M1 in eruption	5-6 months
4	M1 as erupted	7-14 months
5	M2 in eruption	15-18 months
6	M2 has erupted	19-24 months
7	M3 in eruption, P3 changing	24-28 months
8	P2 and P4 changing	29-34 months
9	M3 and P2-P4 have erupted, hardly worn	older as 36 months
9+	M3 medium worn	older as 36 months
9++	M3 significant worn	older as 36 months
9+++	M3 heavily worn	much older as 36 months

Classification of the jaws shows that mainly older animals were slaughtered (Figure AB 2). The wear stage analysis showed that the wear stages on the third molar run from 3 to M with a preference for G and J, suggesting adult but not aged animals.

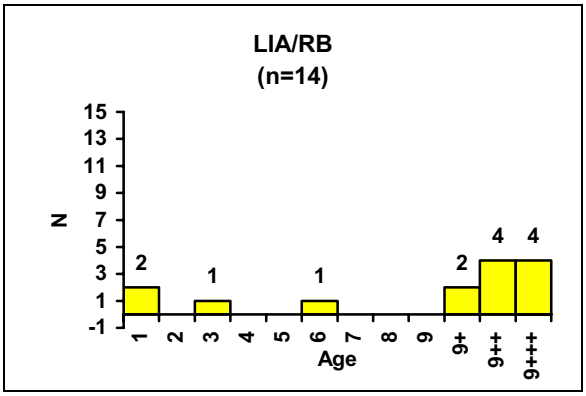


Figure AB 2. Classification of the cattle maxillae and mandibles per occupation layer

Figure AB 3 is based on the epiphyseal fusion data of cattle, which can be found in Table AB 6 of the appendix. The results obtained from the epiphyseal fusion data underline and enhance the tooth eruption data. It becomes apparent that most cattle were allowed to live beyond the age of five. This indicates that milk, manure and traction were more important than meat quality. Animals not performing well in one of these tasks were slaughtered earlier. It seems that slaughtering surplus calves in order to save the cow's milk was not practiced. This might indicate that cattle were mainly kept for traction.

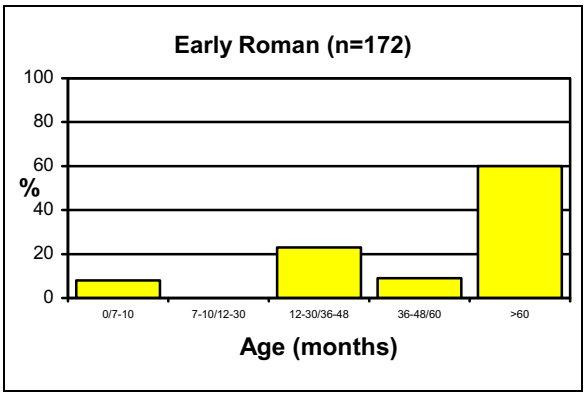


Figure AB 3. Mortuary graph based on the epiphyseal fusion data of cattle

According to Reichstein (1994, 448) the presence of foetus bones is an indicator for animal keeping on the spot as meat of foetuses is not eaten, but discarded. Foetal remains could also get into the assemblage when animals with young are slaughtered. This is uneconomical and would only take place in case of an emergency such as famine or a for humans non-harmful decease of the mother. Part of a foetal cattle humerus was found in context 1770. Context 1792 and 1795 contained foetal bones of sheep/goat.

Classifying of the sheep/goat mandibles was done according to the data provided by Jones (2006; see Table AB 4).

Table AB 4. Stages of tooth eruption in sheep (after Jones 2006)

Sheep/Goat		
Stage	**Tooth eruption stadium**	**Age**
A	Dp4 not yet in wear	0-1 month
B	Dp4 in wear, M1 not yet in wear	1-4 month
C1/2	M1 anterior cusp(s) only in wear)	3-7 month
C3/4	M1 at 3/4A, M2 not yet in wear	4-9 month
C5	M1 at 5A, M2 not yet in wear	6-10 month
C6+	M1 at 6A or more, M2 not yet in wear	8-13 month
D1/2	M2 anterior cusp(s) only in wear)	10-14 month
D3/4	M2 at 3 or 4A, M3 not in wear	11-20 month
D5	M2 at 5A, M3 not yet in wear	13-22 month
D6+	M2 at 6A or more, M3 not yet in wear	14-27 month
E1/2	M3 anterior cusp(s) only in wear	19-36 month
E3+	M3 central cusp(s) in wear, distal unworn	21-54 month
F5/8	M3 5G to 8G	2.5-4.5 years
F9/10	M3 distal cusps in wear, 9G to 10G	3.5-6 years
G	M3 at 11G, M2 at 9A	4-estimated 9 years
H	M3 at 11G, M2>9A	Estimated 6-11+ years
J	M3 at >11G	Estimated 8-13+ years

The results of the jaw classifying can be seen in Figure AB 4. The figure shows a preference for the consumption of the meat of lambs and mature animals. This figure might be biased, as the bones of juvenile animals are less resilient. However, the presence of foetal bones from Area 16 shows that this bias is only slight for at least this area.

A wear stage analysis showed that the third molar was mostly worn down to stage G with a range from 1 to H indicating adult but not aged animals. Soil and fodder type determine the wear rate, with sandy soils and silicate-rich short grass being the most abrasive (Silver 1970, 290). The uniformity of the found wear stages, with fewer observations on the lower and upper end of the scale, shows that the animals were probably kept under the same conditions

and, in case of the wear stage pattern deriving from the third molars, slaughtered around the same time.

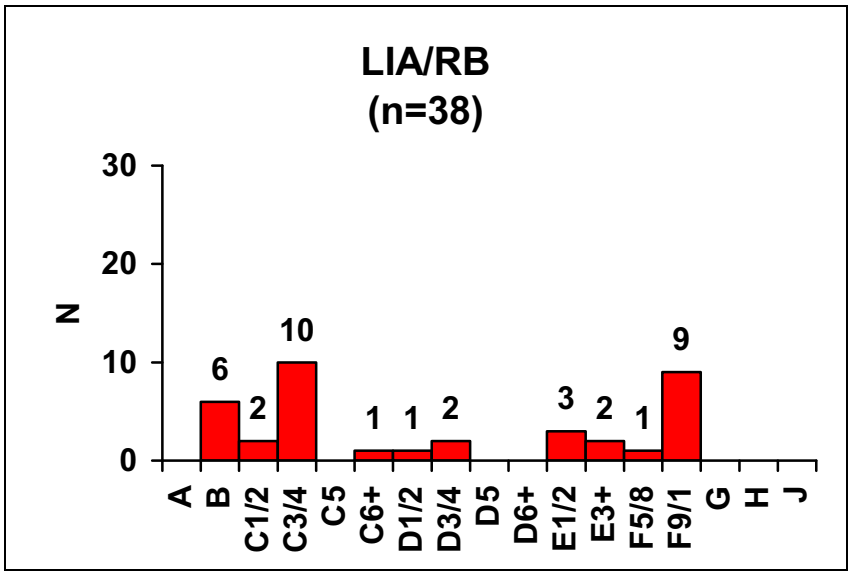


Figure AB 4. Classification of the sheep mandibles

Figure AB 5 is based on the epiphyseal fusion data of sheep found in Table AB 7 in the appendix. The data in the last row of these tables is an interval: the relative number of animals who died between this and the preceding age group (see also: Uerpmann 1972, 16).

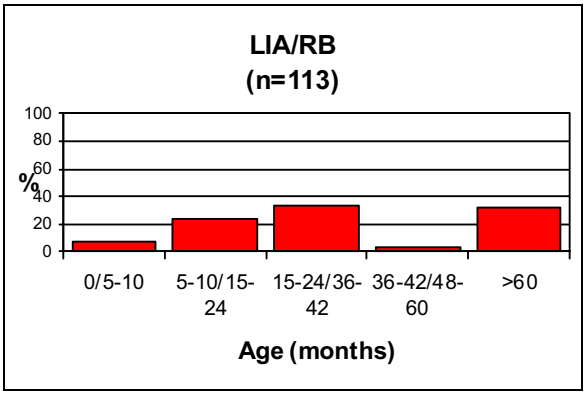


Figure AB 5. Mortuary graph based on the epiphyseal fusion data of sheep

The results in Figure AB 5 are not consistent with the age analysis based on the jaws, as the number of lambs killed seems lower. However, the not always favourable conditions for bone preservation on the different sites are likely to blame for this, as young bones are less resilient compared to adult bones. Contrary, mandibles are known to be resilient. Upon combining the two ageing methods, it seems that the husbandry strategy practised in the Margate area during the LIA/RB period was a mixed one. Surplus animals were killed early to safe the ewe's milk for human consumption. Animals of subadult age not suitable as breeders or with a lesser quality wool were killed as well. Almost no killing took place once the animals were between three and five years of age. One third of the herd was allowed to live well into maturity and was only killed when their wool or breeding quality declined.

Classifying of the pig mandibles and maxillae was done according to the data provided by Habermehl (1975; see Table AB 5) and resulted in Figure AB 6.

Table AB 5. Stages of tooth eruption in pig (after Habermehl, 1975)

Pig		
Group	**Tooth eruption stadium**	**Alter**
0	Milk premolars in eruption	0-7 weeks
1	Pd4 has erupted	Older than 7 weeks
2	M1 in eruption	4-6 months
3	M1 has erupted, I3 and C changing	6-10 months
4	M2 in eruption, I3, C and I1 changing	10-12 months
5	M2 has erupted, P2-P4, I1 and I2 changing	12-16 months
6	M3 in eruption, I2 changing	16-24 months
7	M3 has erupted	older than 24 months
7+	M3 medium worn	older than 24 months
7++	M3 significant worn	older than 24 months
7+++	M3 heavily worn	much older than 24 months

The graph in Figure AB 6 shows that the majority of pigs died at an age of more than two years. This is a common and ideal age for butchering. Varro (cited by Benecke et al. 2003, 72) says that the Romans used sows for breeding from 20 months up to 7 years. According to Columella (book 7 chapter 9 Ahrens 1972, 238) a boar can serve at the age of 6-12 months until it is four years of age. Sows can be served twice a year from the age of one year until the age of seven. Müller (1973, 436) states that it was customary in the 19th century country side to use sows with an age of 2 till 8 years and boars until 4 years for breeding. This means that most of the pigs in the Margate area were used for breeding once or twice.

The wear stage analysis showed that most pig teeth were in the earlier wear stages indicating young animals. One mandible with a third molar in wear stage J however, shows that animals could reach a higher age. The particular animal might have been an excellent breeding animal.

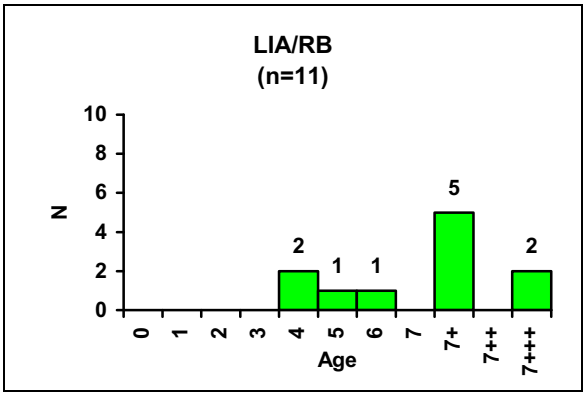


Figure AB 6. Classification of the pig maxillae and mandibles

Figure AB 7 is based on the epiphyseal fusion data of pig found of Table AB 8 in the appendix. It becomes apparent that one quarter of the pigs were slaughtered in their first year and half of the pigs were slaughtered in their second year. A quarter of the pigs were allowed to live beyond the age of three.

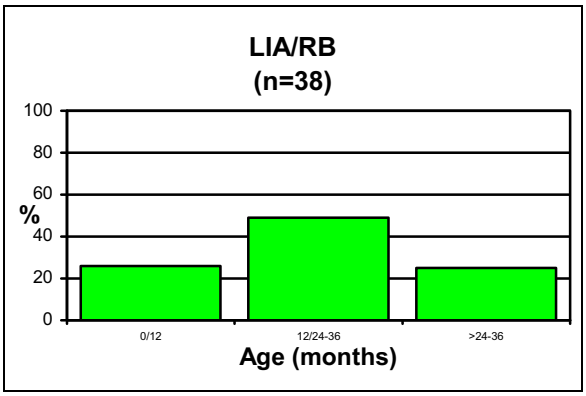


Figure AB 7. Mortuary graphs based on the epiphyseal fusion data of pig

Most horse remains derive from adult animals. Some teeth demonstrably belonged to juvenile or subadult animals. The presence of almost all skeletal elements as well as the fact that their fragmentation was similar to that of cattle, points to the custom of eating horsemeat. Consuming horsemeat was quite common before the early Christian ban. Adult animals dominate the dog bone assemblage and only a few juvenile dog bones were found.

Breed

The cattle breed around Margate was of the short-horned variety as the horncore fragments found in Area 16 show. Five metapodials and one radius were suitable for a height at the withers estimation. As the metapodials were not sexed, the means as proposed by Von den Driesch and Boessneck (1974) were used. With an average height at the withers of a little under 1.12 m, the cattle breed around Margate was rather small.

Several cranium fragments indicate that the sheep breed around Margate was horned. Remains of naturally polled animals were not found. One metacarpus and three radii were suitable for a height at the withers estimation resulting in an average of just under 56 cm. Three complete pig bones, probably from the same animal, yielded a height at the withers of 70 cm.

Three probable horse bones dating to the LIA/RB period were suitable for a height at the withers estimation. According to Vitt (1952), two belonged to a rather small type of horse and the other one to a small type of horse. The average height of the Margate horses lies around 1.29 m. Upon comparing the two complete metacarpi with the data collected by Eisenmann and Beckouche (1986), it becomes apparent that the metacarpus from context 1137 might belong to a donkey or a hinnie based on the GL/Bd. The metacarpus from context 8750 (Late Prehistoric in date) corresponds well with the values for *Equus przewalskii*. As the material is of LIA/RB date, the presence of donkeys and crossbreeds like mules and hinnies forms a real possibility.

26 complete dog bones were suitable for a height at the withers estimation. This resulted in an average height at the withers of the Margate LIA/RB dogs of 45 cm. This includes (partial) skeletons as well. Looking at the values individually, it seems that the actual height at the withers of the dogs from Margate is a couple of centimetres higher.

Sex

In some animal species, the bones show enough sexual dimorphism to separate the males from the females. This can be based on the visual form of a particular skeletal element or the analysis of some particular measurements of a skeletal element. Three sheep/goat pelves

probably belonged to ewes, whereas a horned cranium fragment probably belonged to a ram or wither as it was quite robust.

The sex of the pigs was estimated using the canines of the maxillae and mandibles. The form of these teeth differs in boars and sows. Above this, the teeth of boars are larger and have roots that stay open all their lives whereas they close with advanced age in sows. Three canines came from sows and two canines belonged to boars.

A horse pelvis fragment was thought to be that of a mare and a frog humerus belonged to a female as well. The results of the sex analysis are based on too little data and can therefore not be used with confidence to further elucidate the LIA/RB husbandry regimes.

Pathologies and anomalies
Although not many bones show 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.

Most pathology in sheep occurs in the jaws. Siegel (1976, 361) also noted this for 18 British sites ranging from the Neolithic until medieval times. A right mandible from context 1789 showed an extension of the articular surface towards medial formed of irregular bone tissue. A right mandible from context 1792 belonged to a mature animal and had a lump of irregular bone tissue on the buccal side beneath the molars. Furthermore, bone resorption was seen around the roots of M1 and M2. The later condition is likely the result of an inflammation. These occur when the gum is damaged by something sharp in the fodder. When the animal is in a lesser condition, the gum does not heal and nasty inflammations with alveolar recession are the result.

On the lateral face of sheep mandible, a foramen is frequently found below P2-4 (Halstead and Collins 2002). Of the 42 LIA/RB sheep and sheep/goat mandibles from Margate with the appropriate region preserved, seven had this characteristic (17%). Of these, three were orientated below P2, one below P2/3 and three below P3.

Context 1764 contained a left radius of sheep/goat. The radius displayed sharp bone nodules on the lateral side of the proximal articular surface. This condition is called penning elbow. A right cattle femur from context 1337 had a shiny rim on the caput, orientated towards the collum. These shiny patches develop when one bone makes direct contact with another bone (in this case: femur head with pelvis socket). The later condition is typical of old age and commonly encountered in draught cattle.

Butchery marks
The accumulation of cut- and chop marks on particular skeletal elements point to the use of the dead animal body (See for instance Uerpmann 1977, Lauwerier 1988 and Ewersen 2004). As some marks occur during butchering practices: skinning and partitioning of the carcass, other marks are the result of food preparation.

Clear signs of butchery were seen on 3% of the LIA/RB animal bones. Of these, 67% involved cattle fragments, 25% sheep/goat and 2% pig bones. Butchery marks were also seen on a caudal vertebra of cod (cut) and a horse ulna. Interestingly, a dog atlas from context 1792 displayed a chop mark on its cranial articulation as if the dog was decapitated. A dog ulna from 1795 had cut marks along its shaft possibly deriving from skinning.

The butchery marks left on cattle were largely caused by a knife. This is characteristic of the LIA indigenous way of life as the Romans practised a more heavy butchering technique mainly using a cleaver. The knife was mainly used for filleting, which might have occurred in the kitchen rather than on the butchery site. However, many marks on the articular surfaces show that disarticulating the joints was done using a knife as well. Knife marks on the mandibula, principal tarsal bones and phalanx I are likely the result of skinning. The cleaver was mainly used to disarticulate and portion the carcass. Some filleting was also carried out with this tool as shaving marks on the humerus, radius and pelvis show.

As in cattle, a knife caused most butchery marks on sheep/goat bones. Knives were used mainly for filleting and to a lesser extend for disarticulation and skinning. The cleaver was used solely for portioning. Splitting the cranium longitudinally in order to obtain the nutritious brain was seen several times. The two butchery marks seen on pig bones derived from disarticulating the carcass.

Bone distribution and deposition

To detect any special depositions or relationships between the archaeological features and the animal bone, the later were also examined per relevant area or context.

The 14 bones from Area 8 were all in a poor state and belonged to cattle, horse and pig. Only one bone is dated as Medieval, all other bone comes from undated contexts. It becomes clear that the animal bone is not able to enhance the other archaeological data found on this site (i.e a cremation from the Late Bronze Age/Early Iron Age, field system ditches and pits from the Romano-British period and a medieval bakery structure).

Of the 269 bones found in Area 9, 172 date to the medieval period or are undated. Of the later, possible RB pit 8240 probably contains the remains of two more or less complete hens (one adult, one juvenile), as well as a buzzard bone. The 96 bones dating to the LIA/RB period consist of cattle, horse, sheep/goat and pig. Cremation burial 8195 contained the burnt molar teeth of a juvenile pig and cremation pit 8199 contained an unburnt mandibular pig tooth. Cremation burial 8202 probably contains part of a suckling pig represented by many rib fragments and unidentifiable fragments of possible long bones. The bone is burnt and has a greenish bronze stain. Cremation burials 8273 contained only small un-burnt bone splitters attributed to large and medium mammals. Furthermore, a probably fossilized shark tooth was found (identification by Sheila Hamilton-Dyer, Southampton). It seems that the burnt pig teeth in 8195 and the burnt suckling pig from 8202 represent pyre goods.

Most of the 539 bones from Area 14 date to the Roman and Saxon period. Of particular interest is re-used tree throw 6371. The upper part of this tree throw was filled with a placed deposit of pig skeletons. The deposit might contain as many as four (partial) skeletons as suggested by the mandible fragments (usually the best-preserved body part in pigs). Two pairs of mandible fragments had their M2 in eruption, which suggests an age of 10-12 months. One left mandible fragment had an erupted M2, but the M3 has not yet erupted; suggesting an age of 12-16 months. The skeleton probably best represented in the material is that of a mature sow (possibly) with a very worn third molar (wear stage according to Grant 1983: J) and a height at the withers of 70 cm. No butchery marks were seen on any of the pig skeletons.

The field drawing suggests that the animals were not placed separately next to each other, but partly on top of each other. This resulted in field staff assigning three object numbers (827, 828 and 834) to the pig remains and one (829) to a set of adult cattle maxillary teeth. However, these object numbers do not represent complete skeletons as parts of the juvenile pigs got happily together in a bag with a leg from the mature pig.

Upon studying the field drawing it becomes clear that the mature pig was probably orientated N-S; head facing south. Its bones are mainly concentrated in the southern corner of the tree throw (Objects 827 and 834). The animal was probably lying on its left side, which is better preserved. Parts of the right hind limb (pelvis, fibula and talus) were found in the NW corner of the tree throw (Object 828). A pair of mandibles of one of the 10-12 month old animals together with other juvenile bones was mainly found in the middle of the tree throw (Object 834). Many juvenile bones and the left mandible of the 12-16 month old animal were found in the N part of the tree throw (Object 828). The maxillary cattle teeth were probably associated with the mature pig (Object 829). The above makes it clear that the pig skeletons were probably no longer completely in anatomical order.

Probable pyre goods from Area 14 include the calcined remains of pigs and birds. Cremation burial 6003 contained the burnt back of a cranium of a young pig and some unidentifiable burnt bird bones. Cremation burial 6009 contained the burnt fragments of a possible cranium of a young pig, a burnt fragment of a right tibia of pig and a burnt fragment of a femur probably belonging to domestic fowl. Cremation burial 6012 contained the calcined fragments of a right femur and a tibiotarsus from domestic fowl. Cremation burial 6015 contained the possibly burnt fragment of a right carpometacarpus of a small corvid as well as the calcined fragment of a lumbal vertebra of a medium mammal. Cremation burial 6019 contained unidentifiable burnt fragments of bird and medium mammal bone. Cremation burial 6022 contained the burnt fragments of a clavicula and tibiotarsus possibly of chicken. Further burnt fragments of a femur and a tibiotarsus might belong to duck (Anatidae). A burnt fragment of a mandibula probably belonged to heron. Furthermore, calcined fragments of medium mammals were found.

The Saxon bones from Area 14 all come from the natural backfill of a SFB and consist of cattle, sheep/goat, pig and chicken. These contexts contain residual Roman pottery.

An assemblage of 418 animal bones was recovered from Area 15. Of these, 209 date to the LIA/RB period and 128 are medieval or post-medieval in date. A possible LIA/RB boundary ditch was filled with normal waste as well as six complete first phalanges of horse, several sets of horse teeth (one adult, one subadult and one juvenile horse), at least two fragmented cattle skulls, an articulating dog skull with jaws and a partial dog skeleton consisting of the lower front extremities and possibly the hind feet. The articulated dog remains might come from one medium sized individual. It is likely that the now loose horse teeth once represented complete skulls as teeth survive well. The placement of animal skulls in a boundary ditch might be associated with territorial claims or they might act as protectors.

Further interesting LIA/RB assemblages from Area 15 are: cut 5170 (possible animal burrow) containing the (articulating) skull, both jaws, epistropheus and four cervical vertebra of a dog aged 9-10 years according to Habermehl (1975). Furthermore, boundary ditch 5201 contained the head and first vertebra of a medium-sized cod. The medieval animal bone from Area 15 looks like normal waste. No animal bone was associated with the inhumation graves.

The 2487 animal bones from Area 16 mainly date to the LIA/RB period and come from ditches. Object 16 consist of a right cattle femur and radius fragment as well as a right sheep/goat mandibula fragment. These bones come from a palaeochannel dated to the Iron Age. A left sheep/goat costa fragment was found in context 1068 and assigned object number 16. No bone was associated with the two inhumations.

Compound 16 yielded 932 animal bones mainly dating to the LIA/RB period. A circular pit (cut 3535; Object 325) dating to the Iron Age contained the complete skeleton of a dog with very worn teeth. The dog lies with its head turned to its back, facing NW. Many fine parallel cut marks on the distal ends of both tibia and both fibula indicate that the dog was skinned. However, the feet are also present and were thus not left attached to the skin. As no os penis was found, the dog might have been a bitch. The dog would have had a height at the withers of 46 cm. This so-called medium size would have resembled a modern border collie. Apart from the loss of the P1 in the right mandible (alveolus almost completely closed), no pathology was seen.

The upper fill of ditch 3000 in Compound 16 probably contains the complete horned skull of a mature cattle.

Summary and synthesis

The animal bone material analysed in this report came from a pipeline excavation near Margate in Kent. The nature of the excavated area resulted in the discovery of archaeological remains from many different periods. Some periods only yielded a few bones, whereas the LIA/RB period yielded enough bone to form a meaningful assemblage. Most of these bones derived from boundary ditches and pits and are likely domestic in nature. Another large proportion of the material comprises of calcined bones found in the cremation burials. Taphonomic analysis showed that the assemblage has not been intensively re-worked. The differences in underlying geology resulted in variable bone preservation.

The bulk of the LIA/RB bones derive from the usual domesticates (i.e. cattle, sheep/goat, pig and dog) and wild species were not important in covering the protein demand of the people living in this area. It is likely that sheep dominated the landscape and beef was the primary meat eaten. The analysis of the body part distribution showed that probably some meat trade took place as the elements of the front leg dominate and a taphonomic cause is not likely. It is not possible to determine with certainty if meat was transported to or from the site. However, as Margate itself was not a town and the archaeological evidence found was primarily of agrarian nature (boundary ditches), it is likely that the meat-rich hind legs were transported of the site. Possible destinations could have been the forts at Reculver, Richborough or Dover, as well as the tribal civitas at Canterbury.

Earlier excavations near Margate (Sandwich wastewater treatment scheme) yielded a small animal bone assemblage. Analysis by Hamilton-Dyer (1995) showed that most bones derived from domesticated animals and the only wild species present was cod. The cattle and horses were of similar size as those described in this report. Variable bone preservation makes it likely that smaller species are underrepresented.

The age at death of the cattle shows that mainly older animals were slaughtered. The absence of calve bones shows that cow milk was probably not widely consumed. As evidence of pathological changes correlated to traction was found, it is likely that mainly meat of draught animals was consumed. Contrary, the kill-off pattern of sheep/goat shows that a proportion of lambs were killed to safe the ewe's milk. Once an animal was destined to become a breeder and/or a wool producer, it was let to live until it no longer performed well in these tasks. As usual, pigs were mainly slaughtered around the age of two. The practiced butchery technique was characterised by the use of a knife as the primary butchery tool. This is a characteristic of Iron Age butchery as the Romans tend to use choppers and cleavers.

The presence of disarticulated horse bones with a similar degree of fragmentation as cattle indicates that horsemeat was eaten on a regular basis. Butchery marks on dog bones showed that some animals were skinned and some might even have been butchered and subsequently eaten.

Margate falls within the 'Eastern England and East Anglia' region as defined by Hambleton (1999) in her study of animal husbandry regimes in Iron Age Britain. Although sites from this region exhibit a broad range of species proportions, the percentages of cattle are generally high (c. 40-80%), while the sheep (c. 10-50%) and pig (c. 0-20%) percentages are generally low. The assemblage from Margate certainly falls within these broad parameters. However, the MNI method showed a predominance of sheep more in line with sites from Wessex and the South. Hambleton (1999) notes that especially wetland sites from the region have a pattern comparable with the South.

Combining the husbandry strategies as seen in the Margate material would complement arable farming with cattle, sheep and pig manure to fertilize the fields. After the harvest, sheep could be grazed on the fields to feed on the stubbles and manure the field at the same time. It is likely that excess yearlings would have been killed before they could loose condition during the winter. Keeping the animals close to the settlement during winter would make feeding them and collecting manure to subsequently spread on the fields easier. In the spring, sheep could be grazed on the pastures further away from the settlement. This would explain the low numbers of neonate material as lambing would have taken place away from the settlement. In addition, cattle could be used to pull the plough.

Comparing diet in the Roman Empire, King (1999) showed that the standard Late Iron Age pattern of a high sheep percentage was changing to a pattern with high cattle and pig percentages. These changes were strongest in urban and military settlements and to a large part ignored in rural sites. Pork-rich diets were originally a feature of Rome and its hinterland reflecting a concentration of wealth as a result of the imperial exploitation of the provinces. It seems that mainly people who copied other aspects of Roman life copied this diet as well (King 1991). This was also seen in three animal bone assemblages from Dorchester where the highest social group lived in a central insula probably near the forum. They ate quality meat from young animals with a high proportion of wild birds and pigs (Maltby 1993). The intermediate group lived in the south-west corner of the town and ate similar proportions of meat as the elite indicating Roman customs as well, but the animals where the meat came from were considerable older. The lowest social group clung to their Iron Age customs and ate primarily mutton in a more rural site outside the gates (Hamilton-Dyer 1993). Cool (2006) argues that the low pig percentages in rural settlements might be the result of pigs being viewed as special. This might have resulted in eating pork only on special occasions or avoiding eating pork (taboo).

Gerlach (1986) states that meat was an important element of Roman dinner, the *cena*. The Romans preferred the tender meat of young animals and diary products like cheese were also important. Especially cheese from sheep's milk was popular. The meat from game did not play a huge role in the diet of the inhabitants of the Northern Provinces. Apparently, the preference for tender meat was not or could not always be shared by the people from Margate. The taste of meat, and how tough it is, depends amongst others on the age of the animal. Most beef consumed at Margate would have been rather tough like it would have been on most Romano-British sites. It is no surprise that cooking jars, ideal for slow cooking of stews, are common in the pottery assemblage from these sites (Cool 2006).

The consumption of milk would have been limited given the fact that it is not safe to drink in a society that does not have refrigerators. Furthermore, cow's milk was a source of bovine tuberculosis. Milk was therefore likely converted into butter and cheese. Especially hard cheeses would have been storable. Eating chicken was probably influenced by Roman customs as well with proportions rising after the conquest. Again, they form a minority or are absent in assemblages from rural settlements. In addition, chickens did fulfil an important role in religious practices with the birds being found in (rural) cemeteries (Cool 2006). This holds true for Margate was well (see below). Apart from rearing chickens for their meat, their eggs and feathers would have been used as well.

Pyre goods encountered in the cremation burials of Area 9 include suckling pig and juvenile pig. The remains of the suckling pig from 8202 are bronze stained which indicate that they were in contact with a bronze object. Several fragments of copper alloy were found in this

grave. The cremation burials in Area 14 contained juvenile pig, domestic fowl and possibly corvid, duck and heron. The dominance of pig and domestic fowl as a pyre good does not reflect species proportions as seen in the 'normal' domestic waste. The small quantities of bone and the fact that only certain parts of the animals are present (i.e. pig head, chicken drumstick) makes it unlikely that complete animals were burnt on the pyre.

The animal bone from the cremation burials found at the cemetery east of the fort and *vicus* at Brougham, Cumbria (third century AD) was studied by Bond and Worley (2004). Animal remains present in the cremation burials include horse, cattle, sheep/goat, pig, domestic fowl and goose. The remains represented sacrifices and food offerings; less likely had a totemic function, as they are all domestic animals. Both, men and women were given (parts of) animals. However, they are almost absent from children's graves. The presence of horse in the burial graves is unique and is probably related to the fact that the people living in the fort and vicus came from the Danube area. The offering of a complete horse must have been a big economic sacrifice (McKinley 2004). A wide range of species was present at the Eastern cemetery of Roman London. Pig and domestic fowl clearly dominated, but the other domesticates, birds and fishes were also present. Again, adults were more likely to be accompanied by animal remains than children were. About half of the burials contained cremated animal bone (McKinley 2000).

The occurrence of special depositions like dog and pig burials as well as the placement of skulls of horse, cattle and dog is quite common in the Iron Age and subsequent Roman period. Research by Fulford (2001) showed that especially the burial of dogs in a settlement context was quite common in the Roman period. The presence of inhumation and cremation cemeteries around Margate makes it probable that some of these depositions (tree throw with pigs, pig and birds in grave) are associated with grave rituals.

Summarizing the above, the LIA/RB assemblage from Margate is characteristic of a rural settlement. The people were engaged in arable farming and stock raising. In order to spread risks and be largely self sufficient with possibly some meat trade, they practiced mixed husbandry regimes, which would have maximized the yield in primary and secondary products. Pig and domestic fowl had roles beyond that of manure and meat supplier as they featured also as pyre goods.

Bibliography

Ahrens, K. (1972) *Columella über Landwirtschaft* (=Schriften zur Geschichte und Kultur der Antike 4) Berlin: Akademie.

Albarella, U. (2005) 'Alternate fortunes? The role of domestic ducks and geese from Romano to Medieval times in Britain' in G. Grupe and J. Peters (eds), *Feathers, Grit and Symbolism. Birds and humans in the ancient old and new worlds*. Rahden/Westf.: 249-258.

Benecke, N. (2003) 'Haustierhaltung' in N. Benecke, P. Donat, E. Gringmuth-Dallmer and U. Willerding (eds), *Frügeschichte der Landwirtschaft in Deutschland*. Langenweissbach: 173-195.

Bond, J. M. and F.L. Worley (2004) 'The animal bone' in H.E.M. Cool (ed.), *The Roman cemetery at Brougham, Cumbria excavations 1966-67*, Britannia monograph series no. 21, Society for the promotion of Roman studies/English Heritage: 311-331.

Clark, K.M. (1995) 'The later prehistoric dog: the emergence of canine diversity' *ArchaeoZoologia* 7/2: 9-32.

Cool, H.E.M. (2006) *Eating and drinking in Roman Britain*, University Press, Cambridge.

Dobney, K. and K. Reilly (1988) 'A method for recording archaeological animal bones: the use of diagnostic zones', *Circaea* 5/2: 79-96.

Driesch, A. von den (1976) *A Guide to the Measurement of Animal Bones from Archaeological Sites.* Cambridge, Massachusetts: Peabody Museum of Archaeology and Ethnology, Bulletin no. 1.

Driesch, A. von den and Boessneck, J. (1974). 'Kritische Anmerkungen zur Widerristhöhenberechnung aus Langenmaßen vor- und frühgeschichtlicher Tierknochen', *Säugetierkundliche Mitteilungen* 22: 325-48.

Ewersen, J. (2004) 'Die unterschiedliche Nutzung von Haus- und Wildtieren im Neolithikum Ostholsteins am Beispiel der Schnittspurenanalyse an Knochen aus Grube-Rosenhof, Wangels LA 505 und Heidmoor' *Archäologische Informationen* 27/1: 109-121.

Fulford, M. (2001) 'Links with the past: pervasive 'ritual' behaviour in Roman Britain' *Britannia* 32: 199-218.

Grant, A. (1982) 'The use of tooth wear as a guide to the age of domestic ungulates' in B. Wilson, C. Grigson and S. Payne (eds.), *Ageing and Sexing Animal Bone from Archaeological Sites.* Oxford: British Archaeological Reports; British Series 109: 91-108.

Gerlach, G. (1986) *Essen und Trinken in römischer Zeit*. Köln: Rheinland-Verlag GmbH.

Habermehl, K.H. (1975) *Die Altersbestimmung bei Haus- und Labortieren 2. vollständig neubearbeitete Auflage*. Berlin and Hamburg: Paul Parey.

Hambleton, E. (1999) *Animal husbandry regimnes in Iron Age Britain* (=BAR British Series 282), Archaeopress, Oxford.

Hamilton-Dyer, S. (1993) 'Animal bones' in R.J.C. Smith (ed.) *Excavations at County Hall, Colliton Park, Dorchester, Dorset, 1988* (=Wessex Archaeology Report No. 4). Wessex Archaeology.

Hamilton-Dyer, S. (1995) Animal bone archive report for Sandwich wastewater treatment scheme.

Halstead, P. and P. Collins (2002) 'Sorting the sheep from the goats: Morphological distinctions between the mandibles and mandibular teeth of adult Ovis and Capra', Journal of Archaeological Science 29: 545-553.

Harcourt, R.A. (1974) 'The dog in prehistoric and early historic Britain' *Journal of Archaeological Science* 1: 151-175.

Jones, G. G. (2006) 'Tooth eruption and wear observed in live sheep from Butser Hill, the Cotswold Farm Park and five farms in the Pentland Hills, UK' in D. Ruscillo (ed.) Recent advances in ageing and sexing animal bones, Oxford: 155-178.

King, A. (1991) 'Food production and consumption – meat' in R.F.J. Jones (ed.) *Britain in the Roman Period: Recent trends*, University of Sheffield: 15-20.

King, A. (1999) 'Diet in the Roman world: a regional inter-site comparison of the mammal bones' *Journal of Roman Archaeology* 12: 168-202.

Lauwerier, R.C.G.M. (1988) *Animals in Roman times in the Dutch Eastern River Area*, Amersfoort.

Maltby, J. M. (1993). '*Animal Bones*' in P.J. Woodward, S.M. Davies and A.H. Graham (eds), Excavations at the old Methodist chapel and Greyhound Yard, Dorchester, 1981-1984 (=Dorset Natural History and Archaeological Society Monographies Series: Number 12). Wessex Archaeology: 315-340.

Matolcsi, J. (1970) 'Historische Erforschung der Körpergröße des Rindes auf Grund von ungarischem Knochenmaterial' *Zeitschrift für Tierzüchtung und Züchtungsbiologie* 87/2: 89-137.

May, E. (1985) 'Widerristhöhe und Langenknochenmaße bei Pferden – ein immer noch aktuelles Problem' *Zeitschrift für Säugetierkunde* 50: 368-382.

May, E., Teichert, M. and Hanneman, K. (1996) 'Allometric aspects to the determination of the withers height in pigs on the basis of the data of M. Teichert' *ArchaeoZoologia* 8/1,2: 125-139.

McKinley, J.I. (2000) 'Funerary practice' in B. Barber and D. Bowsher (eds) *The Eastern Cemetery of Roman London excavations 1983-1990*, MoLAS monograph 4, Museum of London Archaeology Service/English Heritage: 60-81.

McKinley, J.I. (2004) ‘Aspects of the cremation ritual as evidenced by the animal bones’ in H.E.M. Cool (ed.), *The Roman cemetery at Brougham, Cumbria excavations 1966-67*, Britannia monograph series no. 21, Society for the promotion of Roman studies/English Heritage: 331-332.

Müller, H.-H., (1973) ‘*Zur Nutzung der frühgeschichtlichen Haustiere (auf Grund osteologischer Untersuchungen)*’ Berichte über den II. Internationalen Kongreß für slawische Archäologie Berlin 1970, Band 3. Berlin: 429-439.

Prummel, W. and Frisch, H.-J. (1986) ‘A guide for the distinction of species, sex and body side in bones of sheep and goat’ *Journal of archaeological science* 13: 567-577.

Prummel, W. (1987) ‘Atlas for identification of foetal skeletal elements of cattle, horse, sheep and pig part 2’ *ArchaeoZoologia* 12: 11-42.

Reichstein, H. (1994) ‘Über Knochen von Rinder-, Schaf- und Schweinefeten aus Kloaken und Abfallschächten spätmittelalterlicher bis frühneuzeitlicher Städte in Norddeutschland’ *Beiträge zur Archäozoologie und Prähistorischen Anthropologie (=Forschungen und Berichten zur Vor- und Frühgeschichte in Baden-Württemberg, Band 53)*:445-448.

Schuster, T. (2001) *Bösselkatrien heet mien Swien. Das Tier in der ostfriesischen Kulturgeschichte und Sprache.* Leer.

Siegel, J. (1976) ‘Animal pathology: possibilities and problems’ *Journal of Archaeological Science* 3: 349-384.

Silver, I. (1969) 'The ageing of domestic animals' in D. Brothwell and E. Higgs (eds.), *Science in Archaeology.* London: Thames and Hudson: 293-302.

Teichert, M. (1969) ’Osteometrische Untersuchungen zur Berechnung der Widerristhöhe bei vor- und frühgeschichtlichen Schweinen’ *Kühn-Archiv* 83: 237-292.

Teichert, M. (1975) ‘Osteometrische Untersuchungen zur Berechnung der Widerristhöhe bei Schafen’ in A. T. Clason (ed.), *Archaeozoological studies*. Amsterdam, etc.: North-Holland Publishing Company/Elsevier: 51-69.

Uerpmann, H.-P. (1972) ’Tierknochenfunde und Wirtschaftsarchäologie. Eine kritische Studie der Methoden der Osteo-Archäologie’ *Archäologische Informationen* 1: 9-27.

Uerpmann, H.-P. (1977) ‘Schlachterei-Technik und Fleischversorgung im römischen Militärlager von Dangstetten (Landkreis Waldshut)’ *Regio Basiliensis Baseler Zeitschrift für Geographie* 18: 261-272.

Vitt, V.O. (1952) **‘**The horses of the kurgans of Pazyryk’ Journal of. *Soviet Archaeology 16*: 163- 206.

Wahl, J. (1981) ‘Beobachtungen zur Verbrennung menschlicher Leichname. Über die Vergleichbarkeit moderner Kremationen mit prähistorischem Leichenbränden’ *Archäologisches Korrespondenzblatt* 11: 271-279.

Yalden, D. (1999) *The history of British Mammals.* London: Academic Press.

Appendix

Ageing

Table AB 6. Epiphyseal fusion data of cattle

Cattle							
Age (Months)	**Epiphysis**	**Number fused**	**%**	**Number non-fused**	**%**	**Total**	**Interval %**
7-10	Scapula	10					
	Pelvis	1		1			
Total		**11**	**92**	**1**	**8**	**12**	**8**
12-15	Radius p.	18					
15-18	Phalanx II p.	9					
15-20	Humerus d.	14					
20-24	Phalanx I p.	9					
24-30	Tibia d.	7		5			
	Metapodia d.	15		1			
Total		**72**	**92**	**6**	**8**	**78**	**0**
c. 36	Calcaneus p.	2		3			
42	Femur p.	2		1			
42-48	Tibia p.	4		2			
	Radius d.	11		2			
	Femur d.	4		2			
	Humerus p.	1		2			
	Ulna p/d.	3					
Total		**27**	**69**	**12**	**31**	**39**	**23**
60	Vertebra	26		17			
Total		26	60	17	40	43	9
Total		**136**	**79**	**36**	**21**	**172**	

Table AB 7. Epiphyseal fusion data of sheep/goat

Sheep/Goat							
Age (Months)	**Epiphysis**	**Number fused**	**%**	**Number Non-fused**	**%**	**Total**	**Interval %**
3-4	Humerus d.	13					
	Radius p.	12					
c. 5	Scapula	4					
	Pelvis	5		1			
5-7	2nd Phalanx	3					
7-10	1st Phalanx			2			
Total		**37**	**93**	**3**	**7**	**40**	**7**
15-20	Tibia d.	15		6			
20-24	Metapodia d.	3		2			
Total		**18**	**69**	**8**	**31**	**26**	**24**
36	Calcaneus	1		1			
36-42	Femur p.			3			
	Ulna p.	1		2			
42	Humerus p.			1			
	Radius d.	4		4			
	Tibia p.			4			
	Femur d.	2		3			
Total		**10**	**36**	**18**	**64**	**28**	**33**
48-60	Vertebra	6		13			
Total		6	32	13	68	19	4
Total		**71**	**63**	**42**	**37**	**113**	

Table AB 8. Epiphyseal fusion data of pig

Pigs							
Age (Months)	**Epiphysis**	**Number fused**	**%**	**Number non-fused**	**%**	**Total**	**Interval %**
12	Pelvis	4					
	Phalanx II p.	1		3			
	Radius p.	4		1			
	Scapula	2					
	Humerus d.	3		1			
Total		**14**	**74**	**5**	**26**	**19**	**26**
24	Metapodia d.	1					
	Tibia d.	3		4			
24-30	Calcaneus p.			3			
36	Ulna p.			1			
Total		**4**	**25**	**8**	**75**	**12**	**49**
42	Tibia p.	1					
	Humerus p.			2			
	Femur p./d.	1		3			
Total		2	29	5	71	7	-
Total		**20**	**53**	**18**	**47**	**38**	

Measurements

Table AB 9. Cranium measurements, all species

Cranium														
Site	**Period**	**ABG**	**Context**	**Species**	**Side**	**Age**	**Sex**	**1**	**2**	**7**	**15**	**16**	**17**	**18**
A15	RO		5152	dog	Both	>6-12					54.7	17.6	40.1	14.3
A15	RO		5168	dog	Both	adult							39.9	15.1
C16	IA	1	3534	dog	N/A	>6-12		174.0	145.0	83.3	65.4	18.0	47.1	17.4
Site	**Period**	**ABG**	**Context**	**Species**	**Side**	**Age**	**Sex**	**18a**	**19**	**19L**	**19B**	**20**	**20L**	**20B**
			3000	cattle	Both	9++						119.1		
A15	RO		5152	dog	Both	>6-12		8.4		11.6	15.1		6.0	9.0
A15	RO		5168	dog	Both	adult		9.5	15.0				11.7	15.1
C16	IA	1	3534	dog	N/A	>6-12		8.8	17.7				11.8	15.7
Site	**Period**	**ABG**	**Context**	**Species**	**Side**	**Age**	**Sex**	**21**	**21L**	**21B**	**22**	**23**	**25**	**27**
A15	LIA/ER		5151	cattle	L	9++		76.9						
			3000	cattle	Both	9++		74.0			49.9			
C16	IA	1	3534	dog	N/A	>6-12			5.9	9.4		61.2	36.3	15.1
A16	LIA		1774	sheep/goat	R	7++		56.3			36.9	20.9		
Site	**Period**	**ABG**	**Context**	**Species**	**Side**	**Age**	**Sex**	**28**	**29**	**30**	**31**	**40**	**41**	**42**
A15	RO		5168	dog	Both	adult							31.0	
C16	IA	1	3534	dog	N/A	>6-12		14.8	54.9			44.8		
A14			6260	pig	Both	7+		61.3		29.9	15.3			
A16	LIA		1796	pig	R	adult			41.7					
A16	LIA		1796	pig	L	7+				24.8	14.3			
A16	LIA/ER		1792	pig	L	7+				28.0	13.0			
A14	RO	4	6372	pig	L	7+++				28.7	19.7			
A14	RO		6372	pig	R	7+++				29.8	17.9			
A16	LP		1739	sheep	R	adult						112.0	39.4	28.0
A16	LIA		1796	sheep	R	adult	Male					123.0	45.7	29.7
A16	LIA/ER		1789	sheep	L	adult						92.0	33.4	21.9
Site	**Period**	**ABG**	**Context**	**Species**	**Side**	**Age**	**Sex**	**43**	**44**	**45**	**46**			
A15	LIA/ER		5151	cattle	Both	adult			176.0	60.6	45.6			
			3000	cattle	Both	9++			144.0	49.0	41.6			
A16	ER		1799	cattle	L	adult			151.0	51.0	43.4			
A16	LIA/ER		1789	sheep	L	adult		111.0						

Table AB 10. Mandibula measurements, all species

Mandibula													
Site	**Period**	**ABG**	**Context**	**Species**	**Side**	**Age**	**1**	**2**	**3**	**4**	**5**	**6**	**7**
A16	LIA/ER		1089	cattle	L	9+++			100.6		247.0	310.0	134.9
A15	RO		5168	dog	Both	>6-12							62.2
C16	LIA		3396	dog	L	adult				108.0	105.0	109.0	73.8
C16	IA	1	3534	dog	Both	>6-12	129.5	125.5	119.8	111.0	104.2	109.8	74.2
A16	LIA		1770	sheep	L	F9/10		163.0		101.4			61.4
A16	MIA		1045	sheep/goat	L	F9/10							66.2
A16	ER		1119	sheep/goat	R	F9/10							65.7
A15	ME		5137	sheep/goat	R	F9/10							67.9
A16	LIA		1795	sheep/goat	R	F9/10							59.3
A16	LIA/ER		1792	sheep/goat	R	E3+			39.3		104.8	117.2	70.4
C16	LIA/ER		3145	sheep/goat	L	F9/10							62.3
Site	**Period**	**ABG**	**Context**	**Species**	**Side**	**Age**	**8**	**9**	**9a**	**10**	**10L**	**10B**	**11**
A16	ER		1017	cattle	L	9++					35.9	14.1	
A16	ER		1176	cattle	R	9+++					35.0	13.6	
A15	LIA/ER		5151	cattle	R	9+++					37.2	15.5	
C16	LIA		3310	cattle	R	9++					32.6	11.8	
C16	LP		3399	cattle	R	9++						12.4	
C16			3457	cattle	R	9++						14.0	
			1025	cattle	L	9+++					35.3	15.1	
A16	MIA/LIA		1090	cattle	L	adult		47.5					
A16	LIA/ER		1089	cattle	L	9+++	83.3	50.5			38.9	16.0	
A15			5120	cattle	L	9+++	72.4				33.1	14.2	
A15	RO		5152	cattle	L	9+++	81.7				34.8	14.4	
A16	LIA/ER		1358	cattle	L	9++	81.4				33.1	12.5	
A16	LP		1088	dog	L	>6-12				32.6			
			1174	dog	L	>6-12				34.9			
A16	LP		1365	dog	L	>6-12				37.8			
A15	RO		5152	dog	Both	>6-12	64.1	59.0		30.7			35.2
A15	RO		5168	dog	Both	>6-12	59.4	55.4		29.7			31.9
C16	LP		3394	dog	Both	>6-12							35.9
C16	LIA		3396	dog	L	adult	68.2	63.5		34.5			
C16	IA	1	3534	dog	Both	>6-12	68.1	63.3		33.9			36.9
A16	LP		1024	pig	R	7+					31.5	12.5	
A16	ER		1102	pig	R	7+					29.5	13.7	
A16	LIA		1354	pig	R	adult			38.4				
A14	RO	4	6372	pig	L	7+++					31.6	14.6	
A14	RO		6372	pig	R	7+++					31.9	15.4	
A16	LIA		1770	sheep	L	F9/10	42.7	19.0			21.6	9.2	
A16			1374	sheep/goat	L	adult					18.8	6.6	
A16	ER		1764	sheep/goat	L	F9/10					21.8	8.1	
A16	LIA		1796	sheep/goat	R	E1/2					18.1	6.1	
C16	LP		3138	sheep/goat	L	adult					20.0	7.0	
C16			3403	sheep/goat	R	adult						7.5	
A9			8246	sheep/goat	L	F5/8					22.0	7.7	
A16	IA		1032	sheep/goat	R	adult		21.2					
A16	MIA		1045	sheep/goat	L	F9/10	45.4	23.1			20.3	8.8	
A16	ER		1029	sheep/goat	L	adult		19.1					
A16	LP		1088	sheep/goat	L	E3+					16.8	6.4	
A16	ER		1119	sheep/goat	R	F9/10	44.6	22.2					
A16	LIA/ER		1159	sheep/goat	L	adult		20.1					

Mandibula													
A16	LIA/ER		1160	sheep/goat	L	adult		19.2					
			1174	sheep/goat	L	E3+					17.9	6.5	
A16	MIA/LIA		1127	sheep/goat	L	F9/10	40.6				19.7	7.4	
A15	ME		5137	sheep/goat	R	F9/10	45.8	21.2			22.1	8.5	
A15	LR		5153	sheep/goat	R	adult		21.4					
A15	RO		5034	sheep/goat	L	F9/10	46.5				24.5	8.8	
A16	IA		1755	sheep/goat	L	F9/10					19.8	7.3	
A16	LIA		1774	sheep/goat	R	adult		19.8					
A16	ER		1651	sheep/goat	R	F5/8		20.5			21.7	7.4	
A16	LIA		1795	sheep/goat	R	F9/10	38.7	19.1			19.6	7.5	
A16	LIA/ER		1792	sheep/goat	R	E3+	24.0	47.7			19.8	6.9	
A16	LIA/ER		1792	sheep/goat	R	F9/10	42.6				18.7	7.1	
A16	LIA/ER		1792	sheep/goat	R	F9/10	42.5				21.2	8.1	
A16	LIA/ER		1792	sheep/goat	R	E3+		21.2			19.7	7.6	
C16	LIA/ER		3143	sheep/goat	R	F9/10					21.4	8.0	
C16	LIA/ER		3145	sheep/goat	L	F9/10	42.6	20.3			17.7	7.2	
Site	**Period**	**ABG**	**Context**	**Species**	**Side**	**Age**	**12**	**13**	**13L**	**13B**	**14**	**15a**	**15b**
			1025	cattle	L	9+++						67.2	
A16	LIA/ER		1089	cattle	L	9+++	145.0	140.0			190.0	66.9	49.2
A15			5120	cattle	L	9+++						59.2	41.8
A15	RO		5152	cattle	L	9+++						72.3	49.7
A16	LIA/ER		1358	cattle	L	9++						65.8	46.3
A16	LP		1088	dog	L	>6-12		20.0					
A16	LIA/ER		1137	dog	Both	>6-12		21.0			20.0		6.4
			1174	dog	L	>6-12		20.9			20.1		6.7
A16	LP		1365	dog	L	>6-12			24.6	9.9	23.2		7.1
A15	RO		5152	dog	Both	>6-12	30.2		18.9	7.7	17.8		
A15	RO		5168	dog	Both	>6-12	28.1		19.3	8.3	17.6		5.5
A15	RO		5169	dog	L	>6-12			16.9	6.5	15.5		4.8
C16	LP		3394	dog	Both	>6-12	30.9		20.6	7.9			
C16	IA	1	3534	dog	Both	>6-12	31.4		20.3	7.5	19.3		6.0
A16	LIA		1770	sheep	L	F9/10						28.6	18.1
A16	ER		1029	sheep/goat	L	adult							20.9
A16	LP		1088	sheep/goat	L	E3+						29.8	
A16	MIA/LIA		1090	sheep/goat	R	adult							21.5
A16	ER		1119	sheep/goat	R	F9/10							22.3
A16	LIA/ER		1159	sheep/goat	L	adult							19.8
A16	LIA/ER		1160	sheep/goat	L	adult							20.8
A15	ME		5137	sheep/goat	R	F9/10						36.9	21.9
A16	LIA		1774	sheep/goat	R	adult							18.1
A16	LIA		1795	sheep/goat	R	F9/10							17.9
A16	LIA/ER		1792	sheep/goat	R	E3+	54.9	53.9				37.7	18.4
A16	LIA/ER		1792	sheep/goat	R	F9/10	64.3	60.4				33.1	
A16	LIA/ER		1792	sheep/goat	R	F9/10						31.6	18.4
A16	LIA/ER		1792	sheep/goat	R	E3+							19.1
C16	LIA/ER		3143	sheep/goat	R	F9/10						34.0	
C16	LIA/ER		3145	sheep/goat	L	F9/10							19.7
Site	**Period**	**ABG**	**Context**	**Species**	**Side**	**Age**	**15c**	**15L**	**16L**	**16B**	**17**	**18**	**19**
A16	MIA/LIA		1090	cattle	L	adult	31.9						
A16	LIA/ER		1089	cattle	L	9+++	34.4						
A16	LIA/ER		1358	cattle	L	9++	36.4						
A16	LIA		1770	cattle	L	adult	32.2						

Mandibula													
A16	LP		1088	dog	L	>6-12						52.0	22.8
A16	LIA/ER		1137	dog	Both	>6-12		9.3					21.2
			1174	dog	L	>6-12		9.1	5.6	4.5			22.9
A16	LP		1365	dog	L	>6-12		9.4					23.7
A15	RO		5152	dog	Both	>6-12							20.5
A15	RO		5168	dog	Both	>6-12		7.2	3.7	3.5			19.5
A15	RO		5169	dog	L	>6-12		6.2					14.6
C16	LIA		3396	dog	L	adult						49.9	
C16	IA	1	3534	dog	Both	>6-12		8.1	5.1	4.2	11.4	47.9	23.1
A16	LIA		1770	sheep	L	F9/10	12.9						
A16	IA		1032	sheep/goat	R	adult	16.1						
A16	ER		1119	sheep/goat	R	F9/10	17.4						
A16	LIA/ER		1159	sheep/goat	L	adult	15.1						
A16	LIA/ER		1160	sheep/goat	L	adult	15.0						
A16			1170	sheep/goat	R	adult	15.4						
A15	ME		5137	sheep/goat	R	F9/10	17.2						
A16	LIA		1774	sheep/goat	R	adult	14.1						
A16	ER		1651	sheep/goat	R	F5/8	14.2						
A16	LIA		1795	sheep/goat	R	F9/10	13.6						
A16	LIA/ER		1792	sheep/goat	R	E3+	14.1						
A16	LIA/ER		1792	sheep/goat	R	F9/10	13.7						
A16	LIA/ER		1792	sheep/goat	R	E3+	14.0						
C16	LIA/ER		3145	sheep/goat	L	F9/10	17.0						
Site	**Period**	**ABG**	**Context**	**Species**	**Side**	**Age**	**20**	**21**	**22**	**23**	**24**	**25**	**26**
A16	LIA/ER		1137	dog	Both	>6-12	18.2	36.5					
A15	RO		5152	dog	Both	>6-12	14.3						
A15	RO		5168	dog	Both	>6-12	14.8						
C16	LP		3394	dog	Both	>6-12	17.7	37.3					
C16	IA	1	3534	dog	Both	>6-12	19.5		151.9	152.1	152.1	152.0	153.5

Table AB 11. Atlas measurements, dog and horse

Atlas											
Site	**Period**	**ABG**	**Context**	**Species**	**Age**	**BFcd**	**BFcr**	**GL**	**GLF**	**H**	**Lad**
A16	LIA/ER		1137	dog	adult	29.2	38.9		25.6	25.7	16.0
C16	IA	1	3534	dog	adult	27.4	37.4	32.9	25.3	23.7	12.2
A16	MIA/LIA		1127	horse	adult	73.3	75.9		73.0		

Table AB 12. Epistropheus measurements, cattle, dog and pig

Epistropheus													
Site	**Period**	**ABG**	**Context**	**Species**	**Age**	**BFcd**	**BFcr**	**Bpac**	**BPtr**	**H**	**LAPa**	**LCDe**	**SBV**
			1174	cattle	>48-60		78.3	50.4					40.9
A15	RO		5168	dog	>18-24		22.4						16.0
C16	IA	1	3534	dog	>18-24	16.2	27.1	26.6	34.1	34.5	42.8	41.8	20.5
A14	RO	4	6372	pig	>48-84								

Table AB 13. Sacrum measurements, cattle

Sacrum								
Site	**Period**	**Context**	**Species**	**Side**	**Age**	**BFcr**	**HFcr**	**PL**
A16	LP	1365	cattle	N/A	>48-60	53.7	25.8	193.0

Table AB 14. Coracoid measurements, chicken

Coracoid								
Site	**Period**	**Context**	**Species**	**Element**	**Side**	**Age**	**BF**	**Lm**
A9		8242	chicken	coracoid	R	adult	10.8	48.1

Table AB 15. Scapula measurements, all species

Scapula											
Site	**Period**	**ABG**	**Context**	**Species**	**Side**	**Age**	**BG**	**Dic**	**GLP**	**LG**	**SLC**
A16	LIA/ER		1125	cattle	L	>7-10			63.6		50.7
A16	RO		1141	cattle	L	adult					48.7
A16	RO		1142	cattle	R	>7-10	41.1		56.1	49.0	
A16	MIA/LIA		1184	cattle	L	>7-10	45.2		59.1	51.8	39.3
A16	MIA/LIA		1127	cattle	L	>7-10					43.8
A16	ER		1611	cattle	R	>7-10	42.9			51.4	43.9
A15	LIA/ER		5151	cattle	L	>7-10	45.6		67.6	56.8	
A15			5014	cattle	L	>7-10	42.3		64.1	49.7	55.7
A16	LIA		1774	cattle	L	>7-10	46.2		68.2	57.1	45.7
A16	ER		1691	cattle	R	adult	43.1				46.5
A16	LIA/ER		1789	cattle	R	>7-10	40.8		62.9	54.6	48.2
A16	LIA		1795	cattle	L	>7-10	44.3		58.3	48.6	43.5
A16	LIA/ER		1792	cattle	R	>7-10	42.5		61.1	50.4	37.1
C16	LIA/ER		3145	cattle	L	adult					49.3
C16	LIA/ER		3145	cattle	R	>7-10	42.6		66.3	55.3	
C16	IA		3393	cattle	R	>7-10			58.0	48.9	41.5
C16	IA		3393	cattle	L	>7-10	44.2				
C16	IA	1	3534	dog	Both	>3-5	14.9		26.5	22.8	21.3
A16	ER		1029	chicken	R	adult		6.8			
A9			8242	chicken	L	adult		11.9			
A16	RO		1079	horse	R	>10-12	40.0		74.7	49.5	
A14	LIA/ER		6337	horse	L	>10-12			92.1		66.8
A16	LIA		1770	horse	L	>10-12			76.6	47.3	52.7
C16	IA		3393	pig	L	>12	23.0		33.8	30.0	22.3
A9	RO		8244	pig	R	>12			32.2		22.0
A14	RO	4	6372	pig	L	>12			34.8	27.5	23.2
A15	LIA/ER		5151	sheep/goat	L	>5	21.2		32.8	25.4	19.7
A16	LIA		1796	sheep/goat	R	adult	16.1				15.7
A16	LIA		1796	sheep/goat	L	>5	16.8		27.3	20.8	16.5
C16	LP		3138	sheep/goat	R	>5	18.9		29.4	23.0	15.9
C16	LBA/EIA		3424	sheep/goat	L	>5	18.6		27.9	21.0	17.6

Table AB 16. Humerus measurements, all species

Humerus													
Site	**Period**	**ABG**	**Context**	**Species**	**Side**	**Age**	**Bd**	**Bp**	**BT**	**CD**	**Dp**	**GL**	**GLC**	**SC/SD**
A16	RO		1011	cattle	R	>15-20	73.0		66.0					28.1
			1025	cattle	R	>15-20	72.0		68.6					
A16	ER		1029	cattle	R	>15-20	75.0		70.3					
A16	LP		1088	cattle	L	>15-20	72.0		64.9					
A16	MIA/LIA		1123	cattle	L	>15-20	66.0							
A16	RO		1142	cattle	R	>15-20	68.0		62.4					
A16	LIA/ER		1160	cattle	R	>15-20			62.2					
A16	ER		1380	cattle	R	>42-48	67.0		64.1	100.5			223.0	27.4
			1174	cattle	R	>15-20			63.8					28.7
A16	MIA/LIA		1184	cattle	R	>44-48	70.5		68.1				242.0	29.9
A16	MIA/LIA		1184	cattle	R	>15-20			68.1					30.2
A16	MIA/LIA		1127	cattle	L	>15-20			69.9					
A16			1374	cattle	L	>15-20			71.6					
A16	ER		1611	cattle	L	>15-20			65.8					28.0
A15	ME		5175	cattle	R	adult								29.7
A15	ME		5199	cattle	R	>11.5		16.4			20.1			
A16	LIA/ER		1641	cattle	R	>15-20	77.0		73.8					
A16	LIA		1796	cattle	R	>15-20	73.5		65.5					30.0
A16	LIA/ER		1792	cattle	L	>15-20	66.5		64.0					
C16	LIA/ER		3139	cattle	L	>15-20			59.0					
C16	RO		3330	cattle	L	>15-20								35.2
A16	LIA/ER		1137	dog	L	>5-8	32.1							12.8
A16			1781	dog	R	>5-8	34.0							
A16	LIA		1795	dog	R	>5-8	32.8			46.0				13.9
A16	LIA		1796	dog	L	>5-8	33.3			47.0				14.0
C16	IA	1	3534	dog	Both	>10	28.1				37.3	144.0	139.0	11.5
A9			8242	chicken	Both	adult	13.9	17.5				65.1		6.3
A15	LP		5116	horse	L	>42	73.0	78.7	66.8			278.0		35.9
A16	LIA		1774	pig	L	>12	40.0							
A16	LIA/ER		1642	pig	R	>12	41.5							16.4
A14	RO		6372	pig	L	>42	36.6					178.0		16.6
A14	RO	4	6372	pig	R	>42								15.9
A16	LIA/ER		1043	sheep/goat	R	adult								13.9
A16	MIA/LIA		1148	sheep/goat	L	>3-4	26.1		25.6					12.6
A16	LIA		1354	sheep/goat	L	>3-4	27.8		26.5					
A15	RO		5204	sheep/goat	L	>3-4	32.9		30.0					
A16	LIA/ER		1641	sheep/goat	R	>3-4			26.0					
A16	LIA/ER		1721	sheep/goat	L	>3-4			24.1					12.8
A16	LIA/ER		1792	sheep/goat	R	>3-4	28.0		25.4					
A16	LIA/ER		1792	sheep/goat	L	>3-4	25.0		24.1					11.5
C16	LP		3140	sheep/goat	L	>3-4			28.0					

Table AB 17. Radius measurements, all species

Radius														
Site	**Period**	**ABG**	**Context**	**Species**	**Side**	**Age**	**Bd**	**BFd**	**BFp**	**Bp**	**CD**	**Did**	**GL**	**SC/SD**
A16	ER		1019	cattle	L	>42-48	52.8	45.0						
A16	ER		1019	cattle	L	>42-48	56.7	47.3						
A16	ER		1104	cattle	R	>42-48	60.4	50.0						
A16	LP		1167	cattle	L	>42-48			68.2	71.9				37.1
A16	LIA/ER		1629	cattle	L	>42-48	59.4	47.7						
A16			1781	cattle	R	adult	64.6	50.0						
A16	LIA		1770	cattle	R	>42-48	64.5	47.0	66.0	72.7	99.0		254.0	36.0
A16	LIA/ER		1792	cattle	R	>42-48	58.5	43.3						
A16	LIA/ER		1792	cattle	R	>42-48	60.1	45.3						
A16	LIA/ER		1792	cattle	R	>12-15			67.7	73.6				
A16	LIA/ER		1792	cattle	L	>12-15			65.4	70.5				
A16	LIA/ER		1792	cattle	L	>12-15			65.4	70.2				
C16	LIA/ER		3143	cattle	R	>15-18			69.5					
C16	LIA/ER		3145	cattle	R	>12-15			67.0	72.9				
C16	LP		3394	cattle	L	>42-48			67.5	72.4			249.0	35.3
A16	LIA/ER		1137	dog	L	adult								11.9
A15	LIA/ER		5151	dog	Both	>6-9	19.8			15.4	28.0		151.0	10.4
A16	LIA		1770	dog	R	>6-9	21.1				31.5			11.8
C16	IA	1	3534	dog	Both	>6-9	20.7			15.9			133.0	12.7
A15	ME		5226	hare	R	adult								6.8
A15	LR		5153	horse	R	>15-18			72.9	78.4				
A16	LIA/ER		1641	horse	L	>42	69.0	54.2	67.8		86.5		297.0	33.1
C16	LP		3138	horse	L	>42								39.5
A16	ER		1008	pig	R	>12				24.1				
A16	LIA		1770	pig	R	>12				27.4				
A14	RO	4	6372	pig	R	>12				28.1				
A16	ER		1029	raven	L	adult						8.0		3.3
A16	ER		1012	sheep/goat	R	adult					39.0			14.2
A16	ER		1029	sheep/goat	L	>3-4			23.3	26.7	39.0			14.7
A16	MIA/LIA		1184	sheep/goat	R	>3-4			22.9	25.2	33.0			12.1
A16	MIA/LIA		1216	sheep/goat	L	>42	24.4	19.9	23.7	26.5	37.5		139.8	13.6
A16	LIA		1354	sheep/goat	R	>42	24.2	19.6			39.5		134.7	14.4
A16	ER		1764	sheep/goat	L	>42	23.5	20.0	25.8	29.9	36.5		136.6	12.9
A16	ER		1764	sheep/goat	R	>3-4			24.1	26.5				
A16	LIA		1795	sheep/goat	R	>42	24.3	20.1	25.6	27.1	38.0		140.0	13.2
A16	LIA		1795	sheep/goat	R	>42	24.0	19.7						13.1
A16	LIA		1796	sheep/goat	L	>3-4			25.3	27.3	37.0			13.6
A16	ER		1800	sheep/goat	L	>3-4			24.4	29.0				
A16	LIA/ER		1792	sheep/goat	L	>3-4			25.1	26.5	38.0			13.5

Table AB 18. Ulna measurements, all species

Ulna													
Site	**Period**	**ABG**	**Context**	**Species**	**Side**	**Age**	**BPC**	**Did**	**Dip**	**DPA**	**GL**	**LO**	**SC**	**SDO**
A16	ER		1044	cattle	L	adult				57.0				
A16	LP		1167	cattle	L	>42-48	44.0			60.0				50.5
A16	MIA/LIA		1127	cattle	R	>42-48	40.0			54.2		76.5		43.8
A15	LIA/ER		5151	cattle	L	>42-48				55.5		87.3		43.8
A16	LIA		1770	cattle	R	>42-48	42.2			56.0				47.0
A16	LIA/ER		1792	cattle	R	adult	43.4							
A16	LIA/ER		1792	cattle	L	adult	43.1			51.1				45.2
A15	LIA/ER		5151	dog	Both	>6-8	13.7			20.9	178.0	26.2		18.1
C16	IA	1	3534	dog	Both	>6-8	14.8			22.3	158.0			19.7
A14	SAX		6312	chicken	R	adult		8.4					4.1	
A9			8242	chicken	L	adult		8.9	12.1		63.2		4.4	
A15	ME		5197	gannet	R	adult			20.3					
A15	LR		5153	horse	R	>15-18	39.6			60.4				
A16	LIA/ER		1642	horse	L	adult	36.0			58.2				47.5
C16	LIA/ER		3139	mallard	R	adult		11.2	11.7		80.2		5.8	
A16	LIA		1354	sheep/goat	R	>36-42	14.9			22.2		33.5		18.5
A16	RO		1759	sheep/goat	R	adult	15.6							

Table AB 19. (Carpo-) Metacarpus measurements, all species

(Carpo-) Metacarpus														
Site	**Period**	**ABG**	**Context**	**Species**	**Element**	**Side**	**Age**	**Bd**	**Bp**	**CD**	**Did**	**GL**	**L**	**SD**
A16	LIA		1796	Raven	CMC	L	adult				16.0	67.5	61.4	
A16	LIA/ER		1792	raven	CMC	R	adult				16.0			
A16	ER		1044	cattle	MC	R	>24-30	50.4	48.1	75.0		178.0		25.9
A16	LIA/ER		1137	cattle	MC	R	>24-30	50.8	48.2	79.5		179.0		27.7
A16	MIA/LIA		1184	cattle	MC	L	adult		46.4					
A16	MIA/LIA		1127	cattle	MC	L	>24-30	59.6	57.0	92.0		182.0		31.9
A16	MIA/LIA		1127	cattle	MC	R	adult		47.0					
A16	MIA/LIA		1127	cattle	MC	R	>24-30	51.8						
A16	MIA/LIA		1127	cattle	MC	L	adult		54.9	84.0				29.2
A16	MIA/LIA		1127	cattle	MC	R	>24-30	56.6						
A16			1374	cattle	MC	R	adult		49.0	79.0				27.2
A16	LIA		1770	cattle	MC	R	>24-30	52.7	51.1	81.0		180.0		27.9
C16	LIA/ER		3145	cattle	MC	R	>24-30	49.6	48.1	82.0		181.0		29.1
C16	EIA		3146	cattle	MC	L	>24-30	52.7	52.5	80.0		184.0		27.7
A16	LIA/ER		1137	horse	MC	L	>12-15	40.5				210.0		26.9
A16	MIA/LIA		1786	horse	MC	L	adult		44.5					
A16	LP		8750	horse	MC	R	>12-15	48.2	49.3	90.5		220.0		32.7
A16			1779	sheep	MC	R	>20-24	23.0	19.4	33.5		111.7		10.8
A16	MIA/LIA		1123	sheep/goat	MC		>20-24	21.1						
A16	LIA/ER		1359	sheep/goat	MC	R	>20-24	23.2	19.2	38.0		116.5		12.1
A9	RO		8244	sheep/goat	MC	L	>20-24	24.1						
A15	LIA/ER		5151	dog	MC II	L	>5-7					55.2		
C16	IA	1	3534	dog	MC II	Both	>5-7	7.9				45.3		
A16	MIA/LIA		1127	dog	MC III	L	>5-7	9.4				72.4		
C16	IA	1	3534	dog	MCs III	Both	>5-7	7.2				50.9		
A16	LIA/ER		1783	dog	MC IV	R	>5-7	7.7				54.7		
C16	IA	1	3534	dog	MC IV	Both	>5-7	7.1				51.3		
A15	LIA/ER		5151	dog	MC V	L	>5-7					46.1		
C16	IA	1	3534	dog	MCV	Both	>5-7	7.7				43.8		

Table AB 20. Pelvis measurements, all species

Pelvis													
Site	**Period**	**ABG**	**Context**	**Species**	**Side**	**Age**	**Sex**	**GL**	**LA**	**LAR**	**LV**	**SB**	**SC**	**SH**
A16	MIA/LIA		1127	cattle	R	adult						22.1	100.5	37.4
A15	LP		5116	cattle	R	>7-10			62.4	54.7				
A16	LIA		1774	cattle	R	adult						24.9	87.0	30.6
C16	LIA/ER		3145	cattle	L	>7-10			61.9	56.1				
A16	ER		1029	dog	L	adult						9.3	47.5	19.3
C16	IA	1	3534	dog	Both	>20-24		129.5		18.0		8.4	43.0	16.5
A9			8242	chicken	N/A	adult					62.8			
A16	LP		1088	horse	L	>10-12	Female			50.7		21.1	81.5	28.8
A16	ER		1029	pig	L	>12				28.3				
A16	LP		1088	pig	R	>12				31.0				
A16	IA		1755	pig	L	>12				31.5				
A16	LIA		1770	pig	R	>12				31.0				
A14	RO	5	6372	pig	L	>12				29.4				
A16	MIA/LIA		1786	sheep/goat	R	>5	Female		25.9	23.2		9.2	43.0	14.9
A16	LIA		1770	sheep/goat	L	>5	Female		25.5	23.1				
A16	LIA		1774	sheep/goat	L	>5	Female		25.6	22.1		9.4	39.0	13.1
C16	ME		3068	sheep/goat	R	>5	Female		24.1	27.3				
C16	LIA/ER		3145	sheep/goat	L	>5			20.3	19.1				

Table AB 21. Femur measurements, all species

Femur														
Site	**Period**	**ABG**	**Context**	**Species**	**Side**	**Age**	**Bd**	**Bp**	**CD**	**DC**	**Dd**	**Dp**	**GL**	**GLC**	**SC/SD**
A16	LIA/ER		1124	cattle	L	>42-48	84.0								
A16	MIA/LIA		1127	cattle	L	>42-48	89.0		109.0						33.4
A16	LIA/ER		1337	cattle	R	>42				35.7					
C16	IA	1	3534	dog	Both	>9-10	27.9	31.7	42.0	16.8			158.0		12.8
A9			8242	chicken	L	adult	14.1				11.5				6.7
A9			8242	chicken	R	adult	13.0								6.5
A9			8242	chicken	R	adult	13.3	14.4			11.2	10.1	67.1	64.4	6.1
C16	LP		3394	horse	L	adult									36.0
A16	LP		1092	sheep/goat	R	>42			48.0						14.8
A15	PM		5190	sheep/goat	L	adult			41.0						12.6

Table AB 22. Patella measurements, cattle and horse

Patella							
Site	**Period**	**Context**	**Species**	**Side**	**Age**	**GB**	**GL**
A16	ER	1596	cattle	R	adult		64.1
A16	LIA	1795	cattle	R	adult	45.0	58.1
C16		3429	cattle	L	adult	43.2	
A16	LIA	1774	horse	R	adult	58.1	58.0
C16	LIA/ER	3145	horse	L	adult	54.6	51.2

Table AB 23. Tibia measurements, all species

Tibia														
Site	**Period**	**ABG**	**Context**	**Species**	**Side**	**Age**	**Bd**	**Bp**	**CD**	**Dd**	**Dip**	**GL**	**LA**	**SC/SD**
A16	ER		1017	cattle	L	>24-30	52.4		84.0					29.5
A16	RO		1142	cattle	R	adult								31.5
A16	ER		1176	cattle	R	>24-30	59.9							
A16	LIA		1774	cattle	R	>24-30	53.0							
A16	LIA/ER		1642	cattle	R	>24-30	54.1							
A16	LIA/ER		1740	cattle	L	>24-30	57.8		100.0					35.9
A16	ER		1799	cattle	L	>42-48		85.2						
A16	LIA/ER		1792	cattle	R	>42-48		85.0						
C16			3468	cattle	R	>24-30	54.8							
			1174	dog	R	>8-12	22.6	37.7	45.0			191.0		14.3
A16	LIA/ER		1358	dog	L	>8-12	20.7	33.2	40.5			181.0		11.9
A16	LIA		1796	dog	L	>8-12		32.9						11.8
C16	LP		3274	dog	L	adult			30.0					9.3
C16	IA	1	3534	dog	Both	>8-12	20.0	30.8	37.0			154.5		11.3
A16	ER		1800	hare	L	adult		20.2						
A16	MIA/LIA		1786	horse	R	>42	70.0	88.5	109.5			347.0		37.6
A16	LIA/ER		1792	horse	R	>42	65.0		96.0			328.0		31.9
A16	IA		1046	sheep/goat	R	>15-20	23.4							13.5
A16	LIA/ER		1089	sheep/goat	R	>15-20	24.3							12.7
A16	LIA/ER		1137	sheep/goat	R	>15-20	22.4							13.6
A16	LIA/ER		1359	sheep/goat	L	>15-20	22.3							
A16	LIA		1770	sheep/goat	L	>15-20	23.1		38.0					12.5
A16	LIA		1796	sheep/goat	R	>15-20	23.0							
A16	ER		1799	sheep/goat	L	>15-20	22.7		37.0					11.9
A16	ER		1799	sheep/goat	L	>15-20	23.6		40.0					13.8
A16	LIA/ER		1809	sheep/goat	L	>15-20	23.5							
A16	LIA/ER		1792	sheep/goat	R	>15-20	23.8							
A16	LIA/ER		1792	sheep/goat	L	>15-20	21.8		34.0					11.5
C16	LIA/ER		3139	sheep/goat	R	>15-20	23.8							12.9
A9			8242	buzzard	L	adult	13.0			7.8				6.3
C16	IA		3463	chicken	R	adult	10.9			12.0				6.9
A9			8242	chicken	L	adult	9.8			10.2				
A9			8242	chicken	R	adult	10.2			11.7	18.3	98.7	94.7	5.9

Table AB 24. Talus measurements, cattle, dog and horse

Talus														
Site	**Period**	**ABG**	**Context**	**Species**	**Side**	**Bd**	**BFd**	**Dl**	**Dm**	**GB**	**GH**	**GL**	**GLl**	**GLm**
A16	ER		1029	cattle	R	41.7		34.9					62.2	57.2
A16	MIA/LIA		1148	cattle	R	34.4		31.6	31.6				57.3	51.1
A16	ER		1596	cattle	R	42.0								
A16	ER		1611	cattle	R			33.4					58.3	
A16	MIA/LIA		1210	cattle	R			32.2					58.2	
A16	LIA		1221	cattle	R	34.6							56.6	51.2
A15	RO		5080	cattle	R	43.1			40.6					64.9
A15	LR		5153	cattle	R	44.0								65.0
A16	LIA		1354	cattle	R	40.4		32.8					58.5	54.3
A16	ER		1764	cattle	R	41.6								
A16	LIA		1774	cattle	L	39.1		35.0	35.4				64.4	58.7
A16	LIA/ER		1648	cattle	R	42.2		34.3	34.3				62.1	55.5
A16	LIA/ER		1792	cattle	R	33.0		30.2	29.9				55.1	50.4
C16	IA		3115	cattle	R	35.3		32.2	31.0				55.9	50.4
C16	LP		3138	cattle	R	40.8		34.1					60.4	
C16	LIA/ER		3139	cattle	L									
C16	LIA/ER		3143	cattle	R	42.8		35.5					62.6	57.6
C16	LIA		3310	cattle	R	37.7		34.1	33.1				59.8	54.0
C16	IA		3393	cattle	R	35.2		30.2	33.0				54.3	51.3
A15	LIA/ER		5151	dog	R							40.1		
A15	LIA/ER		5151	dog	R							24.3		
C16	IA	1	3534	dog	Both							22.5		
C16	LIA/ER		3145	horse	R		40.4			53.0	49.0			

Table AB 25. Calcaneus measurements, cattle and dog

Calcaneus								
Site	**Period**	**ABG**	**Context**	**Species**	**Side**	**Age**	**GB**	**GL**
A16	LIA/ER		1790	cattle	L	>36	41.0	108.0
A16	ER		1104	dog	R	>3-7		39.3
C16	IA	1	3534	dog	Both	>3-7	16.0	37.5

Table AB 26. Centrotarsal measurements, cattle and sheep/goat

Centrotarsal						
Site	**Period**	**Context**	**Species**	**Side**	**Age**	**GB**
A15	RO	5204	cattle	L	adult	54.2
A16	LIA	1774	cattle	L	adult	50.4
A16	LIA/ER	1792	cattle	R	adult	52.3
A16	MIA/LIA	1090	sheep/goat	L	adult	21.1

Table AB 27. (Tarso-) Metatarsus measurements, all species

(Tarso-) Metatarsus														
Site	**Period**	**ABG**	**Context**	**Species**	**Element**	**Side**	**Age**	**Sex**	**Bd**	**Bp**	**CD**	**GL**	**SC**	**SD**
A16	ER		1105	cattle	MT	R	>24-30		46.2					
A16	LIA/ER		1137	cattle	MT	L	>24-30			51.1				
A16	LIA/ER		1137	cattle	MT	L	adult			42.4				22.1
A16			1174	cattle	MT	L	>24-30		48.2					
A16	MIA/LIA		1127	cattle	MT	L	>24-30		55.3	48.0	87.0	216.0		26.0
A16			1374	cattle	MT	L	>24-30			46.0	80.0	211.0		23.5
A16	MIA/LIA		1233	cattle	MT	L	adult		48.4					
A16	LIA/ER		1255	cattle	MT	L	adult			42.7				
A16	LIA		1774	cattle	MT	L	>24-30		51.3	48.0	81.0	219.0		24.5
A16	LIA/ER		1792	cattle	MT	R	adult			42.0				
C16	LBA/EIA		3564	cattle	MT	L	adult			45.9				
A16	MIA/LIA		1127	dog	MT II	R	>5-7		8.5			54.8		
A15	LIA/ER		5151	dog	MT II	R	>5-7					53.2		
A16	LIA/ER		1792	dog	MT II	R	>5-7		7.3			58.5		
C16	IA	1	3534	dog	MT II	Both	>5-7		7.2			50.4		
A15	LIA/ER		5151	dog	MT III	R	>5-7					59.1		
C16	IA	1	3534	dog	MT III	Both	>5-7		7.3			56.5		
A15	LIA/ER		5151	dog	MT IV	R	>5-7					60.4		
A16	LIA/ER		1792	dog	MT IV	R	>5-7		6.9			67.0		
A16	LIA/ER		1792	dog	MT IV	L	>5-7		7.3			60.1		
C16	IA	1	3534	dog	MT IV	Both	>5-7		7.1			58.2		
A15	LIA/ER		5151	dog	MT V	L	>5-7					54.7		
C16	IA	1	3534	dog	MT V	Both	>5-7		6.6			51.6		
A15			5120	chicken	TMT	R	adult			14.1				
A9			8242	chicken	TMT	Both	adult	Female	11.8	12.1		66.2	5.9	
A15	ME		5256	horse	MT	R	adult			50.7	99.0			30.6
A16	LIA/ER		1789	horse	MT	L	adult			45.7	93.0			27.5
Joss Bay	ME		8849	horse	MT	R	>12-15					245.0		26.0
A14	RO	5	6372	pig	MT III	Both	>24					76.0		
A16	ER		1008	sheep	MT	L	adult			18.2				10.5
A16	LIA/ER		1326	sheep	MT	L	>24-30			17.6	33.5			9.9
A16	LIA		1770	sheep/goat	MT	L	adult			17.7				

Table AB 28. Phalanx I measurements, cattle, horse and sheep/goat

Phalanx I													
Site	**Period**	**Context**	**Species**	**Side**	**Age**	**Bd**	**BFd**	**BFp**	**Bp**	**Dp**	**GL**	**Glpe**	**SD**
A16	ER	1044	cattle	L	>20-24	26.2			25.7			57.2	22.4
A16	LIA/ER	1137	cattle	L	>20-24	25.2						47.8	21.2
A16	MIA/LIA	1127	cattle	R	>20-24				27.0				
A16	LIA	1229	cattle	R	>20-24	30.0							28.7
A15	LIA/ER	5151	cattle	R	>15-18	23.0			28.7		41.0		23.1
A15	LIA/ER	5151	cattle	R	>20-24	31.8			34.1			66.0	29.3
A16	LIA/ER	1253	cattle	L	>20-24	24.7							21.8
A16	LIA/ER	1809	cattle	R	>20-24	29.7			28.5				27.2
C16	EIA	3146	cattle	L	>20-24				27.2				22.6
C16	IA	3393	cattle	R	>20-24	27.3			30.3			53.7	24.5
A16	ER	1006	horse	N/A	>12-15	39.6	37.2	42.7	47.4	30.0	71.5		28.7
A16	RO	1011	horse	N/A	>12-15						74.0		
A15	LIA/ER	5151	horse	N/A	>12-15	43.5	41.5	47.7	52.1	31.3	82.0		33.6
A15	LIA/ER	5151	horse	N/A	>12-15	41.0	40.6	46.9	50.2	29.7	74.0		30.8
A15	LIA/ER	5151	horse	N/A	>12-15	46.7	43.0	51.2	56.6	37.7	88.0		34.2
A15	LIA/ER	5151	horse	N/A	>12-15	42.4	40.6	46.7	50.1	28.9	78.0		30.9
A15	LIA/ER	5151	horse	N/A	>12-15	42.0	40.5	48.1	51.2	30.9	76.0		31.2
A15	LIA/ER	5151	horse	N/A	>12-15	40.9	40.9	45.9	49.3		73.0		30.0
A16	LIA/ER	1358	horse	N/A	>12-15	39.3	35.4	44.5	49.2	28.6	72.5		28.7
A15		5014	horse	N/A	>12-15	41.5	38.8	43.5	48.7	34.2	73.0		31.1
A16	LIA	1795	horse	N/A	>12-15	41.7	38.8	43.1	48.4	26.9	73.0		29.7
		1033	sheep/goat	L	>7-10	10.8			11.3			34.6	8.5
A16	MIA/LIA	1155	sheep/goat	L	>7-10	9.5			10.3			30.9	8.3

Table AB 29. Phalanx II measurements, cattle and sheep/goat

Phalanx II										
Site	**Period**	**Context**	**Species**	**Side**	**Age**	**Bd**	**Bp**	**GL**	**Glpe**	**SD**
A16	LIA	1134	cattle	R	>15-18	21.3	26.1	33.0		20.8
A16	LIA/ER	1766	cattle	R	>15-18	21.5	28.5	39.0		21.3
A16	LIA	1770	cattle	L	>15-18	21.9	25.9	38.0		20.9
A16	LIA	1774	cattle	Both	>20-24	26.1	28.2		58.5	23.2
A16	LIA/ER	1792	cattle	R	>15-18	21.3	26.1	38.5		19.8
C16	IA	3115	cattle	R	>15-18	23.9				
C16	LIA/ER	3139	cattle	R	>15-18	20.9	25.0	34.0		20.1
C16	LIA	3310	cattle	R	>15-18	21.3	26.4	34.0		20.5
A16	ER	1029	sheep/goat	L	>5-7	8.9	11.1		25.3	8.6

Table AB 30. Phalanx III measurements, cattle and horse

Phalanx III										
Site	**Period**	**Context**	**Species**	**Side**	**Age**	**BF**	**DLS**	**Ld**	**LF**	**MBS**
A16	LIA/ER	1137	cattle	Both	adult		67.0	48.4		21.6
A15	ME	5197	cattle	R	adult		72.2	53.2		21.7
A16	LIA	1770	cattle	L	adult		68.0	52.1		23.0
C16	IA	3534	cattle	L	adult		65.1	51.4		20.4
A16	LIA	1770	horse	N/A	adult	40.2			27.4	
A16	LIA	1795	horse	N/A	adult	45.3			24.9	

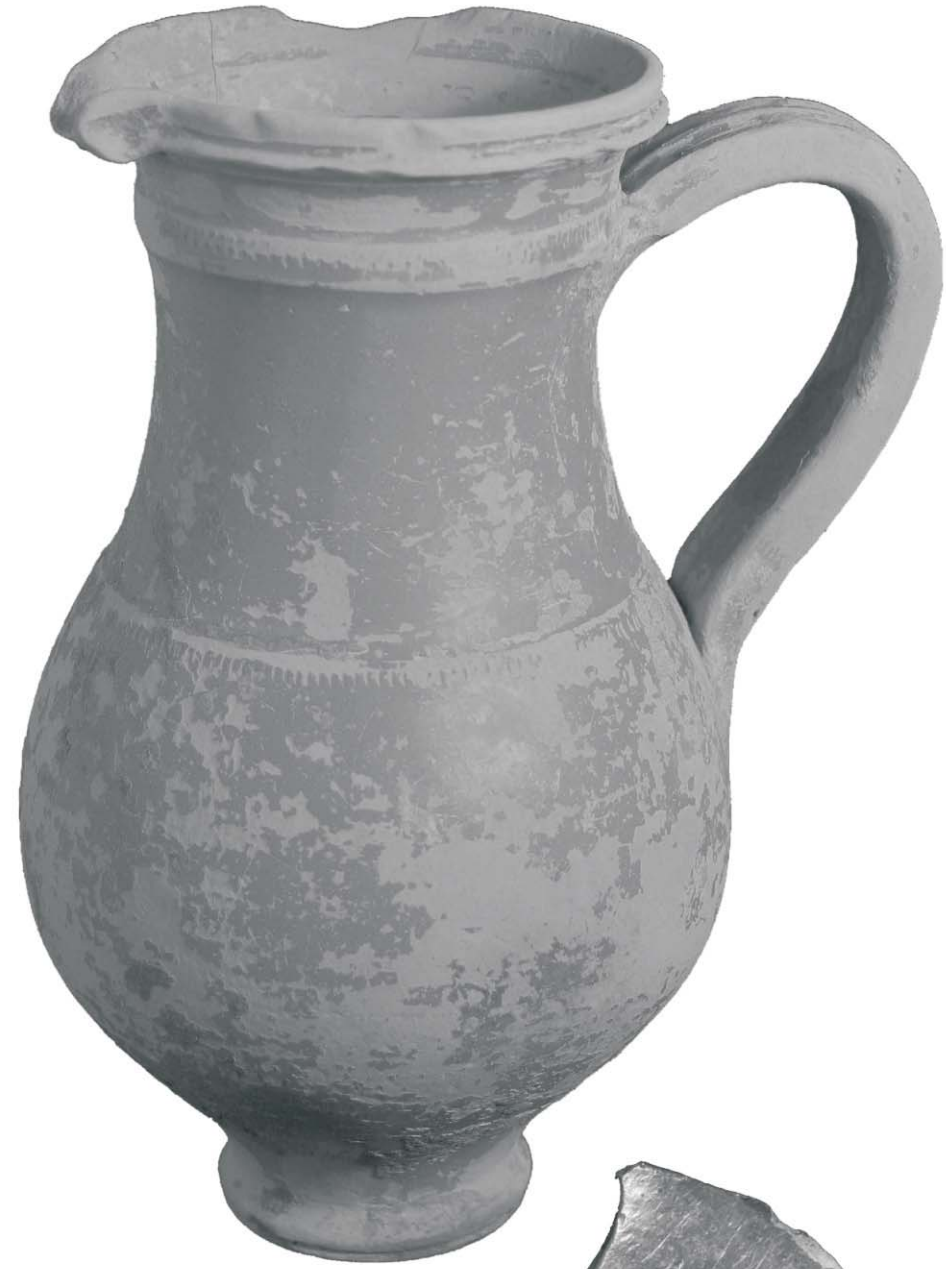
Table AB 31. Fish measurements, cod

Fish								
Site	**Period**	**Context**	**Species**	**Element**	**Side**	**Age**	**2**	**3**
A15	RO	5202	cod	vomer	N/A	adult	18.8	
A15	RO	5202	cod	articular	Both	adult		8.2

This volume presents the results of archaeological investigations undertaken at four sites in Kent. The two 'linear' schemes: the West Malling and Leybourne Bypass and Weatherlees-Margate-Broadstairs Wastewater Pipeline, provided transects across the landscape revealing settlement and cemetery evidence of Neolithic, Bronze Age, Iron Age, Romano-British and Anglo-Saxon date. Two Bronze Age metalwork hoards were also recovered and a variety of World War II features.

Medieval settlement remains included sunken-featured buildings at West Malling, Fulston Manor, and Star Lane, Manston, that appear to belong to a type of building specific to Kent that had combined uses as bakeries, brewhouses, and/or kitchens. A short study of these, their distribution, form and possible functions, is included.

In addition to evidence for Bronze Age occupation, Manston Road, Ramsgate produced Anglo-Saxon settlement evidence with six sunken-featured buildings and a sizeable assemblage of domestic items.



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