Ancient Monuments Laboratory
Report 134/91

THE ANIMAL BONES FROM CHURCH CHARE, CHESTER-LE-STREET, CO. DURHAM 1990-91

Ms Sue Stallibrass

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Summary

Excavations prior to building work on a small part of the Roman fort of Congangis, Chester-le-Street, produced a small collection of animal bones, mainly from the late Roman period. Cattle bones dominate the collection. Sheep/goat, Pig and Dog are also represented. The Roman dog bones are all from small, bandy-legged individuals and contrast with a later, post-Medieval burial from the site. The measurements and morphology of the Roman Cattle bones suggest that two types of animal were present: the indigenous 'Celtic-shorthorn' and a larger type with different horncore morphology. Comparisons with other Roman sites in the north of England suggest that there may be some contrast in the types of cattle used by the Roman military in the western and eastern parts of the territory. The discovery of well-preserved fish bones in wet-sieved samples shows that this aspect of the military diet might be worth pursuing with a larger sample from the site.

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The animal bones from Church Chare, Chester-le-Street, Co. Durham, 1990-91.

Sue Stallibrass

INTRODUCTION

The site

Excavations for the foundations of an extension to the Parish Centre building provided the opportunity to investigate an area of the Roman fort of Congangis, down to a depth of approximately 800mm. The excavations were undertaken in bad weather conditions from November 1990 until early February 1991, and were directed by Mike Bishop for the Archaeological Practice of Newcastle University department of Archaeology, on behalf of the Bowes Museum.

The site lies on the high ground of a boulder clay river terrace between the Cong Burn and its confluence with the River Wear. The Roman road to Newcastle (*Pons Aelius*) lies just to the west of the fort.

The first fort (Phase 1) was timber-built, and the excavated area included part of a ditch and a clay and turf rampart with some associated postholes. This fort probably dates to the Antonine period.

The subsequent fort (Phases 2 and 3) was constructed in the early third Century and continued in use into the late fourth Century A.D.. Archaeological contexts from this period relate mainly to a ditch, to the stone-built officer's quarters and post-built contubernia of a barrack block, and to portions of two roads (the *via sagularis* and the *via vicinaria*).

Late Roman activity has been assigned to Phase 4.

In the medieval period (Phase 5) there was considerable disturbance to the original Roman road surfaces, and many of the medieval features themselves have been truncated by later activities. Traces of pits, areas of cobbles and industrial activity were discovered.

Phase 6 includes all of the features dating from the beginning of the 17th Century up until the present day. A stone-lined pit predated the building of various sets of cottages, the last of which were demolished within the past 50 years. The services for these cottages had caused serious disturbance to the archaeological levels.

THE MATERIAL.

A. THE HAND-RECOVERED ANIMAL BONES.

Preservation.

Most of the animal bones recovered by hand are in a poor state of preservation. Many of them have suffered breakage during excavation, due mainly to their brittle texture and to the problems of excavating material from wet clayey deposits during cold weather.

Occasionally, the bones are in a very poor condition, where the surface has been totally eroded away and much of the bone structure is infilled with mineral deposits.

On many sites, the ratio of loose teeth to total numbers of fragments recovered indicates the degree of loss due to poor preservation (since the more mineralised teeth tend to preserve better than the more organic bone). However, it is noticeable that some of the loose teeth from Chester-le-Street are in a worse condition than the bones from the same contexts. In these instances, the laminae of the teeth are being pushed apart by minerals, often at the junction of the enamel and dentine layers. This leads to cracking and exfoliation, and many of the teeth have broken up into pieces that are difficult to recover and identify. In this collection, therefore, it is possible that loose teeth are, themselves, under-represented.

The following table summarises the numbers of fragments, weights of bones and loose teeth by Phase.

Table 1: quantities of hand-recovered bones.

PHASE	WEIGHT (in gm)	No. of FRAGS.	LOOSE TEETH	% LOOSE TEETH
1	348	5	0	0%
4	4924	193	7	3.6%
4?	153	5	0	0%
5?	56	5	5	100%
6*	1311	57	12	21.1%
6?	91	6	2	33%

* does not include 223 bone & tooth fragments from a dog burial in Context 37.

Table 2 lists the material by context, and also names the identified species.

For the Roman levels (Phases 1, 4 and ?Phase 4), the preservation conditions of the bones tend to be uniformly poor within each context. Only one ?medieval context produced animal bones (?Phase 5: context 88) totalling five

whole or partial cattle teeth. For the more recent levels (Phase 6) the preservation conditions vary considerably. Some of the contexts have material that is uniformly buff coloured, slightly brittle but otherwise robust (eg: context 37, which contains a dog burial) whilst others contain mixtures that appear to include some residual Roman material (eg: context 34/39).

Material from the different phases.

The bulk of the material derives from Roman levels, accounting for approximately 5 kg of the total of c. 7 kg bone weight.

No bones were recovered by hand from any contexts dating to Phase 2 or 3.

Material from the Primary fort (Phase 1):

Context 248 was a clay fill of the ditch (context 376) of the primary fort, and it produced five bone fragments including a substantial portion of a cattle skull with both horncores intact. The size and morphology of the skull fragment is similar to that of the indigenous 'Celtic shorthorn' cattle that were ubiquitous throughout England during the Iron Age and which continued in use into the Roman period (Luff, 1982; Thomas, 1989). The measurements of the horncores are given in Appendix 4. No other species was identified.

Material from later Roman levels (Phase 4):

The late Roman material is dominated by bones of cattle, with a few bones from sheep/goats, pigs and dogs. The material appears to be mainly the remains of food and/or butchery waste, with no indication of any craft working activities. Some of the cattle, sheep/goat and pig bones bear butchery marks, but the eroded surfaces of many of the bones means that many more such marks may have been eradicated.

None of the dog bones show any signs of butchery or skinning.

The largest group of bones was recovered from context 129, the fill of a demolition pit (context 148), but this does not appear to differ from the material from the other contexts, either in preservation or element type.

The identified anatomical zones listed in Appendices 1, 2 and 3 show that cattle bones dominate the collection from Phase 4 deposits. The numbers of zones identified are: 39 Cattle, 3 Sheep/goat, 2 Pig and 14 Dog.

All of the cattle epiphyses are fused and the few tooth rows present all have full adult dentition erupted and in wear. It is possible that the poor preservation conditions have led to the loss of less robust, juvenile bones and teeth, but the fact that occasional unfused bones of sheep/goat were recovered from the same contexts suggests that most, if not all, of the cattle represented had mature bones.

Appendix 1 lists the anatomical zones that were recorded for the cattle bones. Most parts of the skeleton are represented, despite the small number of fragments.

The measurements for the cattle bones are presented in Appendix 4. Generally, they are similar to those for cattle bones from successive Roman forts at Annetwell Street, Carlisle dating from c AD 74 -330 (Periods 3 and 5, *circa* AD 74-140: Stallibrass, 1991; Period 9, *circa* AD 320-330: Stallibrass, unpublished data). These are, themselves, similar to those of the indigenous cattle of the preceding Iron Age: the so-called 'Celtic shorthorns'. However, there is a slight difference between some of the element types ie: although the measurements for the four metatarsals from Chester-le-Street are very similar to the means for the Carlisle material, the measurements for the two Roman metacarpals from Chester-le-Street are all at the larger ends of the ranges of those for contemporaneous material from Carlisle. This could simply reflect the extremely small sample size, but it might be significant, and indicate a difference in conformation of the cattle in the eastern and western sides of northern England. A third possibility is that the Chester-le-Street cattle happened to be entire males (since the sexual dimorphism between bulls and cows is more marked for the forequarters than for the hindquarters), but this is less likely to provide a full explanation, since a large hindlimb is also represented at Chester-le-Street by a large naviculo-cuboid. Unfortunately, none of the securely-dated Roman material from Chester-le-Street can be sexed. The larger measurements are towards or beyond the upper limits of the ranges given by Luff (1982) in her review of cattle bone measurements from several Romano-British or Roman sites in Britain.

O'Connor (1988) noted that people in Roman York used cattle that had two different types of horncores, one type having horncores almost twice the size of the others, which resemble those of the indigenous 'Celtic shorthorns'. Although the collection from Congangis is small, both types of horncore are present. Whereas the horned cattle skull fragment from the Phase 1 ditch is similar to the 'native' type of small cattle, there is a broken horncore from Phase 4 (context 129) which is considerably larger. Although it is broken, so that its original length cannot be estimated, its basal measurements are similar to the large type noted by O'Connor, fitting neatly into his group of ten large horncores in his Figure 11 (O'Connor, 1988: page 94). It seems possible, therefore, that cattle of two types were present in the Roman fort at Chester-le-Street: one similar to the indigenous 'Celtic shorthorns' (represented by the metatarsal measurements from Phase 4, and by the skull fragment from Phase 1), and a larger type (represented by the metacarpal and naviculo-cuboid measurements and the large horncore, all from Phase 4). This aspect of the material is worth pursuing in future enquiries into the site of Congangis.

Sheep/goat bones are far fewer than those of cattle. None of the Roman sheep/goat bones could be identified to species, and none of the bones was complete enough for measurements to be taken. No skull or horncore fragments were recovered, and so nothing can be said about the conformation, stature, sex or hornstructure of the sheep and/or goats represented at the site.

Appendix 2 lists the anatomical zones identified for sheep/goat bones by context. It is noteworthy that at least one of the sheep/goat bones (a distal tibia) was unfused when the animal died (probably at less than 18 - 24 months of age: Silver, 1969). Also, there is a mandible fragment with the first permanent molar (M1) only just coming into wear. Since the fourth deciduous premolar has fallen out of its socket since the animal's death, it is not possible to state whether the animal was a kid or a lamb, but it was probably only three or four months old when it died. This contrasts with the data described above for the cattle bones, all of which had fused epiphyses.

Pig bones were even more infrequent than those of sheep/goats in the Roman levels. Appendix 2 lists the anatomical zones identified for pig bones. Only one bone could be measured: a scapula from context 129 with the proximal tuberosity fused: LG=31.9mm and SLC=20.2mm (measurements defined by von den Driesch, 1976). Context 129 also produced a pig maxilla fragment that has the third permanent molar (M3) in the process of erupting, indicating that the animal was close to attaining dental maturity when it died. The sample is small and fragmentary, but there is no indication of any particularly large bones that might indicate the presence of wild pigs.

The only other mammal species represented in the Roman levels is dog. The bones appear to be the disturbed remains of buried individuals rather than food or butchery waste. Appendix 3 lists the identified zones of dog bones from the site. An adult innominate (pelvis) and a fragment of an ulna were found in context 129. Context 64 produced the remains of at least two individuals, both of them being very small. One of them was less than 8-9 months old when it died (the humerus is completely unfused) and had short bandy forelimbs. It may have resembled a modern Jack Russell Terrier in size and shape. One pair plus another complete mandible were found in the same context. All three jaws have complete adult dentition with only light wear on the teeth. Silver (1969) gives the age by which all of the permanent teeth are fully erupted as 6 - 7 months. This might indicate that one of the individuals was between 6/7 - 8/9 months old when it died. The other individual represented by the mandibles was probably not much older, although the other long bones (radius, ulna and femur all have fused epiphyses, suggesting an age at death of over 12-18 months. All of the long bones, together with the metapodials and the atlas are small and gracile. It is difficult to tell whether two or three individuals are represented, but all (or both) of the animals were very small. One of the two ulnas may show a slight pathological alteration where the radius and ulna meet midshaft. The muscle attachment is particularly pronounced and the shaft of the ulna is slightly bent at this point. The bone does not appear to have been broken and it might be another indication of bandy forelimbs. Unfortunately, this ulna does not have its matching radius present for comparison. None of the dog bones are complete enough to measure.

Material from Post-Roman levels (Phases 5, 6 & ?6):

Only five whole or fragmentary cattle teeth were recovered from the medieval levels (Phase 5).

Phase 6 contains a mixture of material, some of which appears to be residual ?Roman bones. In particular, context 3 (from a trial trench) appears to contain only material with 'Roman-type' preservation, and the nature of the bones themselves fits in with the general pattern for the Roman levels ie: all of the bones are from cattle, and their sizes and the shapes of the horncores are all typical for Iron Age/Roman cattle in the north of England (see Appendix 4 for the measurements).

In contrast, most of the material from context 34/49 is buff coloured and and relatively lightweight, although there are two sheep/goat humeri that may be residual. There is a wider range of species represented (including horse, which was not identified from any of the Roman contexts), and a greater proportion of pig and sheep/goat bones compared to those of cattle. A pig mandible has the permanent premolars P3 and P4, and the third molar (M3) all in their crypts or actually in the process of erupting, indicating an age at death close to dental maturity (currently *circa* 2 - 3 years: Silver, 1969). The distally fused radius could be identified specifically as sheep and is quite large (Bd=31.3mm). This is similar to modern 'improved' hill sheep.

Horse is represented only by two loose teeth, one each from contexts 34/39 and 10.

Most of the bones recovered from Phase 6 derive from a dog burial found in the back garden of one of the recent cottages (in context 37). All of the bones are buff coloured and lightweight. Unfortunately, breakage during excavation has caused extensive damage, and none of the bones can be measured. The skull and scapulae are missing although a fragment of one maxilla and several loose maxilliary teeth are present. Otherwise, most of the animal's body is present (see Appendix 3 for a list of identified zones). All of the permanent teeth have erupted, although they are not particularly worn. Some of the epiphyses are fused, others unfused. They are all consistent with an age at death of approximately one year (*circa* 12-13 months). Although the long bones are broken, and were not fully grown when the animal died, it is possible to state that it was slightly larger than the two (or more) individuals recovered from the Roman context 64.

The complete nature of this post-Medieval skeleton contrasts with the Roman dog remains. Although the dog bones themselves showed little damage in the Roman deposits, the fact that so few bones were recovered from any one individual suggests either that original burials had suffered considerable subsequent disturbance, or that dogs were not afforded separate burial, but were simply discarded with other unwanted animal material.

The counts of identified anatomical zones given in Appendices 1, 2 and 3 show that the post-Medieval collection is dominated by the remains of this one dog skeleton. For the three major domesticates, the collection is extremely small. The rank order is the same as that in the Roman collection, but Sheep/goat bones are

relatively more common. The counts of identified zones are: 9 Cattle, 6 Sheep/goat, 1 Pig and 25 Dog.

THE ANIMAL BONES RECOVERED FROM WET-SIEVING.

Seventeen bulk samples each of 60-litres of soil were taken for flotation and wet sieving (see Huntley, 1991 for a report on the botanical remains). The flots were collected over 500 μ mesh and the residues over 1mm. These were sorted for animal bones and the quantities are listed by context in Table 3. The bulk sample from context 253 (sample no. 26, Phase 6) did not produce any animal bones.

The total hand-recovered and wet-sieved collections are too small for quantifications of species ratios, although qualitative comments are made, below, when the sieved sample adds to or contrasts with the observations made on the hand-recovered collections.

In particular, it is notable that the quantities of material from Phases 1 and 2 are miniscule. No bones were recovered by hand, and only 42.3 grammes of bone were recovered from 420 litres of wet-sieved soil. Also, as expected (Payne, 1975), bones from smaller species are better represented in the sieved collection than in the material recovered by hand in bad weather conditions.

Table 4 lists the identifications of bones from the bulk samples.

The burnt bone tends to consist of tiny fragments (*circa* 4-10mm long) of calcined bone. The fragments appear to derive from sheep/goat-sized animals more commonly than from cattle-sized animals.

Context 129 produced mainly cattle or cattle-sized bones from the wet-sieved bulk sample (as in the hand-recovered collection), and some of these bones bear tooth marks from canids, probably dogs (see Stallibrass, 1986). In addition, there are a first and second phalange of a neonatal lamb or kid that articulate and which both appear to have passed through the gut of a carnivore, possibly a dog (see Payne & Munson, 1985). It is interesting to speculate whether sheep/goats were being raised in the vicinity of the fort during the late Roman period (in which case, dogs may have been able to kill livestock, or to scavenge natural neonatal deaths), or whether dogs had access to butchery waste from suckling lamb/kid killed for human consumption within the fort.

Also dating to Phase 4, context 76 produced bones identified to sheep/goat and pig from the bulk samples, whereas only cattle bones were identified from the hand-recovered collection. With regard to the ageing of the species in Phase 4, the sieved material confirms that from the hand-recovered collection ie: the cattle bones and teeth are all mature, whilst those of sheep/goat and pig tend to be immature. The cattle ulna is proximally fused whereas the loose third molar (M3) of pig has not yet erupted, and the second molar (M2) in the sheep/goat mandible fragment is only slightly worn, indicating that the third molar would have been in the process of erupting when the animal died.

Most of the bones from context 64 consist of more loose teeth, plus small carpals and phalanges of the dog identified in the hand-recovered collection.

Context 189 (Phase 2) contained mainly bones of sheep/goat, including a neonatal phalange.

None of the burnt bones could be identified to species except for two unerupted pig teeth from context 110 (sample 3).

The bird bone and small mammal bones are few and very fragmentary. None of them have been identified to species.

The few fish bones have been identified by Mrs. Alison Locker and the identifications are listed in Appendix 5. They include small salmonids and some flat fish (including possible plaice or flounder). The site is located a few hundred metres from the River Wear, twenty-one kilometres upstream from the river mouth at Sunderland.

The shell fragments are minute (totalling less than 1 g in weight) and have not been identified.

DISCUSSION & CONCLUSIONS

Previous excavations in Chester le Street have produced small quantities of animal bone from within the Roman fort of Congangis (Gidney, in press). This collection, too, is very small and probably raises more questions than it answers, but it does show that the site has potential for further studies.

In particular, further studies might be addressed towards (1) the general question of how the fort inter-related with its hinterland, and (2) the specific question of whether or not 'improved' types of livestock (particularly cattle, but also sheep) were introduced to the fort during the Roman occupation. The processing of bulk soil samples has shown that future excavations might also seek to investigate (3) the types of fish exploited in the Roman fort. Early excavations of Roman forts did not consider the role of fish in the Romano-British military diet and, due to the absence of sieved material, had no evidence for their use. The few fish bones recovered from Congangis in 1990-91 are, in fact, well preserved, and suggest that future sieving programmes might produce useful samples of material.

REFERENCES

von den Driesch, A. 1976. **A guide to the measurements of animal bones from archaeological sites.** Cambridge, Massachusetts: Peabody Museum, Harvard University. **Peabody Museum Bulletin 1.**

Gidney, L.J. (in press) A report on the animal bones from excavations at Chester-le-Street in 1978 and 1979. In J. Evans, R.F.J. Jones & P. Turnbull. Excavations at Chester-le-street, County Durham, 1978-79. **Durham Archaeological Journal.** (volume 7 or 8, for 1991 or 1992)

Huntley, J.P. 1991. Plant remains from Church Chare, Chester-le-Street, 1990-91 (CC90). **Ancient Monuments Report Series** 84/91.

Luff, R-M. 1982. **A zooarchaeological study of the Roman north-western provinces.** British Archaeological reports, International Series S137.

O'Connor, T.P. 1988. **Bones from the General Accident Site, Tanner Row.** The Archaeology of York: The animal bones. Volume 15, Fascicule 2. London: Council for British Archaeology for the York Archaeological Trust for Excavation and Research.

Payne, S. 1975. Partial recovery and sample bias. In A.T. Clason (Ed.) **Archaeozoological Studies.** North Holland/Elsevier.

Payne, S. & Munson, P.J. 1985. Ruby and how many squirrels? The destruction of bones by dogs. In N.R.J. Fieller, D.D. Gilbertson & N.G.A. Ralph (Eds.) **Palaebiological Investigations, Research Design, Methods and Data Analysis.** Symposia of the Association for Environmental Archaeology No. 5B. British Archaeological Reports, International Series S266. Pages 31-39 plus 5 tables, 6 plates and 1 figure.

Silver, I.A. 1969. The ageing of domestic animals. In D. Brothwell & E.S. Higgs (Eds.) **Science in Archaeology.** London: Thames & Hudson. Pages 283-302

Stallibrass, S.M. 1986. **Some taphonomic effects of scavenging canids on the bones of ungulate species: Some actualistic research and a Romano-British case study.** Unpublished Ph.D. thesis, University of Sheffield.

Stallibrass, S.M. 1991. A comparison of the measurements of Romano-British animal bones from Periods 3 and 5, recovered from excavations at Annetwell Street, Carlisle. **Ancient Monuments Laboratory Report Series** 00/91.

Thomas, R.N.W. 1989. **Cattle and the Romano-British economy: a metrical analysis of size variation.** Unpublished Ph.D. thesis, University of Southampton.

CC90: TABLE 2: DISTRIBUTION OF HAND-RECOVERED ANIMAL BONES BY CONTEXT

PHASE	CONTEXT	WEIGHT in g.	No. of FRAGS.	LOOSE TEETH	PRESERVATION	SPECIES IDENTIFIED
1	248	348	5		POOR, BRITTLE	C
4	64(Y)	658	23		BRITTLE	C,DOG
4	76(Y)	893	23	(2)	POOR, BRITTLE	C
4	129(Y)	2360	97	(1)	POOR, BRITTLE	C,S/G,P,DOG
4	136	72	2	(1)	BRITTLE	C,S/G
4	325	218	11	(1)	POOR, BRITTLE	C,S/G
4	335	236	11	(2)	POOR, BRITTLE	C,S/G
4	344	127	5		VERY POOR	C
4	345	218	10		POOR, BRITTLE	C,P
4	349	142	11		POOR,BRITTLE	C
4?	166	153	5		VERY POOR	C
5?	88	56	5	(5)	TEETH ONLY	C
6	34/39	297	28	(3)	MIXED. GOOD	C,S/G,P,HORSE
6	3	748	8		GOOD	C
6	37	193	225	n.a.*	GOOD	DOG, BIRD
6	41	73	19	(9)	VERY POOR, CALCINED	
6?	10	77	5	(2)	VERY MIXED	C,S/G,DOG,HORSE
6?	67	14	1	0	POOR, BRITTLE	C
TOTALS		6883	494	(26)		

KEY

(Y) denotes a bulk sample taken from this context

n.a.* due to the presence of 223 bone and tooth fragments from one dog skeleton in this context, the loose teeth ratio is not comparable with those for the other contexts. Of the remaining 2 fragments, none are teeth.

SPECIES IDENTIFIED:

C: CATTLE

S/G: SHEEP OR GOAT

P: PIG

CC90: TABLE 3: DISTRIBUTION OF WET-SIEVED ANIMAL BONES BY CONTEXT

weights are in g.

PHASE	SAMPLE No.	SUB CODE	CONTEXT	LARGE MAMMAL	SMALL MAMMAL	BURNT MAMMAL	BIRD	FISH	SHELL
1	32	B	357	7		0.6			Y
1	31	B	359	0.5		0.1			Y
1	35	B	362	0.7	0.1				
2	3	B	110	6	0.1	0.2			
2	34	B	110	1.4		1.3			Y
2	36	B	189	15		0.2		Y	Y
2?	20	B	253	8	1.1				
3	37	B	188	2		0.6			Y
4	4	B	62	3	1.6				
4	5	B	63	0.6		0.1			Y
4	2	B	64	74	0.3	1.6	0.5	Y	
4	12	B	76	122	0.1	5.5			Y
4	22	B	129	210	0.1	3.9	0.1	Y	Y
4	17		135	0.1		0.1		Y	
4	13	B	207	0.4		0.8			Y
6	24	B	142	0.1		0.2		Y	
		TOTAL WEIGHTS		450.8	0.6	18	0.6	0.6	0.1 g.

Y indicates presence in very small quantities

CC90: TABLE 4: DISTRIBUTION OF IDENTIFIED WET-SIEVED ANIMAL BONES BY CONTEXT

PHASE	SAMPLE No.	CONTEXT	SPECIES IDENTIFIED	HAND-RECOVERED IDENTIFICATIONS (for comparison)
1	32	357	S/G	
1	31	359		
1	35	362		
2	3	110	PIG	
2	34	110	PIG	
2	36	189	C, S/G	
2?	20	253	C	
3	37	188		
4	4	62	S/G	
4	5	63		
4	2	64	PIG, DOG	C, DOG
4	12	76	C, S/G PIG	C
4	22	129	C, S/G	C, S/G, PIG, DOG
4	17	135		
4	13	207		
6	24	142		

KEY:

C: CATTLE
S/G: SHEEP and/or GOAT

LIST OF ABBREVIATIONS AND DEFINITIONS OF ZONES USED IN APPENDICES 1, 2 & 3.

ABBREVIATIONS:

L	left
R	right
D	distal

DEFINITIONS:

PROXIMAL and DISTAL each refer to the relevant epiphysis in each cases.

SKULL	HORNCORE	base of horncore
SKULL	OCCIPITAL	occipital condyle
MANDIBLE	CONDYLE	condyloid process
HUMERUS	DELTOID	deltoid tuberosity
PELVIS	ILIUM	mid-shaft
FEMUR	FOSSA	supracondyloid fossa

CC90: APPENDIX 1: ANATOMICAL ZONES OF CATTLE BONES

PHASE		1	4	4	4	4	4	4	4	4	6	6?
CONTEXT No.		248	64	76	129	136	325	335	345	349	3	67
SKULL	HORNCORE	1L 1R			1R						1L	
	OCCIPITAL	(a pair)		1R								
MANDIBLE	DIASTEMA				1R							
	CONDYLE				1L 1R							
SCAPULA	GLENOID		1R	1L	2L							
	NECK		1R		1L 1R							
HUMERUS	DELTOID			1R								
	D.TROCHLEA			1L	1L		1R					
RADIUS	PROXIMAL											
	DISTAL											
ULNA	PROXIMAL											
	DISTAL											
METACARPAL	PROXIMAL								1L		1R	
	DISTAL				1L 1?						(complete)	
PELVIS	ACETABULUM				1L							
	ILIUM											
FEMUR	PROXIMAL				1R							
	FOSSA											
TIBIA	PROXIMAL		1L									
	DISTAL											
METATARSAL	PROXIMAL							1L			2L (1 comp)	
	DISTAL		1L	1?	1L 2R						1L(complete)	
ASTRAGALUS							1L	1R		1R		
NAVICULO - CUBOID					1R							
CALCANEUM			1L			1L	1R					
PHALANGE	I									1		1
PHALANGE	II				1							
PHALANGE	III											

CC90: APPENDIX 2: ANATOMICAL ZONES OF SHEEP/GOAT (S/G) AND PIG BONES

		S/G	PIG	PIG	S/G	PIG
PHASE		4	4	4	6	6
CONTEXT No.		129	129	345	34/39	34/49
SKULL	HORNCORE					
	OCCIPITAL					
MANDIBLE	DIASTEMA					1R
	CONDYLE					
SCAPULA	GLENOID		1L			
	NECK		1L		1L	
HUMERUS	DELTOID				1L 1R	
	D.TROCHLEA					
RADIUS	PROXIMAL					
	DISTAL				1R	
ULNA	PROXIMAL					
	DISTAL					
METACARPAL	PROXIMAL					
	DISTAL					
PELVIS	ACETABULUM				1R	
	ILIUM					
FEMUR	PROXIMAL					
	FOSSA					
TIBIA	PROXIMAL			1R		
	DISTAL	1R				
METATARSAL	PROXIMAL					
	DISTAL				1?	
ASTRAGALUS						
NAVICULO -	CUBOID					
CALCANEUM		1R				
PHALANGE	I					
PHALANGE	II					
PHALANGE	III					

CC90: APPENDIX 3: ANATOMICAL ZONES OF DOG BONES

PHASE		4	4	6	6?
CONTEXT No.		64	129	37	10
ATLAS		1			
SACRUM				1	
SKULL	HORNCORE				
	OCCIPITAL				
MANDIBLE	DIASTEMA	1L 2R		1R	
	CONDYLE	(1 pair)			
SCAPULA	GLENOID				
	NECK				
HUMERUS	DELTOID	1L		1R	
	D.TROCHLEA	complete		1R	
RADIUS	PROXIMAL			1L 1R	
	DISTAL	1L			
ULNA	PROXIMAL		1L	1L	
	DISTAL			1?	
METACARPAL	PROXIMAL				
	DISTAL				
PELVIS	ACETABULUM		1L	1L 1R	1R
	ILIUM		1L	1L 1R	
FEMUR	PROXIMAL			1L 1R	
	FOSSA	1L		1L 1R	
TIBIA	PROXIMAL			1L 1R	
	DISTAL			1L 1R	
METATARSAL	PROXIMAL				
	DISTAL				
ASTRAGALUS				1L 1R	
NAVICULO - CUBOID					
CALCANEUM				1L 1R	

zones were not recorded for metapodials nor phalanges

CC90: APPENDIX 4: MEASUREMENTS OF CATTLE BONES

measurements are in mm
and defined by von den Driesch, 1976

PHASE	CONTEXT		ELEMENT			
			HORNCORE			
			basal diameters	basal circumference		outer curve
1	248		44.8 x 33.8	125		130
		(a pair)	40.4 x 31.6	125		110
4	129		62.7 x 42.2	171		
6	3		42.8 x 30.3	120		100
			SCAPULA			
			LG	SLC		
4	64		58.6	48.4		
			HUMERUS			
			Bd	Max. Height Distal Trochlea		
4	76		83.2	49.9		
			METACARPAL			
			Bp	SD	Bd	BfD	GL
4	129				60.6	53.6	
4	345		58.6				
6	3		47.1	27.1			173
			METATARSAL			
			Bp	SD	Bd	BfD	GL
4	129				51.2	47.8	
4	129				49.5	47.7	
4	129				47.5	44.7	
4	64			23.2	49.7	45.9	
6	3		46.4	26.0	59.0	52.8	209
6	3		50.0				
			NAVICULO-CUBOID			
			GB			
4	129		54.1			

CC90: APPENDIX 5: IDENTIFICATIONS OF FISH BONES

(by Mrs. Alison Locker)

Phase	Context	Sample no.	IDENTIFICATIONS
2	189	36B	indeterminate: 1 fragment
4	64	2B	small salmonid (approx. 200 mm total length): 8 vertebral centra plaice/flounder?: 1 caudal vertebral centrum,very encrusted indeterminate: 2 vertebral fragments 9 fragments
4	129	22	small salmonid: 2 caudal vertebral centra 1 precaudal vertebral centrum cf. flatfish: 1 skull fragment indeterminate: 1 vertebral centrum 2 skull fragments 15 fin ray fragments 21 fragments
4	135	17	indeterminate: 1 broken caudal vertebral centrum
6	142	24B	indeterminate: 1 fragment