Animal bone from Market Place, Masham

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Introduction

The animal bones in this report were recovered from a watching brief during cable laying in the central area (NGR: SE 2280) of Masham, North Yorkshire in 1996. The material was manually recovered from a JCB bucket from trenches dug by Northern Electric. There was no opportunity for hand-recovered excavated recovery or sampling.

Approximately one half of the animal bones from the Market Place are very fragmentary and appear to have been redeposited, whilst the others are in fairly good condition. Modern breaks are, not surprisingly, common.

Dating evidence suggests that most material is late Medieval to Post Medieval

Methods

All identifiable fragments of bone were catalogued to species, element and zone. The zones used are those defined by Rackham (unpubl.). Besides zones, partial and whole mandibles and maxillae were recorded, together with any teeth they contained. Loose teeth were also recorded. The mandible wear stage was recorded for the single mandible with an intact tooth row.

All vertebrae that could be recognised were recorded as large or small ungulates. Those labelled large ungulates are almost certainly from cattle rather than red deer or horse. Whilst horse bone was present the vertebrae did not exhibit horse like features. The small ungulate was almost certainly sheep because the alternatives of pig have distinctive vertebrae and roe deer bones were not otherwise present.

Results

There were approximately 51 kg of bone in total from the whole of the excavation from which only 610 bones were identified using the above criteria. Fragment counts for the species present are given in Table 1 from which it is clear that the common domestic species predominate. Over half of the assemblage consisted of cattle bones (69%) followed by sheep/goat bones (23%) with pig bones contributing only eight percent. Horse, cat, dog, red deer and bird bones and oyster shells are also present. Human bones were noted in one context.

Table 1: fragment counts by species

species	fragment count
cat	3
cattle	378
dog	2
domestic fowl	4
duck	1
goose	3
horse	15
human	3
large ungulate	20
oyster	2
pig	45
red deer	1
sheep/goat	129
small ungulate	7

A full catalogue is presented in Appendix 1, a list of anatomical abbreviations in Appendix 2 and a list of all measurements taken (after von den Dreisch 1976) in Appendix 3.

Cattle

Thirty-nine percent of the cattle bones were from one trench, trench 20 context 33002 from which there was almost 24 kg of bone. This sub-assemblage was very different in character from the rest and will be discussed as such below.

In terms of the elements represented Trench 20 is dominated by metapodials suggesting that it is not simply whole carcases being disposed of here. Whilst such bones are dense and survive well there may be a suggestion that this is why they are "too abundant". However, this density also renders them favourable to craft working, for example in the manufacture of bone pins and so on, thus there may be indications of a craft industry in this part of the town. This latter seems plausible for such an domination of two elements (metatarsals and metacarpals).

For the remaining material, skull fragments are rather under-represented indicating that the head bones were probably removed elsewhere. The fact that the axis and atlas vertebrae are absent would further endorse this hypothesis - they would be removed, or at least broken up, during removal of the head. All of the bones associated with both hind and fore limbs are more or less equally represented suggesting the provision of whole legs of meat.

The cattle bones from trench 20 appeared much larger than the norm for the Medieval period indicating that they were either derived from prehistoric or from mid to late eighteenth/very early nineteenth century, the former is ruled out on the context information. It therefore seemed that "modern" breeds of cattle were finding their way to the Masham

market. A comparison was therefore made with bones from a known specimen of the early nineteenth century as well as with other archaeological bones from another site near to Catterick.

The north-east of England is renowned for its development of the shorthorn breed (Holderness Teeswater cross) of cattle with the Colling brothers particularly active in this field. Although energetic in their efforts:-

"*Cattle provision in the area was poor. Very few turnips and little clover were grown to provide winter fodder and the buildings to house animals were far from good. There were fairs in Darlington where cattle and other animals could be sold but there were no regular cattle markets. Nothing in the way of beef could be bought in the area under five years old. Draught oxen and milk cows were invariably kept to that age and frequently much longer. When attempts were first made locally to improve the Teeswater cattle, as they were known, little thought seems to have gone into the project. Cost and time were scarcely considered in the attempts to produce fat cattle, great walls of beef created from the big-boned breed*". (Proud & Butler 1985, 9)

- less seems to have gone into the background of such breeding programmes. However, the aim of the Colling brothers was to reduce the size of these rather gross animals and to improve the general symmetry and flesh-points of their beasts.

One of the most famous of all their improved shorthorns was 'Comet', born in 1804 and dying in 1815. The surviving parts of his skeleton are in the Tubwell Road Museum in Darlington. The majority of the surviving limb bones from Comet are pathological showing signs of osteoarthritis and, indeed, in 1846, J. Wright "On Short-horn Cattle" writes that Comet had a deformed shoulder or the cripples due to inbreeding. Thus a complete set of measurements could not be taken although one of Comet's metacarpals was free from any extra bone growth and thus could be measured.

The other archaeological bones derived from St. Giles by Brompton Bridge where burials of whole animals possibly represented death by rinderpest or other disease (Stallibrass 1993). They, too, were thought to be mid-eighteenth century in date.

Two measurements on the metacarpals were used for comparison 1) Bd - the greatest breadth of the distal end and 2) Bp - greatest breadth of proximal end (von den Driesch 1976). These are plotted on figures 1 & 2 respectively. Figure 1 shows that Comet falls midway amongst those from Masham and, indeed, from Brough St. Giles although he is at the upper end of Masham in terms of the proximal data. H.H. Dixson, in 1865, describes Comet as not very large, but larger cattle did exist at that time. In 1799 the 'Durham Ox', who shared Favourite as a sire with Comet, had had a live weight of 216 stones or 1375 kg. and it is possible that some of the Masham bones came from animals of this larger type. However, the distal end of the metacarpal can become splayed if the animal comes under undue stress during its life. This may be through overweight or from being a draught animal. The proximal end is less prone to such splaying and therefore more likely to reflect a real representation of the size of the animal. Of course, sex comes into the equation too. Comet was a bull and therefore likely to be large whereas the Masham bones are from animals of unknown sex. They may therefore represent the females and castrates of a population of the size of Comet

or from a less improved stock. Whichever, they are unlikely to represent the gross animals initially bred for bulk and beef.

Figure 1:

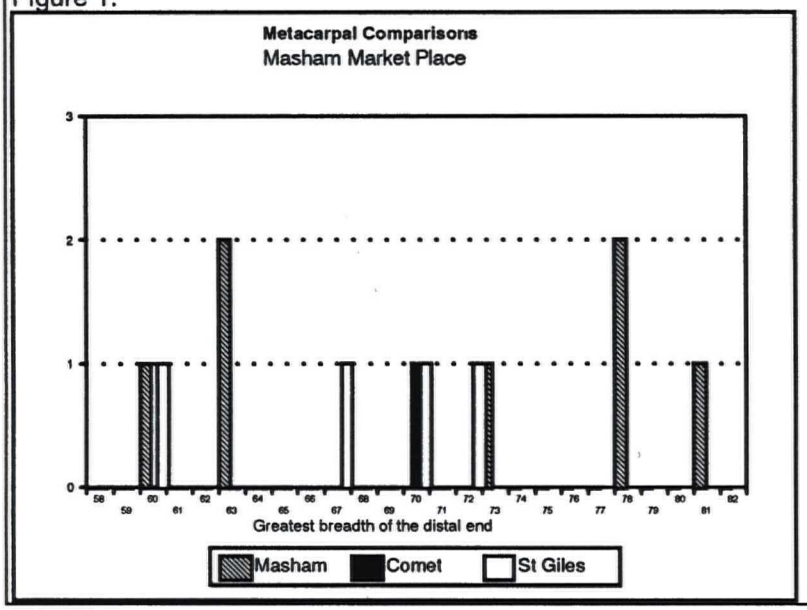
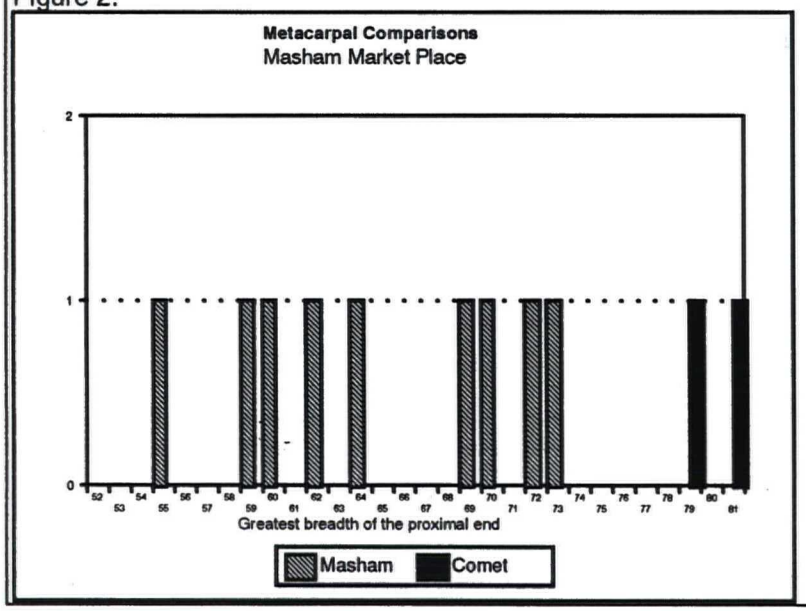


Figure 2:



Using Comet's good metacarpal, an estimated wither's height of 1.36m was calculated after Zalkin (1960, 126) for animals where sex is unknown, even though the sex of Comet is known. The factor for unknown sex is more reliable. The withers height of the cattle from Brough St. Giles range from 1.30m to 1.47m - somewhat larger. There was only one complete cattle metacarpal from Masham (trench 17 context 28005) and from which a withers height of 1.29m was obtained. Again, this is comparable to Comet. The big shorthorns frequently reached 1.5 to 1.7m at the withers.

The epiphysial evidence depicted in Table 2 clearly shows that nearly a quarter (23%) of the cattle from Masham were either being slaughtered under 3 years of age or, if the historical text is correct in that beef could not be obtained under 5 years of age, the unfused bones must have come from castrated animals. Male castrated animals mature at a different rate to entire males, for example in the modern reference collection of the Bio.Lab. the epiphyseal closure in a 9-year old castrate goat is still clearly visible whilst in entire animals complete closure has occurred by 2.5 to 3 years of age. In addition there is often an associated lengthening of the long bones. Unfortunately this can be discussed no further through the lack of entire long bones in the Masham assemblage but would warrant investigation if more material is excavated in the future.

Table 2: Cattle epiphyses in approximate order of fusion
(Ages of fusion after Silver, 1969).

	fused	just fused	unfused
by 18 months			
Scap tub	9		
Acet symph			1
Prox rad	6		
Dist hum	6		3
Prox Ph2	1		
Prox Ph 1	17	1	
by 2-3 years			
Dist tib	10	2	4
Dist mc	15	1	10
Dist mt	20		9
Dist mp	9		13
by 3.5 - 4 years			
Prox cal.	6	1	1
Prox fm	6	1	3
Dist rad	3		1
Prox tib	1		
Dist fem			2
Prox and dist uln	1		
Prox hum	1		
by > 5 years			
Ant vert	3	1	12
Post vert	2	1	5

Sheep/Goat

It is accepted that sheep and goat are superficially alike in appearance but can, with care, be differentiated, particularly from the metapodials and skull. None of the 14 metapodials from the site was identified as goat nor did any other sheep/goat fragments exhibit the characteristics of goat. All the sheep/goat fragments are therefore considered to derive from sheep.

In terms of elements represented the more robust elements are more abundant, for example, the distal tibia, proximal radius and distal humerus. In general the preservation and recovery patterns are representative of whole carcases.

The greatest length of only complete metatarsal, was multiplied by the factor used by Teichert (in Driesch and Boessneck 1974, 339) produced an estimated withers height of 0.59m which fits well with the modern Soay range (Clutton-Brock *et al* 1990). The other measurements (Appendix 3) suggest that the sheep being utilised in and around Masham were of two types a small primitive and a slightly larger improved type.

The epiphysial fusion data clearly show that all of the epiphyses are fused but there are too few in any context to draw any firm conclusions regarding the culling patterns. There is an absence of juvenile sheep bones. No pathology was recorded.

Pigs

Only 38 fragments of bone and 7 loose teeth were recorded from the entire excavation. From the epiphysial fusion data three bone fragments appear to have derived from adults. The under-representation of pig is not uncommon on archaeological sites compared to those of cattle and sheep.

Other Species

The other species present were horse, red deer, cat, dog, domestic fowl, goose duck, fish, and oyster shell.

Gnawing and Butchery

Two distinct butchery methods could be noted on the bone remains from trench 20. In the first, the metapodials have been chopped with a large cleaver, in most cases repeatedly, with the resulting chop marks on the shaft. The second, and most unusual, method of butchery appears to have a sawn surface but, on closer inspection, it appears that a flat sharp chisel-like implement was placed on the bone surface and then hit with a heavy object repeatedly until the bone broke, thus producing chatter lines. A proximal metatarsal demonstrates this particularly well - it has three surfaces clearly showing chatter marks and there is a faint mark where the chisel slipped/jumped. From the angles it appears that who ever did the job held the chisel in the left hand and hit it with something in the right. An explanation for this type of butchery could be that the person involved was weaker, either the son or wife of the butcher or an elderly person - someone unable to chop with sufficiently direct force.

27 bone fragments exhibited gnawing, one by a rat and the others by canids. 22 of these were from trenches on the southern side of the Market Place.

Discussion and Conclusions

Although the standard of preservation is mixed, the bone assemblage from the Market Place appears to be domestic household or eating establishment waste. It is almost entirely from the domesticated species - cattle, sheep/goat and pig - and either whole carcases or the meatier leg joints seem to be represented. However, material from Trench 20 provides possible evidence for craft-working from its superabundance of lower limb bones.

Metrical data show a mixture of somewhat larger as well as the "typical" small medieval livestock in relation to both the cattle and sheep being utilised. Clearly the material dates from an important transition time and this mixture of types makes it of national as well as regional importance.

This specific material demonstrates the excellent potential of the site to address these questions should further excavation be planned. In which case it is essential that full hand-recovery and associated sampling (to both check for recovery bias in the hand collection and to provide evidence for small mammals, insects and plant remains) is undertaken. An environmental strategy should be determined prior to any excavation being undertaken. This would ensure that not only investigations of animal but crop husbandry too and local diet and economy were considered.

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Appendix 1 The catalogue (archival purposes only)

(available on disc as Paradox© table)
break - a=ancient, m=modern; gnaw=gnawing; butch=butchery marks;
path=pathology; pres=preservation - g=good, f=fair, p=poor
zone=zones (after Rackham) present on the bone
element abbreviations see Appendix 2

Trench	Area	Context	Species	Element	Side	Break	Gnaw	Butch	Path	Pres	Sex	Zone
1	AAA	1002	pig	mtc	r	a				g		1
1	AAA	1002	s/g	mandible	l	a				f		45
1	AAA	1002	s/g	humerus	l	a				g		6789
10	AAI	10002	cattle	phalange 1		a				g		12
10	AAI	10002	s/g	scapula	l	a				g		2345
10	AAK	10004	cattle	phalange 1		a				g		12
10	ADA	19004	cattle	scapula	r	m				g		12
10	ADB	19005	cattle	mandible	r					p		
10	ADB	19005	cattle	mandible	l	a				g		123
10	ADB	19005	cattle	calcaneum	r					g		123
10	ADB	19005	cattle	tibia	r	m				f		56
10	ADB	19005	pig	tibia	l	a				g		4
10	ADB	19005	s/g	tibia	l	am				g		4
10	ADC	19005	cattle	mandible	r	a				f		
10	ADC	19005	cattle	tooth M3								
10	ADC	19005	cattle	radius	r	am				g		1
10	ADC	19005	cattle	scapula	l	am				g		4
10	ADC	19005	goose	humerus								
10	ADC	19005	pig	tibia	l	m				g		567
10	ADC	19005	pig	mcc	l							1
10	ADC	19005	pig	radius	l	a				g		6
10	ADC	19005	s/g	pubis	r	a				g		4
10	ADC	19005	s/g	tooth M1								
12	AFC	21003	duck	tibia								
12	AID	26003	cattle	tooth UM3								
13	AFB	22003	cattle	ulna	l	am				p		3
13	AFB	22003	s/g	radius	r	a	y			g		13
13	AFE	22005	cattle	humerus	l	a		y		p		679
13	AFE	22005	cattle	astragalus	r					g		1
13	AFE	22005	cattle	centro-quartal	r					g		
13	AFE	22005	goose	femur								
13	AFE	22005	pig	radius	l	am				f		23
13	AFE	22005	pig	humerus	ra			y		f		69
13	AFE	22005	s/g	radius	l	am				p		13
13	AFF	22003	cattle	humerus	l	a		y		g		6789
13	AFF	22003	cattle	radius	l	a		y		g		456
13	AFF	22003	cattle	radius	l	a		y		g		123
13	AFF	22003	cattle	phalange 3						g		
13	AFF	22003	cattle	calcaneum	r	am		y		g		2
13	AFF	22003	s/g	tibia	r	am	y	y		g		4
13	AFG	22005	cattle	astragalus	r					g		1
13	AFG	22005	cattle	tibia	l	am		y		g		567
13	AFG	22005	cattle	femur						g		1

13	AFG	22005	cattle	acetabulum	l	am				f		5
13	AFG	22005	horse	mpg								
13	AFG	22005	pig	scapula	l	am				g		4
13	AFG	22005	pig	mandible	l	a				g		
13	AFG	22005	pig	tooth M2								
13	AFG	22005	s/g	mandible	l	am				g		
13	AFH	22003	cattle	femur	r					g		567
13	AFH	22003	cattle	phalange 1		m				p		12
13	AFH	22003	cattle	acetabulum	r	am				f		59
13	AFH	22003	dom fowl	humerus								
13	AFH	22003	l/ung	vertebra undiff.		am				p		14
13	AFH	22003	l/ung	vertebra undiff.		m				f		1
13	AFH	22003	l/ung	vertebra undiff.		a				p		4
13	AFI	22005	cattle	calcaneum	r	m				f		1
13	AFI	22005	s/g	astragalus	r					f		1
13	AFL	22007	s/g	tibia	r	am				p		57
13	AFN	22009	cat	metatarsal								
13	AFN	22009	cattle	centro-quartal	r					g		1
13	AFN	22009	cattle	phalange 3		m				g		
13	AFN	22009	s/g	mandible	l	a				g		45
13	AFN	22009	s/g	tibia	r		y					4
13	AFN	22009	s/g	humerus	r	am				f		69
13	AFN	22009	s/g	radius		am	y					3
13	AFN	22009	s/g	calcaneum	r					g		123
13	AFN	22009	s/g	tibia	l	m				f		567
13	AFN	22009	s/g	maxilla	r	a				g		9
13	AFO	22009	cattle	scapula	l	a	y	y		g		23
13	AFO	22009	horse	metacarpal	l	m				g		
13	AFO	22009	horse	tooth								
13	AFO	22009	pig	humerus	l	am				g		69
13	AFQ	22008	cattle	horn core						p		
13	AFQ	22008	pig	scapula	r	am				g		345
14	AFR	23003	cattle	acetabulum	r	a				g		9
14	AFR	23003	cattle	tooth M3								
14	AFR	23003	l/ung	rib								
14	AFR	23003	l/ung	rib								
14	AFR	23003	s/g	tibia	r	m				g		567
14	AFT	23004	cattle	astragalus	r							1
14	AFT	23004	cattle	metatarsal	r	a		y		g		12
14	AFT	23004	cattle	phalange 1		m				p		1
14	AFT	23004	cattle	pubis	r	a			y	g		4
14	AFT	23004	cattle	ilium	r	a				g		39
14	AFT	23004	pig	mcc		m						
14	AFT	23004	s/g	tooth UM1								
14	AFT	23004	s/g	radius	l	am				f		3
14	AFT	23004	s/ung	vertebra undiff.		m				f		345
14	AFU	23005	cattle	metacarpal	r	a		y		g		12
14	AFU	23005	cattle	astragalus	l	a		y		g		1
14	AFU	23005	goose	tibia								
14	AFU	23005	oyster	shell deep								

14	AFU	23005	pig	tibia	r					g		47
14	AFU	23005	pig	femur	r	a						4
14	AFU	23005	pig	radius	l	a				p		13
14	AFU	23005	red deer	antler								
14	AFU	23005	s/g	ilium	l	m				g		23
14	AFV	23007	cattle	radius	l	a		y		g		1
14	AFV	23007	dom fowl	tarsal						g		
14	AFV	23007	horse	astragalus	l	m				g		
14	AFV	23007	s/g	tooth M2								
14	AFX	23005	cattle	radius	l	a		y		g		12
14	AFX	23005	horse	radius	r	a		y	g			123
14	AFX	23005	horse	ulna	r	m	y			g		23
14	AFX	23005	horse	calcaneum	l		y			g		23
15	AGB	24003	cattle	metatarsal	r	am		y		f		35
15	AGB	24003	pig	mtc	l					g		1
15	AGB	24003	s/g	scapula	l	am				g		235
15	AGC	24008	cattle	tooth M1								
15	AGC	24008	cattle	ulna	l	am		y		g		23
15	AGC	24008	cattle	mandible	l	am				f		5
15	AGE	24007	cattle	metatarsal	r	a		y		g		345
15	AGE	24007	cattle	calcaneum	l			y		g		123
15	AGE	24007	cattle	astragalus	l					g		1
15	AGE	24007	cattle	scapula	l	am				p		2345
15	AGE	24007	pig	canine deciduous								
15	AGF	24007	cattle	calcaneum	r					g		123
15	AGF	24007	cattle	phalange 1						g		12
15	AGF	24007	cattle	humerus	r	a	y	y		g		69
15	AGF	24007	cattle	mandible	l	am						5
15	AGF	24007	cattle	acetabulum	l	am				g		59
15	AGF	24007	cattle	tooth p3								
15	AGF	24007	cattle	tooth M3								
15	AGF	24007	horse	occiput		a				g		
15	AGG	24007	cattle	scapula	l					p		2345
15	AGG	24007	cattle	mandible	r	am				g		23
15	AGH	24007	cattle	ilium	r	am				f		2
15	AGH	24007	cattle	mandible	r	a				g		23
15	AGH	24007	horse	tooth incisor								
15	AGH	24007	l/ung	vertebra undiff.		a				g		4
15	AGI	24007	cattle	tibia	l					g		56
15	AGI	24007	cattle	tibia	r	a		y		g		567
15	AGI	24007	cattle	phalange 1						g		12
15	AGI	24007	cattle	humerus	r	am				f		67
15	AGI	24007	horse	phalange 1								
15	AGJ	24007	cattle	tibia	l	a				p		123
15	AGJ	24007	cattle	radius	l					g		45
15	AGJ	24007	cattle	phalange 1						p		12
15	AGJ	24007	horse	mandible		a				g		
15	AGJ	24007	s/g	radius	l	am						3
15	AGJ	24007	s/ung	vertebra undiff.						f		4
15	AGK	24007	cattle	tibia	l	a		y		g		7

15	AGK	24007	cattle	scapula	l	am		y		f		####
15	AGK	24007	cattle	metatarsal		a	y	y		f		5
15	AGK	24007	s/g	radius	l	am	y			g		1236
15	AGK	24007	s/g	radius	l	a		y		g		123
15	AGM	24008	cattle	metatarsal	r	m				f		1235
15	AGM	24008	cattle	pubis	r	am				f	f	4
15	AGM	24008	cattle	scapula	r	am				f		345
15	AGN	24008	horse	astragalus								
15	AGR	24008	cattle	pubis	l	a						4
15	AGR	24008	cattle	phalange 1		m				p		1
15	AGR	24008	cattle	phalange 1		m				p		1
15	AGR	24008	cattle	radius		m				p		5
15	AGR	24008	cattle	ulna	l	am	y			p		2
15	AGR	24008	cattle	humerus	r	m				p		5
15	AGR	24008	cattle	tooth UM2								
15	AGR	24008	cattle	tooth UM2								
15	AGR	24008	cattle	horn core								
15	AGR	24008	pig	mcd	l					g		2
15	AGR	24008	pig	scapula	r	a				g		345
15	AGR	24008	s/g	humerus	r	a	y			g		679
15	AGS	24008	cattle	occiput	l	a				p		2
15	AGS	24008	cattle	scapula	r	a		y		g		2
15	AGS	24008	cattle	metacarpal	l	a		y		g		12
15	AGS	24008	cattle	tooth UM2								
15	AGS	24008	cattle	tooth M2								
15	AGS	24008	pig	frontal	l	a				g		450
15	AGS	24008	pig	mtc	l					g		1
15	AGS	24008	pig	scapula	l	a	y			g		345
15	AGS	24008	pig	temporal	l	a				g		4
15	AGS	24008	s/ung	vertebra undiff.		a				g		1
16	AHA	25003	human									
16	AHA	25003	s/g	humerus	r	am	y			f		69
16	AHB	25003	human									
16	AHE	25003	cattle	acetabulum	r	am		y		p		5
16	AHE	25003	dog	radius								
16	AHE	25003	human									
16	AHE	25003	pig	tooth incisor								
16	AHI	25002	s/g	radius	r	m				g		12
16	AHJ	25002	cattle	femur	r	am		y		g		13
16	AHJ	25002	cattle	phalange 1						g		12
16	AHJ	25002	l/ung	vertebra undiff.		a		y				4
16	AHJ	25002	s/g	scapula	l	m				g		2
16	AHJ	25002	s/g	scapula	l	m				g		2
16	AHL	25003	s/g	radius	l	m				g		123
16	AHL	25003	s/g	scapula	r	m				g		2345
16	AHM	25002	cattle	phalange 1						g		12
16	AHM	25002	dog	ulna		m						
16	AHM	25002	s/g	tibia	l	a		y		g		567
16	AHM	25002	s/g	radius	l	a	y			p		6
16	AHM	25002	s/g	tooth DP4								

16	AHN	25002	cattle	tibia	r	am		y		g		567
16	AHN	25002	cattle	metacarpal	l	am		y		g		12
16	AHN	25002	cattle	metatarsal	r	m				f		345
16	AHN	25002	cattle	metatarsal	r	am		y		p		12
16	AHN	25002	l/ung	vertebra undiff.		am		y		f		4
16	AHN	25002	pig	scapula	l	am				f		235
16	AHO	25002	cattle	metacarpal	l	a				g		345
16	AHO	25002	cattle	metatarsal	r	a		y		g		345
16	AHO	25002	cattle	femur	r			y		g		1
16	AHO	25002	cattle	humerus	l	am	y			f		69
16	AHO	25002	cattle	horn core		am				p		
16	AHO	25002	cattle	tooth M1								
16	AHO	25002	s/g	occiput		a		y		g		223
16	AHO	25002	s/g	mandible	l					p		
16	AHO	25002	s/g	tooth UM3								
16	AHQ	25002	cattle	phalange 1						g		12
16	AHQ	25002	cattle	mandible	l	am				g		6
16	AHQ	25002	cattle	calcaneum	l	am		y		g		23
16	AHQ	25002	cattle	tooth M1								
16	AHQ	25002	cattle	tooth UP2								
16	AHQ	25002	pig	canine deciduous								
16	AHQ	25002	s/g	tibia	l	a		y		g		567
16	AHQ	25002	s/g	tibia	l	a		y		g		567
16	AHR	25003	cattle	phalange 2						g		12
16	AHR	25003	cattle	calcaneum	l	a	y			g		2
16	AHR	25003	s/g	scapula	l	am				g		####
16	AHR	25003	s/g	tibia	r	a				p		567
16	AHR	25003	s/g	tibia	r	a		y		g		567
16	AHR	25003	s/g	tooth M3								
16	AHU	25007	s/g	metatarsal	l					g		####
16	AHU	25007	s/g	mandible	l	m				g		5
16	AHU	25007	s/g	maxilla	r					p		
17	AIF	28002	cattle	occiput	r	m				g		2
17	AIF	28002	cattle	ulna	l	am		y		p		23
17	AIF	28002	cattle	humerus	l	am				f		5
17	AIF	28002	cattle	metacarpal	l	am		y		p		12
17	AIF	28002	s/g	ilium	l	a				g		359
17	AII	28005	cattle	femur	r	am		y		g		1
17	AII	28005	cattle	femur	r	a				g		1
17	AII	28005	cattle	tibia	l	a		y		g		567
17	AII	28005	s/g	tooth M3								
17	AIJ	28005	cattle	humerus	l	am				g		134
17	AIJ	28005	cattle	tooth UM2								
17	AIJ	28005	s/g	maxilla	l					p		
17	AIJ	28005	s/g	femur	l	a		y		g		567
17	AIK	28005	cattle	metatarsal	l	am		y		p		35
17	AIK	28005	cattle	metacarpal	r					f		####
17	AIK	28005	cattle	maxilla	l	m				p		9
17	AIK	28005	cattle	scapula	r	am		y		f		2
17	AIK	28005	cattle	occiput	l	am				f		12

17	AIK	28005	pig	radius	r	a		y				12
17	AIK	28005	s/g	radius	r	a				g		123
17	AIK	28005	s/g	radius	l	a		y				12
17	AIK	28005	s/g	metacarpal	r	m				p		####
17	AIK	28005	s/g	metacarpal	l	a						12
17	AIK	28005	s/g	calcaneum	l							123
18	AIL	29004	cattle	acetabulum	r	a				g		579
18	AIL	29004	cattle	tooth UPM1								
18	AIL	29004	s/g	radius	l	m				g		456
18	AIL	29004	s/g	femur	r	a				g		3
18	AIN	29004	cattle	metatarsal	r	a		y		g		345
18	AIN	29004	cattle	tibia	r	m				f		567
18	AIN	29004	cattle	metacarpal	l	am		y		g		
18	AIN	29004	s/g	metatarsal		a				p		5
18	AIN	29004	s/g	acetabulum	l							9
2	AAO	12002	s/g	metatarsal	l	a				g		12
2	AAO	12002	s/g	humerus	r	am	y			f		679
20	AGH	33002	cattle	phalange 3						g		1
20	AGH	33002	cattle	carpal								
20	AGH	33002	cattle	femur	r	am		y		f		1
20	AGH	33002	cattle	scapula	l	am		y		f		2
20	AGH	33002	cattle	metatarsal	l	am		y		p		345
20	AGH	33002	cattle	metatarsal	l	am		y		g		12
20	AGH	33002	cattle	metatarsal	l	am		y		p		12
20	AGH	33002	cattle	metatarsal	l	am		y		f		12
20	AGH	33002	cattle	metatarsal	l	am		y	y	g		12
20	AGH	33002	cattle	metatarsal	l	am		y		g		12
20	AGH	33002	cattle	metatarsal		am		y		p		5
20	AGH	33002	cattle	metacarpal		a		y		g		5
20	AGH	33002	cattle	metacarpal		am		y		f		5
20	AGH	33002	cattle	metacarpal	r	am		y		g		12
20	AGH	33002	cattle	metacarpal	r	am		y		p		12
20	AGH	33002	cattle	metacarpal	r	am		y		p		12
20	AGH	33002	cattle	metacarpal	l	a		y		g		12
20	AGH	33002	cattle	metapodial		m				g		3
20	AGH	33002	cattle	metapodial		m				p		3
20	AGH	33002	cattle	metatarsal		am		y		f		5
20	AGH	33002	pig	phalange 1						g		12
20	AGH	33002	s/g	astragalus	r		y			g		1
20	AJB	33002	cattle	tibia	r	am		y		f		567
20	AJB	33002	cattle	horn core		am				p		
20	AJB	33002	cattle	metacarpal	l	am				f		12
20	AJB	33002	cattle	metacarpal	l	a				g		12
20	AJB	33002	cattle	metacarpal	l	am				p		12
20	AJB	33002	cattle	metacarpal	r	a				f		345
20	AJB	33002	cattle	metacarpal	r	m				p		45
20	AJB	33002	cattle	metatarsal	l	a		y		g		12
20	AJB	33002	cattle	metatarsal	l	am		y		f		345
20	AJB	33002	cattle	metatarsal		am				f		5
20	AJB	33002	cattle	metatarsal		am						5

20	AJB	33002	cattle	metatarsal		m						5
20	AJB	33002	cattle	metapodial		m				f		3
20	AJB	33002	cattle	metapodial		m				f		3
20	AJB	33002	cattle	metapodial		m				f		3
20	AJB	33002	s/g	humerus	r	am				f		6789
20	AJB	33002	s/g	mandible	l	m				f		123
20	AJC	33002	cattle	metacarpal	l	a		y		g		345
20	AJC	33002	cattle	metacarpal	r	am				f		12
20	AJC	33002	cattle	metatarsal	rl	a						12
20	AJC	33002	cattle	metatarsal	rl	a		y		g		12
20	AJC	33002	cattle	metatarsal	rl	a		y		f		12
20	AJC	33002	cattle	metatarsal	rl	am		y		p		12
20	AJC	33002	cattle	metatarsal	r	am		y		p		12
20	AJC	33002	cattle	metatarsal	r	m						
20	AJC	33002	cattle	metatarsal	l	m				f		345
20	AJC	33002	cattle	metapodial		m				p		3
20	AJC	33002	cattle	metapodial		m				p		4
20	AJC	33002	cattle	metapodial		m				p		4
20	AJC	33002	cattle	tibia	r	a		y		g		567
20	AJC	33002	cattle	radius	l	am		y		f		1
20	AJC	33002	s/g	metatarsal	r	m				p		12
20	AJC	33002	s/g	radius	l	a				g		3456
20	AJD	33002	cattle	humerus	l	m				p		69
20	AJD	33002	cattle	phalange 3		m						
20	AJD	33002	cattle	carpal								
20	AJD	33002	cattle	metapodial	r	m				g		34
20	AJD	33002	cattle	metapodial		m						3
20	AJD	33002	cattle	metacarpal		m				p		5
20	AJD	33002	cattle	metacarpal		m				p		5
20	AJD	33002	cattle	metacarpal		m				g		35
20	AJD	33002	cattle	metacarpal	r	am		y		g		345
20	AJD	33002	cattle	metacarpal	l	a		y		g		12
20	AJD	33002	cattle	metacarpal	l	m				p		1
20	AJD	33002	cattle	metacarpal	r	m				p		1
20	AJD	33002	cattle	metatarsal		am		y		g		5
20	AJD	33002	cattle	metatarsal	r	a		y		g		12
20	AJD	33002	cattle	metatarsal	l	am		y		p		1
20	AJD	33002	cattle	metatarsal	l	a		y		g		12
20	AJD	33002	cattle	metatarsal	l	a		y		g		12
20	AJD	33002	cattle	metatarsal	l	am		y		f		12
20	AJD	33002	pig	tooth M2								
20	AJD	33002	s/g	metacarpal	l	am	y			g		5
20	AJE	33002	cattle	carpal								
20	AJE	33002	cattle	humerus	l	am		y		f		69
20	AJE	33002	cattle	calcaneum	r	m				p		
20	AJE	33002	cattle	calcaneum	r					g		1
20	AJE	33002	cattle	horn core		a		y		p		
20	AJE	33002	cattle	metatarsal	r	am		y		p		12
20	AJE	33002	cattle	metatarsal	l	a		y		g		12
20	AJE	33002	cattle	metatarsal	l	a		y		g		12

20	AJE	33002	cattle	metatarsal	l	am		y		g		12
20	AJE	33002	cattle	metatarsal	l	m				p		34
20	AJE	33002	cattle	metatarsal		am		y		g		5
20	AJE	33002	cattle	metatarsal		am		y		f		35
20	AJE	33002	cattle	metatarsal		am				f		5
20	AJE	33002	cattle	metacarpal	l	am		y		f		1
20	AJE	33002	cattle	metacarpal		am		y		f		5
20	AJE	33002	cattle	metacarpal	r	am		y		g		345
20	AJE	33002	cattle	metapodial		m				p		3
20	AJE	33002	cattle	metapodial		m				p		3
20	AJF	33002	cattle	metatarsal	r	am		y		p		12
20	AJF	33002	cattle	metatarsal	l	a		y		g		12
20	AJF	33002	cattle	metatarsal	l	a		y				12
20	AJF	33002	cattle	metatarsal		a		y		f		5
20	AJF	33002	cattle	metatarsal		m				p		5
20	AJF	33002	cattle	metapodial								3
20	AJF	33002	cattle	metapodial								3
20	AJF	33002	cattle	metacarpal	r	am		y		f		12
20	AJF	33002	cattle	metacarpal	r	am		y		f		12
20	AJF	33002	cattle	metacarpal	r	am		y				12
20	AJF	33002	cattle	metacarpal	r	am						345
20	AJF	33002	cattle	metacarpal	r	am						12
20	AJF	33002	cattle	phalange 2		m						1
20	AJF	33002	cattle	humerus	r	am		y		f		6789
20	AJF	33002	cattle	maxilla	l							
20	AJG	33002	cattle	metatarsal	l	a		y		g		12
20	AJG	33002	cattle	metatarsal	l	a		y		f		12
20	AJG	33002	cattle	metatarsal	l	a		y		f		12
20	AJG	33002	cattle	metatarsal	l	am		y		p		12
20	AJG	33002	cattle	metatarsal	r	am		y		p		35
20	AJG	33002	cattle	metatarsal	r	am		y		p		
20	AJG	33002	cattle	metatarsal	l	a		y		f		345
20	AJG	33002	cattle	metatarsal	r	am		y		p		5
20	AJG	33002	cattle	metatarsal	l	am				f		345
20	AJG	33002	cattle	metatarsal	l	m				p		35
20	AJG	33002	cattle	metacarpal	r	m				vp		
20	AJG	33002	cattle	metacarpal	r	a		y		g		12
20	AJG	33002	cattle	metacarpal	r	am		y		g		12
20	AJG	33002	cattle	metacarpal	l	am				vp		12
20	AJG	33002	cattle	metacarpal	l	a		y		g		12
20	AJG	33002	cattle	metacarpal	l	am		y		f		345
20	AJG	33002	cattle	metacarpal	r	m				f		345
20	AJG	33002	cattle	metacarpal	r	a		y		g		5
20	AJG	33002	cattle	metacarpal	l	a		y		g		5
20	AJG	33002	cattle	metacarpal	l	a		y				
20	AJG	33002	cattle	metapodial		m				p		3
20	AJG	33002	cattle	metapodial		m				p		
20	AJG	33002	cattle	metapodial		m				p		
20	AJG	33002	cattle	tooth UM2								
20	AJI	33002	cattle	metacarpal		am		y		p		5

20	AJI	33002	cattle	metacarpal		am		y		p		5
20	AJI	33002	cattle	metacarpal	r	a		y		g		12
20	AJI	33002	cattle	metacarpal	r	am		y	y	f		345
20	AJI	33002	cattle	metacarpal	r	m				p		34
20	AJI	33002	cattle	metatarsal	r	a		y		g		12
20	AJI	33002	cattle	metatarsal	r	m				p		12
20	AJI	33002	cattle	metatarsal	r	m				p		345
20	AJI	33002	cattle	metatarsal	l	am		y		f		12
20	AJI	33002	cattle	metatarsal	l	am		y		g		12
20	AJI	33002	cattle	metatarsal	l	am		y		g		12
20	AJI	33002	cattle	metatarsal	l	am		y		f		12
20	AJI	33002	cattle	humerus	l	m				p		78
20	AJI	33002	cattle	tibia	l	am		y		p		4
20	AJI	33002	cattle	occiput	l	am				f		2
20	AJI	33002	cattle	radius	r	am		y		f		1
20	AJI	33002	cattle	tooth								
20	AJI	33002	horse	tibia	l	am		y		f		567
20	AJJ	33002	cattle	tibia	r	m				p		56
20	AJJ	33002	cattle	metapodial		m				p		3
20	AJJ	33002	cattle	metapodial		m						
20	AJJ	33002	cattle	metatarsal		m				p		35
20	AJJ	33002	cattle	metatarsal	r	a		y		g		345
20	AJJ	33002	cattle	metatarsal	r	a		y		g		12
20	AJJ	33002	cattle	metatarsal	l	a		y		g		345
20	AJJ	33002	cattle	metatarsal	l	a		y		g		12
20	AJJ	33002	cattle	metatarsal	l	am		y		p		12
20	AJJ	33002	cattle	metacarpal		m				p		3
20	AJJ	33002	cattle	metacarpal		am				p		5
20	AJJ	33002	cattle	metacarpal	l	am				p		35
20	AJJ	33002	cattle	metacarpal	r	m				o		345
20	AJJ	33002	cattle	metacarpal	r	am		y		f		345
20	AJJ	33002	l/ung	vertebra undiff.		am				p		4
20	AJJ	33002	s/g	metacarpal	r	m				p		12
20	AJJ	33002	s/g	tooth								
20	AJJ	33002	s/ung	rib								
21	AKC	35	cattle	metapodial		am		y		f		
21	AKC	35	cattle	calcaneum	r	a		y		g		1
21	AKC	35	cattle	calcaneum		m				p		1
21	AKC	35	cattle	scapula	l	a				f		4
21	AKC	35	cattle	tooth dp2								
21	AKC	35	cattle	astragalus		a		y		g		
21	AKC	35	cattle	occiput		a				g		
21	AKC	35	pig	humerus	r	a	y	y		f		
21	AKC	35	s/g	atlas		m				p		4
4	AAU	13002	cattle	tooth M3								
4	AAU	13002	cattle	tooth UM2								
5	AAX	14005	cattle	mandible	l	m				p		2
5	AAX	14005	cattle	metatarsal	l	a		y		g		5
5	AAX	14005	cattle	metapodial		m				g		3
5	AAX	14005	cattle	calcaneum	r	m				p		2

5	AAX	14005	cattle	tooth UM2								
5	AAX	14005	cattle	tooth PM3								
5	AAX	14005	s/g	scapula	r	m				g		1235
5	AAX	14005	s/g	scapula	r	m				f		23
5	AAX	14005	s/g	tibia	r	am		y		p		567
5	AAX	14005	s/g	occiput	l	m						2
5	AAX	14005	s/g	radius	r	a				g		12
5	AAX	14005	s/g	tooth M2								
5	AAX	14005	s/g	axis		am		y		p		34
6	ABA	15002	cattle	tibia	l	a		y		g		567
6	ABA	15002	cattle	acetabulum	l	am				g		59
6	ABA	15002	pig	atlas		m				p		
6	ABA	15002	s/g	radius		a	y	y		g		3
6	ABB	15004	oyster	shell flat								
6	ABB	15004	pig	radius	r	am		y		f		123
6	ABB	15004	s/g	tibia	r	a		y		g		567
6	ABE	15006	cat	femur						g		
6	ABE	15006	cat	metatarsal								
6	ABE	15006	cattle	tooth M1								
6	ABE	15006	pig	radius	l	a		y		g		123
8	AAC	8002	cattle	astragalus	l					p		
8	AAC	8002	cattle	astragalus	l			y				
8	AAC	8002	cattle	phalange 2								
8	AAC	8002	cattle	occiput	l	a				g		2
8	AAC	8002	dom fowl	tibia								
8	AAC	8002	l/ung	vertebra cervical				y				14
8	AAC	8002	l/ung	vertebra undiff.				y		g		145
8	AAC	8002	l/ung	vertebra undiff.								145
8	AAC	8002	pig	atlas						g		
8	AAC	8002	pig	axis						g		
8	AAC	8002	s/g	mandible	r	am				g		4
8	AAC	8002	s/g	tooth M1								
8	AAC	8002	s/g	calcaneum	l	m				f		12
8	ABH	17002	cattle	femur	l	a				vp		5
8	ABH	17002	cattle	metapodial		m				f		3
8	ABH	17002	cattle	scapula	l	am				p		4
8	ABH	17002	cattle	tooth UP4								
8	ABH	17002	cattle	metatarsal	r	am		y		p		12
8	ABH	17002	s/g	acetabulum	l	a				g		59
8	ABH	17002	s/g	tooth M3								
8	ABH	17002	s/g	humerus	l	am				f		569
8	ABL	17003	cattle	metatarsal	l	am		y		g		12
8	ABL	17003	l/ung	vertebra undiff.		am				f		4
8	ABL	17003	s/g	tibia	l					f		567
8	ABL	17003	s/g	tooth UM1								
8	ABL	17003	s/g	mandible	l	am				f		5
8	ABM	17003	cattle	metatarsal	l	am		y		f		12
8	ABM	17003	cattle	astragalus	r			y		g		
8	ABM	17003	cattle	tooth UM2								
8	ABM	17003	s/g	radius	r					p		3

8	ABN	17002	cattle	metacarpal	r	a		y		g		12
8	ABN	17002	cattle	carpal		m						
8	ABN	17002	cattle	tooth M2								
8	ABN	17002	cattle	tooth UP4								
8	ABN	17002	dom fowl	ulna								
8	ABN	17002	s/g	humerus	r	a				g		6789
8.11	ABJ	17003	cattle	tibia	r	m				vp		56
8.11	ABJ	17003	cattle	femur	r	am				f		1
8.11	ABJ	17003	cattle	metapodial	?	m				p		3
8.11	ABJ	17003	cattle	carpal						f		1
8.11	ABJ	17003	cattle	carpal		m				p		1
8.11	ABJ	17003	cattle	tooth UM2	r							
8.11	ABJ	17003	horse	tooth M2	l							
8.11	ABJ	17003	s/g	mandible	l	m				p		5
8.11	ABJ	17003	s/g	scapula	l	am				p		2
8.11	ABJ	17003	s/g	tooth UM2	r							
8.11	ABJ	17003	s/g	tooth UM2	r							
9	ABR	18002	cattle	metacarpal	l	a		y		g		12
9	ABR	18002	cattle	tooth M1								
9	ABU	18006	cattle	mandible	r	am				g		
9	ABU	18006	cattle	tooth UM1								
9	ABU	18006	l/ung	vertebra undiff.		a				g		4
9	ABU	18006	l/ung	vertebra undiff.		a						4
9	ABU	18006	s/g	radius	l	a				g		3
9	ABV	18007	cattle	metatarsal	r	am		y		f		12
9	ABV	18007	s/g	mandible	r	am				f		23
9	ABV	18007	s/g	humerus	r	m				f		6789
9	ABV	18007	s/g	acetabulum	r	a		y		g		9
9	ABV	18007	s/ung	vertebra undiff.		a				g		1
9	ABW	18006	cattle	radius	l	a		y		g		456
9	ABW	18006	cattle	astragalus		m	y			f		
9	ABW	18006	cattle	phalange 2						g		1
9	ABW	18006	cattle	calcaneum	r	am				f		2
9	ABW	18006	cattle	tooth p3								
9	ABW	18006	cattle	mandible	l	am				f		2
9	ABW	18006	l/ung	vertebra undiff.		am	y			g		234
9	ABW	18006	pig	tibia	r	am				f		7
9	ABW	18006	s/g	humerus	r	m				f		69
9	ABW	18006	s/g	tibia	r	a		y		p		4
9	ABW	18006	s/g	calcaneum	r	am				f		23
9	ABW	18006	s/g	mandible	l	a				f		45
9	ABW	18006	s/g	tooth M2								
9	ABX	18006	cattle	metacarpal	r	am		y		p		345
9	ABX	18006	cattle	mandible	l	am		y		g		45
9	ABX	18006	cattle	phalange 1		m				p		12
9	ABX	18006	cattle	ulna	l	a				f		3
9	ABX	18006	s/g	tibia	l	a				g		567
9	ABX	18006	s/ung	axis		m				p		
9	ACA	18006	cattle	metatarsal	l	a		y		g		345
9	ACA	18006	cattle	phalange 1						g		12

9	ACA	18006	cattle	phalange 1						g		12
9	ACA	18006	cattle	radius	r	am		y		g		1
9	ACA	18006	cattle	scapula	r	am		y		g		4
9	ACA	18006	s/g	metacarpal	r	am				g		15
9	ACA	18006	s/g	metacarpal	l	am	y			g		5
9	ACA	18006	s/g	metacarpal	r	am				g		5
9	ACA	18006	s/g	radius	r	a	y	y		g		15
9	ACA	18006	s/g	humerus	r	a				g		####
9	ACA	18006	s/g	tooth M2								
9	ACC	18006	cattle	calcaneum	l	a				f		12
9	ACC	18006	cattle	scapula	r	am		y		g		1234
9	ACC	18006	l/ung	vertebra cervical		a				g		234
9	ACC	18006	pig	mandible	r	am				g		
9	ACC	18006	pig	canine permanent							m	
9	ACC	18006	pig	femur	r	m				g		4
9	ACC	18006	s/g	tibia	r	am		y		g		567
9	ACC	18006	s/g	metatarsal	r	m				f		12
9	ACC	18006	s/g	radius	r	m				g		123
9	ACD	18006	cattle	mandible	r	am		y		f		5
9	ACD	18006	cattle	phalange 1						g		12
9	ACD	18006	pig	scapula	l	a	y			g		345
9	ACD	18006	pig	femur	r	a		y		g		3
9	ACD	18006	s/g	occiput	l					g		3579
9	ACD	18006	s/ung	vertebra undiff.		am				f		45
9	ACE	18006	cattle	humerus	l	a		y		g		6789
9	ACE	18006	l/ung	vertebra undiff.		m				f		145
9	ACE	18006	l/ung	vertebra undiff.		m				f		234
9	ACE	18006	s/g	metacarpal	r	m				f		12
9	ACE	18006	s/g	acetabulum	l	am		y		g		59
9	ACI	18006	cattle	mandible	r	am				p		
9	ACI	18006	cattle	ulna	r	m				g		123
9	ACI	18006	cattle	acetabulum	l	am				p		5
9	ACI	18006	horse	tooth incisor								
9	ACI	18006	pig	canine deciduous								
9	ACI	18006	pig	radius	r	a	y			g		3
9	ACI	18006	pig	tibia	l	m				f		4
9	ACI	18006	s/g	metacarpal	l	am				f		12
millgate		u/s	cattle	metacarpal	l	a		y		g		12
millgate		u/s	cattle	metatarsal	r	a		y		g		125
millgate		u/s	cattle	phalange 1						g		12
millgate		u/s	cattle	phalange 1		m				p		12
millgate		u/s	cattle	radius	l	am		y		p		12
millgate		u/s	cattle	humerus	l	a		y		g		78
millgate		u/s	cattle	femur	l	m				f		1
millgate		u/s	cattle	pubis	r	am		y		f		4
millgate		u/s	cattle	pubis	l	am				p		4
millgate		u/s	cattle	metapodial		m				p		34
millgate		u/s	cattle	tibia	l	m				f		6
millgate		u/s	cattle	carpal								
millgate		u/s	cattle	tibia	l	m				g		5

millgate		u/s	cattle	metacarpal	r	am				p		12
millgate		u/s	cattle	metapodial		m				f		3
millgate		u/s	s/g	mandible	r	am				g		45
TH11	AAL	11004	cattle	mandible	r	m				p		
TH11	AAL	11004	s/g	tooth UM2								
TH4	AAB	4003	cattle	femur	r	a		y		g		3
TH4	AAB	4003	s/g	humerus	l	am				p		69
TH8 2/3	AAC	8002	cattle	femur	r					g		1
TH8 2/3	AAC	8002	cattle	phalange 3						g		1
TH8 2/3	AAC	8002	cattle	occiput	l	a				g		2
TH8 2/3	AAC	8002	l/ung	rib								
TH8 2/3	AAC	8002	s/g	calcaneum	l					g		123
TH8 2/3	AAC	8002	s/g	tibia	l	a		y		g		4
TH8 2/3	AAC	8002	s/g	tooth UM2								
TH8 2/3	AAC	8002	s/g	ulna								
TH9	AAF	9002	cattle	phalange 1		a						2
TH9	AAH	9003	cattle	tibia	r					f		56
TH9	AAH	9003	cattle	acetabulum	l	a				f		5
TH9	AAH	9003	cattle	phalange 2						g		12
TH9	AAH	9003	s/g	maxilla	l	am				p		

Appendix 2: List of Anatomical Abbreviations

Skl	Skull (Sfrag=skull fragment)
Hc	Horn core
Inc	Premaxilla
Jaw	Mandible
Max	Maxilla
Ocip	Occipital
Par	Parietal
Temp	Temporal
Vc01	Atlas
Vc02	Axis
Vc	Cervical vertebra
Vt	Thoracic vertebra
Vl	Lumbar vertebra
Vsa	1st sacral vertebra
Vsb	Sacrum frag
Vx	Indet vertebra
Rib	Rib
Scap	Scapula
Hum	Humerus
Rad	Radius
Uln	Ulna
CarR	Radial carpal
CarI	Intermediate carpal
CarU	Ulnal carpal
Mc	Metacarpus
Oc	Pelvis
Acet	Acetabulum
Ilm	Ilium
Ish	Ischium
Pub	Pubis
Fem	Femur
Pat	Patella
Tib	Tibia
Fib	Fibula
Cal	Calcaneum
Ast	Astragalus
Cq	Centroquartal
Mal	Lateral malleolus
Mt	Metatarsus
Mp	Metapodial
Ph 1	1st phalanx
Ph 2	2nd phalanx
Ph 3	3rd phalanx

Teeth:

U	Maxillary
L	Mandibular
D	Deciduous
I	Incisor
C	Canine
P	Premolar(deciduous)
Pm	Premolar(permanent)
M	Molar

Appendix 3: List of all measurements

(measurement numbers refer to standardised specific elements and species, after von den Dreisch, 1976)

		Measurements							
Species	Element	1	2	3	5	6	7	8	10
cattle	hum				64.3				37.5
cattle	hum				98.4				
cattle	mc					59.9			
cattle	mc					63			
cattle	mc					63.5			
cattle	mc					66.2			
cattle	mc					73.8			
cattle	mc					77.7			
cattle	mc					78			
cattle	mc					78.1			
cattle	mc					81.8			
cattle	mc		44						
cattle	mc		50.5						
cattle	mc		55						
cattle	mc		55.1						
cattle	mc		59.8						
cattle	mc		62.3						
cattle	mc		64						
cattle	mc		69.9						
cattle	mc		70.4						
cattle	mc		72.1						
cattle	mc		73.6						
cattle	mc	211	60.8			62.1			
cattle	mt					48.9			
cattle	mt					51.6			
cattle	mt					52.6			
cattle	mt					54.8			
cattle	mt					56.4			
cattle	mt					60.9			
cattle	mt					62.2			
cattle	mt					70.1			
cattle	mt					75.3			
cattle	mt		42						
cattle	mt		49.7						
cattle	mt		52.3						
cattle	mt		52.5						
cattle	mt		53.6						
cattle	mt		53.8						
cattle	mt		54.3						
cattle	mt		55.7						
cattle	mt		56						
cattle	mt		56.6						
cattle	mt		56.8						
cattle	mt		57.4						
cattle	mt		58.1						
cattle	mt		59.9						
cattle	mt		60.3						
cattle	mt		60.6						

cattle	mt		60.8						
cattle	mt		61.9						
cattle	mt		62.6						
cattle	mt		64						
cattle	mt		67.8						
cattle	mt		68.3						
cattle	mt		69.9						
cattle	mt		71.5						
cattle	ph1	71.1							
cattle	ph1`	68							
cattle	rad		81						
cattle	scap				66.3	76.1			
cattle	tib						72	52.8	
cattle	tib						79.4	65.2	
dom fowl	tar	66.2							
horse	rad		80.4						
pig	rad		34.5						
pig	tib						30	26.6	
s/g	ast	35.2							
s/g	cal			55.9					
s/g	cal			61.1					
s/g	cal			61.7					
s/g	hum				28.1				17.8
s/g	mt		21.3						
s/g	mt	130				25.3			
s/g	rad		32						
s/g	rad		32.5						
s/g	rad		33.2						
s/g	rad		36.1						
s/g	tib						27.9	21.3	
s/g	tib						27.9	22.7	
s/g	tib						29.2	22.9	
s/g	tib						29.3	21.7	
s/g	tib						29.4	21.6	