AML File

1688

Ancient Monuments Laboratory
Report 222/87

CATTLE FOOT BONES EXCAVATED IN 1982 FROM A SEVENTEENTH/ EIGHTEENTH CENTURY PIT IN CHURCH STREET, DORCHESTER, DORSET.

Simon J M Davis

Ancient Monuments Laboratory Report 222/87

CATTLE FOOT BONES EXCAVATED IN 1982 FROM A SEVENTEENTH/ EIGHTEENTH CENTURY PIT IN CHURCH STREET, DORCHESTER, DORSET.

Simon J M Davis

Summary

A late seventeenth/ mid eighteenth century pit in Dorchester, Dorset, contained complete metapodials and phalanges from some 20 cattle- most were probably females or oxen. The assemblage is tentatively interpreted as the waste from a cow-hide tannery, in which the hides were transported with feet still attached.

Author's address :-

Department of Zoology
University College
Gower Street
London
WC1

CATTLE FOOT BONES FROM A LATE SEVENTEENTH/MID EIGHTEENTH CENTURY PIT IN CHURCH STREET, DORCHESTER, DORSET

INTRODUCTION

An unusual assemblage of bones, most belonging to adult cattle, has been entrusted to me for identification by Mr. N. Balaam. They were excavated by Mr. D. Batchelor from a seventeenth/eighteenth century pit in the rear yards of the tenement occupations of Church Street in the town of Dorchester. The bones are well preserved, and unlike most archaeofaunal remains, derive from a very restricted part of the anatomy: feet (figure 1), and had not been heavily butchered (*i.e.* cleaved or sawn). They do, however, exhibit cut marks probably made during skinning and separation of foot from leg. My aim was first to understand the human aspect of this collection of bones, and second, by taking a series of measurements compare them with those of other cattle (both ancient and modern), and attempt to determine the numbers of bulls, cows and oxen.

MATERIAL and METHODS

The contexts from which these bones are derived were not sieved. Therefore, different bones may have been subjected to a recovery bias, and counts should be treated with caution. For example, some of the smaller bones such as phalanges were probably missed during excavation.

Approximately one cubic metre of bones was recovered from contexts 363, 374, 70 and 796. Most of the bones are well preserved and identifiable. They were identified to species, left or right side of body, or side of limb (in the case of the phalanges). I examined each bone for knife marks, and noted their location. I was unable to separate fore from hind limb phalanges despite the criteria described by Dottrens (1946). This aspect of my study remains incomplete, and a re-examination of the phalanges might be worthwhile in the future. Measurements were taken with vernier callipers to the nearest 0.1 millimetre, or for lengths of long bones, with an osteometric board, to the nearest millimetre. 13 measurements were taken of each complete or near-complete metapodial in the manner shown in figure 2. These bones will be stored in the Dorset county museum, Dorchester.

BODY PARTS PRESENT

Tables 1a and 1b list most of the bones found in the Dorchester pit. (Several unidentifiable fragments, ribs, and broken shafts are not included in these tables.) Contexts 70, 363 and 374 which contain the cattle foot bones (as well as a few other butchered bones of cattle, sheep, and pig), are considered as a single assemblage. Context 796, however, contained a range of cattle, sheep, pig, horse and cat bones, most of which had been extensively butchered. This context did not include unbutchered cattle feet, and is therefore tabulated-separately.

In contexts 363, 374 and 70 there are 23 right and 22 left metacarpals, and 20 right and 23 left metatarsals. They must, therefore, have belonged to at least 23 individuals. Since there are two sets of phalanges per metapodial (the cow is an artiodactyl), the expected number of first (and second, and third) phalanges in the Dorchester pit is 184: half this number from the fore foot and half from the hind foot. But as table 1 shows, there are only 76 first phalanges, 34 second phalanges, and 32 third phalanges. In other words, there are less than one half the expected number of first phalanges. Where are the rest? As mentioned above, some were no doubt missed during excavation (there were very few sesamoids and carpals) and some may have been carried off in antiquity by scavenging dogs.

CUT MARKS AND DAMAGE

Cut marks. Most of the metapodials bear a small transverse knife mark on their shaft (diaphysis), one half, two thirds or three quarters down the shaft (*i.e.* most are in the mid-shaft region), which I interpret as a skinning cut. On 18 right and 12 left metacarpals the knife mark is on the anterior surface of the shaft. (Five of the other metacarpals have cut marks on the posterior surface.) On 12 right and 13 left metatarsals the knife mark is on the posterior surface of the shaft. (Three of the other metatarsals have cut marks on the anterior surface.) Clearly, metacarpals and metatarsals differ with respect to the location of the skinning cuts. If the small knife marks were made following complete excision of foot from leg, we should expect them to be distributed either on the same side, or randomly: the difference between metacarpals and metatarsals therefore suggests that these knife marks were made while the feet were still attached either to the rest of the leg and carcass, or to the complete cow-hide.

With no distal radii, astragali and calcanea, it is difficult to ascertain precisely where feet were cut from the rest of the leg. However, a number of the metapodials did exhibit small transverse cuts around their proximal ends, adjacent to the articular surface. And one of the few carpal bones recovered had several cuts on its external surface, *i.e.* in the region close to the proximal metacarpal articulation.

Damage. Most of the metatarsals, but only two metacarpals, had suffered slight damage on their distal articulations. This damage does not appear to have been caused by cutting or chopping of phalanges from metapodials. In some cases a wedge or flake of bone had been chipped from the condylar verticilli, and in others a wedge had been displaced from both condyles on both sides of the gap separating the condyles (see plate). This kind of damage could be caused by inserting a metal hook or pick into the joint, or between the two condyles.

Approximately half of the first phalanges are damaged: the edges of their proximal (*i.e.* metapodial) articulations are slightly abraded. Most of these same phalanges also had slightly damaged distal articulation (*i.e.* the phalanx 1-2 articulation). Of the second phalanges, at least 8 left and 5 right have similarly damaged proximal and distal articulations. A small proportion of the third phalanges show some signs of slight damage too.

Without damage on the inter-phalangeal joints, a possible explanation for the metatarsal-phalangeal joint damage would be that cattle carcasses had been hung by a hook inserted through this joint. This possibility was suggested to me by Dr. J. Clutton-Brock of the British Museum (Natural History). With abrasion occurring at the interphalangeal joints such an explanation is unsatisfactory. Moreover, the nature of the damage is not typical of the kind usually inflicted by the butcher, or by dogs gnawing (and why should dogs prefer metatarsals to metacarpals?). I am unable to provide a satisfactory explanation of this bizarre pattern of damage.

Cattle feet may be cooked to make cow-heel brawn, when they are usually cloven through by the butcher (Hartley, 1973). In the absence of heavy butchery on the Dorchester bones, it seems unlikely that they are kitchen refuse.

In a series of late seventeenth and early eighteenth century rectangular pits at Walmgate, York, O'Connor (1984) found that over 99 percent of the bones in the backfill derived from the lower legs and feet (most of the bones were metapodials and phalanges) of sheep. He suggests that these pits were leather tanning vats used for soaking sheepskins. The skins were probably brought in with the foot bones still attached to provide a convenient handle during stretching. After treatment these bones would then have been discarded.

Tanning was a widely distributed local industry. For example in late sixteenth century England most market towns had three, four or five dressers and workers of leather. Great towns often had as many as 20 (Waterer, 1956). According to Hutchins (1861-73) Dorchester, in 1630, had a Company of Shoemakers and Skinners, which included tanners, shoemakers, skinners, furriers, parchment-makers, and saddlers. Mr. D. Batchelor informs me that from the seventeenth century a tannery probably existed down on the Frome. Does the Dorchester assemblage represent waste from a tannery specialising in cow-hides? In the absence of any other satisfactory explanation, this is the one which I prefer, even though it fails to explain the strange pattern of damage on the bones.

Tanning cattle hides was once a long process which required as many as 15 or more months. However, tannage may be accelerated by continuous movement (Waterer, 1956). Perhaps damage on the phalanges resulted from movement of the skins held (or, as O'Connor has suggested to me, clamped) to some kind of machine via their foot bones.

Several bones had spots, 2-5 millimetres across, of brown encrustation on them. These could be rust, possibly from iron scrap buried in the pits.

MEASUREMENTS

Complete limb bones of ungulates are uncommon in archaeological sites. Metapodials, for example, are generally broken/butchered through their shafts. This assemblage from Dorchester is important in providing so many entire metapodials. I have taken 13 measurements on each complete metapodial, (see tables 2 and 3). They should serve as a useful point of reference for studies concerned with the evolution of the cow in post-medieval England. Since Shorthorn cattle were not introduced into Dorset until circa 1870 (Page, 1908), these Dorchester specimens may typify a traditional Dorset breed.

Figure 3 portrays the variation in size of some English and other cattle. The Dorchester cattle belonged to animals which were much larger than contemporary cattle from Prudhoe Castle in Northumberland, as well as cattle from earlier deposits in Exeter and Lincoln. The size of the Dorchester cattle more closely resembles the cattle measured by Armitage (1977) from the palace rubbish at Baynard's Castle in the city of London, dated to circa 1520 AD, and modern Red Danish cattle. Armitage suggests that the difference in size between cattle from the Palace and cattle from the city in sixteenth century London reflects class differences - larger animals carrying more flesh being consumed by the nobility, smaller animals being consumed by the common folk. This temporal and geographical size variation shown in figure 3 may reflect both the improvement of cattle in post-medieval England and the appearance of large breeds earlier in southern England than in the north.

The metapodials from Dorchester are comparable in size to the metapodials of the German Schwarzbunte breed of cattle measured by Fock (1966). He was unable to find a clear separation between cows, oxen, and bulls. While there is some "regionalisation" of the measurements in his graphs, there is considerable overlap. For the metacarpal he plotted the index distal width/length against length. His results show that most of the bulls have an index greater than 0.33 (as do the two Chillingham and two Chartley bulls I measured). There are only three metacarpals at Dorchester with a value as high as this (see figure 4). Many of the Schwarzbunte oxen metacarpals are longer than 225 mm, and there are few Dorchester metacarpals longer than 225 mm. Did the Dorchester metapodials all belong to cows? Comparison of a plot of two indices (minimum shaft width/length versus proximal width/length; figure 8) with a similar plot for Iron Age cattle from Bavaria, southern Germany, by Ekkenga (1984, her diagram 27) confuses the picture. She identifies metacarpals to the right of the dotted line as oxen or bulls, and metacarpals to the left as cows. While the problem of sexing the Dorchester cattle remains unsolved, it is worth pointing out that few of the Dorchester foot bones have exostoses caused by excessive strain, and so are less likely to be derived from retired work animals. For this reason a possibility (admittedly speculative) is that they all derive from retired milk-cows.

CONCLUSIONS and SUMMARY

The bones from contexts 70, 363, and 374 at Dorchester belonged to a breed of large cattle. Most were adult when slaughtered, and they may derive from cows, perhaps retired milk-cows. Most of the bones are metapodials and phalanges (*i.e.* foot bones).

Transverse cut marks on a carpal and near the proximal metapodial joint surface, suggest that the feet were probably removed at the knee and hock. Small incisions on the shafts of the metapodials are interpreted as skinning cuts. Most of these are on the anterior surface of the metacarpals, and posterior surface of the metatarsals which suggests that these cuts were made while the metapodials were still attached either to the rest of the leg and carcass, or to the complete cow-hide. The foot bones may have served subsequently as handles for transport of the hides to a tannery or even during tanning. These foot bones then, probably represent the waste from a cow-hide tannery and the pit was perhaps a rubbish pit. A strange pattern of damage on many of the distal metatarsals, but not metacarpals, as well as many of the phalanges is puzzling.

A thorough review of the literature concerned with the English leather industry might be worthwhile, as would a more thorough examination of the cattle phalanges from Dorchester. The latter should be undertaken when better comparative material is available.

REFERENCES

ARMITAGE, P.L. 1982 Studies on the remains of domestic livestock from Roman, medieval, and early modern London: objectives and methods. In Hall, A.R. and Kenward, H.K. (eds.), *Environmental archaeology in urban context.* pp. 94-106. London CBA Research Report 43.

DAVIS, S.J.M. 1987 *Prudhoe Castle, a report on the animal remains.* HBMC, Ancient Monuments Laboratory reports. 162/87.

DOTTRENS, E. 1946 La faune néolithique de la couche profonde de Saint-Aubin. I. Etude préliminaire: Les phalanges osseuses de *Bos Taurus domesticus. Revue Suisse de Zoologie* 53, 739-74.

DRIESCH, A. von den 1976 *Das Vermessen von Tierknochen aus vor- und fruhgeschichtlichen siedlungen.* Munich, Institut fur Palaoanatomie, Universitat Munchen.

EKKENGA, U. 1984 *Tierknochenfunde von der Heuneburg einem fruhkeltischen Herrensitz bei Hundersingen an der Donau (Grabungen 1966-1979). Die Rinder.* Munich University dissertation.

FOCK, J. 1966 *Metrische Untersuchungen an Metapodien einiger europaischer Rinderrassen.* Munich University, dissertation.

HARTLEY, D. 1973 *Food in England.* London, MacDonald.

HIGHAM, C. 1968 Size trends in prehistoric European domestic fauna, and the problem of local domestication. *Acta Zoologica Fennica* 120, 3-21.

HUTCHINS, J. 1861-73 *The history and antiquities of the county of Dorset* 3ed vol 2. London, Nichols.

MALTBY, M. 1979 *The animal bones from Exeter 1971-1975.* Exeter Archaeological reports (2). Sheffield, Department of Prehistory and Archaeology, University of Sheffield.

O'CONNOR, T.P. 1982 Animal bones from Flaxengate, Lincoln c. 870-1500. *The Archaeology of Lincoln* 18, (1). London, CBA.

O'CONNOR, T.P. 1984 Selected groups of bones from Skeldergate and Walmgate. *The archaeology of York 15/1: The animal bones.* Council for British Archaeology.

PAGE, W. (Ed.) 1908 *The Victoria history of the county of Dorset II.* London, Archibald Constable.

WATERER, J.W. 1956 Leather. In: Singer, C., Holmyard, E.J., Hall, A.R. and Williams, T.I. (eds.), *A history of technology.* pp. 147-87. Oxford, Clarendon press.

ACKNOWLEDGEMENTS

I have had useful discussions and correspondence with several colleagues, in particular Miranda Armour-Chelu, Juliet Clutton-Brock, John Cornish, Peter King, Cathy Macaulay, Beverley Meddens, and Terry O'Connor, concerning this strange collection of bones, and Sebastian and Rosemary Payne made many useful comments on an earlier version of the manuscript. I thank them and also Nicholas Balaam who asked me to undertake this study.

	CATTLE		SHEEP		PIG	
	L	R	L	R	L	R
post. Mandible/M_3	-	-	-	1	-	-
Scapula (glenoid)	-	-	2	-	1	-
dist. Humerus	-	-	-	3	1	-
dist. Radius	-	-	-	-	-	-
prox. Metacarpal	-	-	-	-		
Metacarpal shaft	5	3	-	-		
dist. Metacarpal	-	2	-	-		
complete Metacarpal	17	20	-	-		
Ischium	-	1	-	2	-	1
dist. Femur	1	-	1	1	-	-
dist. Tibia	-	-	2	-	-	-
Calcaneum	2	-	-	-	1	-
Astragalus	-	-	-	-	1	-
prox. Metatarsal	4	1	-	-		
dist. Metatarsal	-	1	-	-		
complete Metatarsal	19	19	-	-		
dist. Metapodial	2		-		1	
first Phalanx	41	35	-	-	-	-
second Phalanx	17	17	-	-	-	-
third Phalanx	14	18	-	-	-	-

Other species: Cat mandible, ?rabbit humerus

Table 1a

Bone counts in contexts 363, 374 and 70 at Dorchester.

	CATTLE		SHEEP		PIG	
	L	R	L	R	L	R
post. Mandible/M_3	-	-	-	1	1	1
Scapula (glenoid)	1	1	-	-	-	-
dist. Humerus	-	2	2	-	-	-
dist. Radius	1	-	1	-	-	-
prox. Metacarpal	-	-	-	-		
Metacarpal shaft	-	-	-	-		
dist. Metacarpal	2	1	-	-		
complete Metacarpal	1	-	-	-		
Ischium	-	-	-	-	-	-
dist. Femur	2	-	-	1	-	-
dist. Tibia	-	-	-	-	-	-
Calcaneum	-	1	-	-	-	-
Astragalus	-	-	-	-	-	-
prox. Metatarsal	-	-	-	-		
dist. Metatarsal	-	-	-	-		
complete Metatarsal	-	-	1			
dist. Metapodial	1		-		-	
first Phalanx	-	1	-	-	-	-
second Phalanx	-	-	-	-	-	-
third Phalanx	-	-	-	-	-	-

Other species: horse distal metapodial.
cat humerus frag.

Table 1b

Bone counts in context 796 at Dorchester.

NUM	CON	a (GL)	b (Bp)	c (BFp)	d (TFp)	e (KD)	f (TD)	g (Bd)	h (BFd)	i (Td)	j	k	l	m
1	374	241	75.1	73.2	40.4	41.5	25.6	69.1	77.0	39.7	37.8	30.0	36.4	28.1
2	70	230	69.9	67.9	38.0	41.1	28.1	68.4	71.1	37.5	33.7	28.4	33.4	26.7
3	70	229	-	-	40.2	44.6	26.1	69.4	75.4	-	36.1	29.5	36.4	27.7
4	70	229	72.1	72.1	-	41.3	25.8	68.4	72.6	37.9	36.2	29.6	33.3	27.9
5	363	225	66.4	66.3	37.9	41.4	25.9	65.9	71.4	37.9	33.2	28.9	24.8	26.8
6	363	223	63.6	62.3	34.9	36.3	25.3	60.2	(63.5)	33.8	-	26.2	30.9	24.7
7	70	216	69.0	68.2	37.7	37.6	25.4	63.3	69.6	38.1	33.7	29.5	32.9	27.9
8	70	215	60.3	57.4	33.0	34.6	24.0	58.6	60.1	32.6	28.0	25.9	27.8	24.3
9	363	216	59.8	58.6	32.5	34.0	24.0	58.6	61.3	33.5	29.1	25.2	28.3	23.7
10	363	209	66.1	64.2	34.5	36.0	22.9	61.3	(66.3)	34.3	32.4	26.5	30.7	24.6
11	363	203	64.2	62.8	35.4	39.9	24.1	58.7	63.9	34.9	31.2	25.9	29.8	24.1
12	363	205	56.6	56.2	31.7	31.6	21.0	55.3	57.1	31.7	27.0	23.6	26.8	21.8
13	70	211	58.7	57.3	-	33.4	22.0	54.0	57.7	32.2	27.3	24.1	27.1	22.8
14	363	208	61.6	58.9	33.3	34.0	24.4	55.9	59.6	35.0	28.7	26.5	27.7	25.3
15	363	207	55.0	53.8	30.3	32.0	21.3	56.5	57.7	(31.8)	27.4	24.1	26.8	22.2
16	363	204	54.2	52.9	31.5	32.0	22.8	52.8	58.0	32.3	28.0	24.5	27.8	23.3
17	363	210	59.5	56.9	33.1	35.5	23.6	58.5	63.1	33.5	30.4	24.7	29.5	23.1
18	363	208	57.8	55.4	33.1	33.2	22.4	57.4	60.0	33.6	28.6	25.1	28.5	23.3
19	70	190	52.5	51.6	29.7	30.1	21.0	50.5	56.0	(30.0)	26.2	22.2	26.1	21.5
20	363	221	66.2	64.0	36.7	39.8	24.5	65.6	69.1	35.1	33.8	27.4	32.8	25.6
L1	70	230	68.7	66.9	39.3	43.3	26.8	69.5	76.7	39.2	37.2	30.5	37.6	27.8
L2	70	(226)	67.6	64.5	37.3	38.6	24.9	64.1	68.4	35.8	31.6	28.9	32.4	27.6
L3	363	225	62.2	61.7	35.6	35.6	23.8	58.2	62.4	35.4	29.6	26.8	28.6	25.5
L4	363	217	59.8	58.2	33.3	34.5	22.9	56.7	61.6	34.0	29.6	24.8	29.2	23.3
L5	70	216	60.3	58.8	32.7	33.9	24.7	59.3	62.7	33.7	29.3	25.2	28.9	24.1
L6	363	208	65.2	62.8	35.1	39.1	25.7	64.2	71.1	34.4	33.6	27.0	34.5	25.7
L7	70	205	61.4	58.8	32.2	(36.5)	24.3	58.2	61.3	33.7	29.4	25.3	28.9	23.4
L8	374	204	59.4	58.1	33.7	37.2	24.2	62.8	68.1	36.3	32.3	28.9	32.8	26.5
L9	363	208	58.4	56.9	32.4	36.2	24.2	56.9	61.6	34.1	29.4	24.5	28.7	23.3
L10	363	201	59.6	57.6	33.9	35.0	22.6	60.0	64.5	32.8	31.5	25.4	30.4	23.9
L11	363	210	56.2	53.7	31.3	30.4	21.6	52.2	57.6	31.4	27.7	23.1	26.9	21.5
L12	363	206	56.1	53.8	28.5	32.0	21.4	54.0	57.3	32.2	26.7	23.0	26.8	21.3
L13	363	208	56.4	55.2	30.3	32.5	23.0	54.7	58.6	31.2	27.3	22.9	28.8	22.1
L14	363	210	61.6	59.4	31.9	33.2	24.2	57.7	60.6	(32)	29.1	24.9	28.0	23.5
L15	363	211	62.1	61.5	34.3	36.1	24.4	60.2	62.7	35.7	30.6	26.4	29.8	24.6
L16	363	211	61.6	58.2	31.7	32.3	22.3	56.2	58.8	33.2	28.2	25.6	27.2	24.3
L17	70	202	-	-	30.8	32.9	21.3	53.2	56.0	30.8	26.5	24.1	26.0	22.9

Table 2. Dorchester pit. Measurements of cattle metacarpals in millimetres The columns are as follows: NUM = metacarpal number assigned by me (1-20 a from the right side of the animal, and numbers L1-L17 are from the left side), CON = context number, a = length (GL), b = external proximal width (Bp), c = proximal width across the articular surface (BFp), d = proximal depth across the articular surface (TFp), e = minimum shaft width (KD), f= minimum shaft depth (TD), g = distal width across the junction between diaphysis and epiphysis (Bd), h = distal width across the condyles (BFd), i = distal depth across the condylar verticilli (Td), j = width of the internal (medial) condyle, k = depth of the internal (medial) trochlea, l= width of the external (lateral) condyle, m = depth of the external (latera trochlea.

Dorset

NUM	CON	a (GL)	b (Bp)	c (BFp)	d (TFp)	e (KD)	f (TD)	g (Bd)	h (BFd)	i (Td)	j	k	l	m
1	374	280	57.6	51.3	51.8	33.8	30.9	64.6	70.5	39.4	33.0	28.6	33.9	27.2
2	70	260	57.1	53.5	51.5	32.3	28.6	62.5	64.0	36.9	30.3	27.1	30.2	25.6
3	363	253	-	50.6	-	30.1	29.3	58.8	57.6	34.6	27.3	25.6	26.6	24.2
4	374	246	59.4	56.7	51.1	35.6	31.7	63.1	67.4	36.6	32.1	27.0	30.8	26.2
5	363	247	50.4	47.7	46.7	28.8	28.0	56.5	56.7	34.2	26.5	24.2	26.6	23.6
6	363	246	52.7	48.8	46.0	27.7	26.8	52.0	55.5	34.6	26.7	26.1	25.6	24.5
7	363	240	47.7	46.1	42.7	29.4	26.0	53.8	54.4	32.4	26.0	24.1	25.0	22.6
8	363	240	48.3	46.9	45.4	27.6	25.8	56.0	56.9	32.6	26.3	24.3	27.1	22.9
9	363	231	48.1	44.7	46.1	28.5	25.7	52.7	55.1	32.9	25.8	24.0	25.0	22.8
10	363	230	51.5	49.2	-	28.8	25.8	54.8	58.5	32.7	28.5	24.7	27.1	23.3
11	363	221	(52.7)	47.1	45.2	25.6	26.1	54.4	(61.1)	33.1	32.0	24.7	27.3	22.6
12	363	232	47.2	44.9	44.1	27.5	25.6	52.1	52.2	31.3	24.8	23.6	23.5	22.2
13	363	238	47.7	45.7	42.9	27.1	24.6	51.6	(52.0)	(30)	24.2	23.2	23.7	21.9
14	363	227	48.8	45.9	-	25.0	24.8	50.5	52.8	31.8	25.5	24.0	24.7	22.9
15	70	221	45.4	42.8	-	23.9	23.9	46.3	51.1	30.8	24.6	22.1	23.6	20.4
16	363	222	49.7	47.1	43.5	25.2	25.1	50.7	52.1	30.7	24.6	22.2	24.4	21.7
17	363	222	44.6	43.6	41.8	23.5	23.5	47.3	50.0	29.2	24.0	21.3	23.1	19.8
18	70	239	49.8	48.7	46.5	27.9	25.7	55.7	-	-	-	-	23.5	23.3
19	363	240	57.1	57.1	51.0	30.4	28.4	62.2	63.0	37.3	29.1	28.2	29.0	27.1
L1	363	269	58.7	53.8	52.0	35.3	31.6	64.6	66.6	37.6	31.0	27.9	30.7	26.6
L2	374	266	-	-	-	-	30.4	62.4	64.3	-	30.7	27.3	29.9	26.2
L3	363	260	52.6	50.2	48.3	27.4	27.4	56.3	60.5	36.8	29.6	26.9	27.4	25.3
L4	70	258	57.9	55.1	-	33.9	28.8	64.4	62.7	36.4	29.4	27.3	29.6	26.5
L5	363	251	51.8	49.2	45.6	30.0	28.9	57.9	60.0	34.5	28.4	24.5	27.2	23.5
L6	374	245	-	(52.6)	50.1	35.7	31.5	62.6	67.0	36.6	31.9	27.2	30.5	25.9
L7	363	245	52.0	50.9	48.5	30.9	(28.5)	58.7	59.6	35.7	28.6	26.4	27.8	25.1
L8	363	247	50.9	48.7	45.9	27.6	25.5	54.3	57.2	34.0	26.3	25.6	26.6	24.7
L9	363	244	48.5	45.5	44.1	27.1	25.6	51.6	(54.8)	32.3	(26.4)	24.2	24.8	23.0
L10	363	242	50.9	48.0	46.0	29.2	26.7	56.1	57.9	32.2	27.8	25.2	26.6	23.2
L11	363	242	47.8	45.1	43.2	28.9	26.0	55.0	54.8	32.5	-	23.8	(25.0)	22.9
L12	70	240	-	53.3	-	(31.6)	30.2	(60.3)	-	36.5	-	27.0	28.4	25.4
L13	363	237	48.0	45.4	43.9	28.5	26.3	54.1	55.0	32.2	(25.6)	23.7	25.1	23.1
L14	363	237	49.7	46.6	46.0	26.1	25.2	51.0	54.4	32.5	25.9	24.1	24.8	23.0
L15	363	236	46.6	44.6	44.1	26.8	25.9	54.1	54.7	31.0	(25.8)	23.5	25.6	22.7
L16	363	235	46.3	43.3	(41.7)	26.5	23.9	49.4	51.9	30.5	24.7	22.5	(23.4)	21.3
L17	363	234	48.0	45.5	42.6	26.7	25.7	50.3	53.6	32.0	25.8	24.0	23.9	21.8
L18	363	232	52.5	49.1	46.2	30.6	28.7	56.8	57.6	31.7	27.7	23.8	26.7	23.1
L19	70	223	50.6	45.7	43.0	28.0	24.6	53.0	53.5	31.6	25.5	23.6	24.1	22.6

Table 3. Dorchester pit. Measurements of cattle metatarsals in millimetres. The columns are as follows: NUM = metatarsal number assigned by me (1-19 ar from the right side of the animal, and numbers L1-L19 are from the left side), CON = context number, a = length (GL), b = external proximal width (Bp), c = proximal width across the articular surface (BFp), d = proximal depth across the articular surface (TFp), e = minimum shaft width (KD), f = minimum shaft depth (TD), g = distal width across the junction between diaphysis and epiphysis (Bd), h = distal width across the condyles (BFd), i = distal depth across the condylar verticilli (Td), j = width of the internal (medial) condyle, k = depth of the internal (medial) trochlea, l = width of the external (lateral) condyle, m = depth of the external (lateral) trochlea.

LEGENDS TO FIGURES

Figure 1 Sketch of a cow's skeleton. The unbutchered bones present in contexts 363, 374, and 70 are shown in black.

Figure 2 Sketch of a left cattle metacarpal from Dorchester in (I) anterior (II) lateral (III) proximal and (IV) distal view, and (V) a proximal view of a left cattle metatarsal, to illustrate how measurements were taken.

Key (measurements according to von den Driesch, 1976 are in parentheses)

a: length (GL)
b: external proximal width (Bp)
c: width across the proximal articular surface (BFp)
d: depth across the proximal articular surface approximately perpendicular to "b" (TFp)
e: minimum shaft width (KD)
f: minimum shaft depth (TD)
g: distal width across the junction between diaphysis and epiphysis (Bd)
h: distal width across the condyles (BFd)
i: distal depth across the condylar verticilli (Td)
j: width of the internal (medial) condyle - measured across the mid-point
k: depth of the internal (medial) trochlea
l: width of the external (lateral) condyle - measured across the mid-point
m: depth of the external (lateral) trochlea

Figure 3 Size variation of some samples of cattle metacarpals. Plots of distal widths (across the condyles) in millimetres of the Dorchester specimens (right side only) and:

Prudhoe Castle, Northumberland, phases 9-11, mid sixteenth century AD onwards (Davis, 1987)
Exeter 1200-1500 AD (Maltby, 1979)
Lincoln 1060-1100 AD (O'Connor, 1982)
Baynard's Castle, city of London: city rubbish c. 1500 AD, palace rubbish c. 1520 AD (cross hatched; Armitage, 1977)
Modern Red Danish females (mean value, n = 28), male (one individual; Higham, 1968)
Modern Swiss females (mean value, n = 13), male (mean, n = 2; Higham, 1968).

Figures 4-8 Dorchester cattle metacarpals. Bivariate scatter diagrams of various measurements in millimetres.
Key:
"a" Dorchester specimens, right side
"A" " " left "
"e" modern Chillingham males
"g" " " females
"i" " Chartley males.

Dorchester cattle had longer metacarpals than modern Chillinghams and Chartleys.

Figure 4 Plot of the index "distal width across the condyles/length" (BFd/GL) against length (GL).

Figure 5 Plot of the index "shaft robustness" (KD/GL) against the index "proximal robustness" (Bp/GL). The dotted line demarcates between oxen-bulls and cows (the latter being on the bottom left hand side) in Ekkenga's (1984) sample of Iron Age cattle from Heuneburg castle (Bavaria) on the Danube.

Figure 6 Plot of length (GL) against minimum shaft width (TD).

Figure 7 Plot of distal width across the condyles (BFd) against distal depth across the condylar verticilli (Td).

Figure 8 Plot of width of the internal condyle against depth of the internal trochlea.

Plate Distal views of two cattle metatarsals to show the damage inflicted in antiquity upon the condyles.

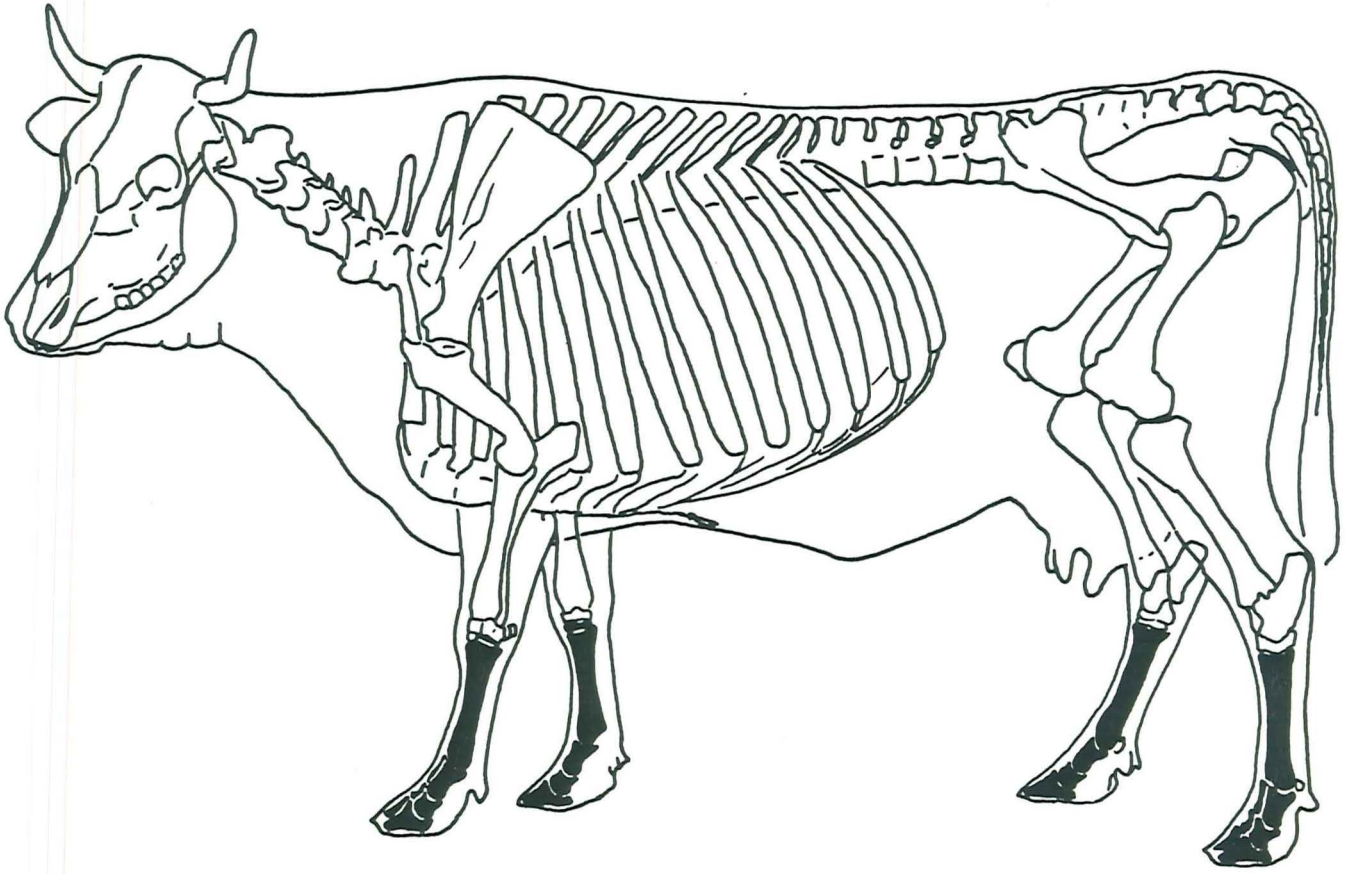


Figure 1 Sketch of a cow's skeleton. The unbutchered bones present in contexts 363, 374, and 70 are shown in black.

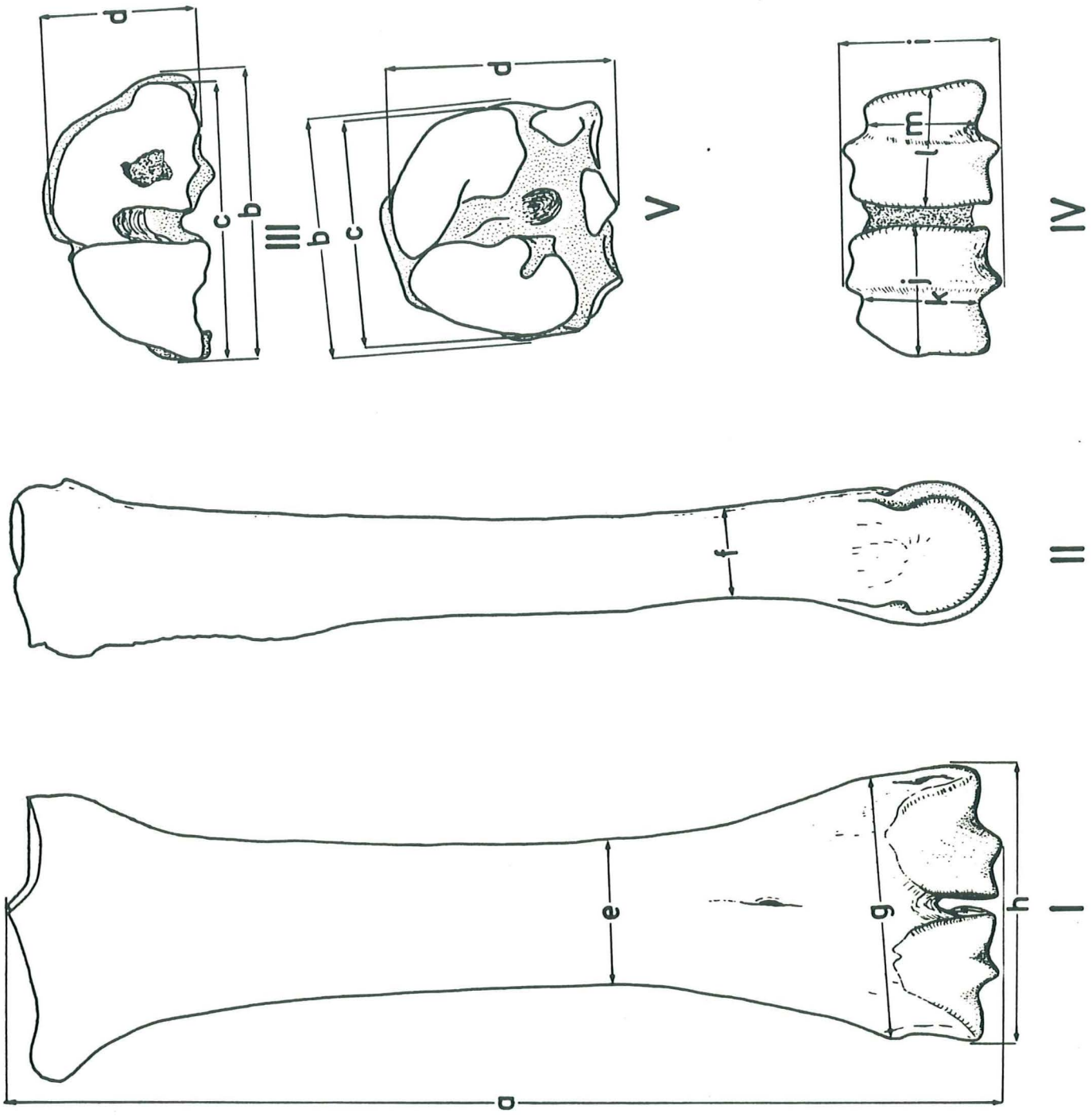


Figure 2 Sketch of a left cattle metacarpal from Dorchester in (I) anterior (II) lateral (III) proximal and (IV) distal view, and (V) a proximal view of a left cattle metatarsal, to illustrate how measurements were taken.

Key (measurements according to von den Driesch, 1976 are in parentheses)

a: length (GL)
b: external proximal width (Bp)
c: width across the proximal articular surface (BFp)
d: depth across the proximal articular surface approximately perpendicular to "b" (TFp)
e: minimum shaft width (KD)
f: minimum shaft depth (TD)
g: distal width across the junction between diaphysis and epiphysis (Bd)
h: distal width across the condyles (BFd)
i: distal depth across the condylar verticilli (Td)
j: width of the internal (medial) condyle - measured across the mid-point
k: depth of the internal (medial) trochlea
l: width of the external (lateral) condyle - measured across the mid-point
m: depth of the external (lateral) trochlea

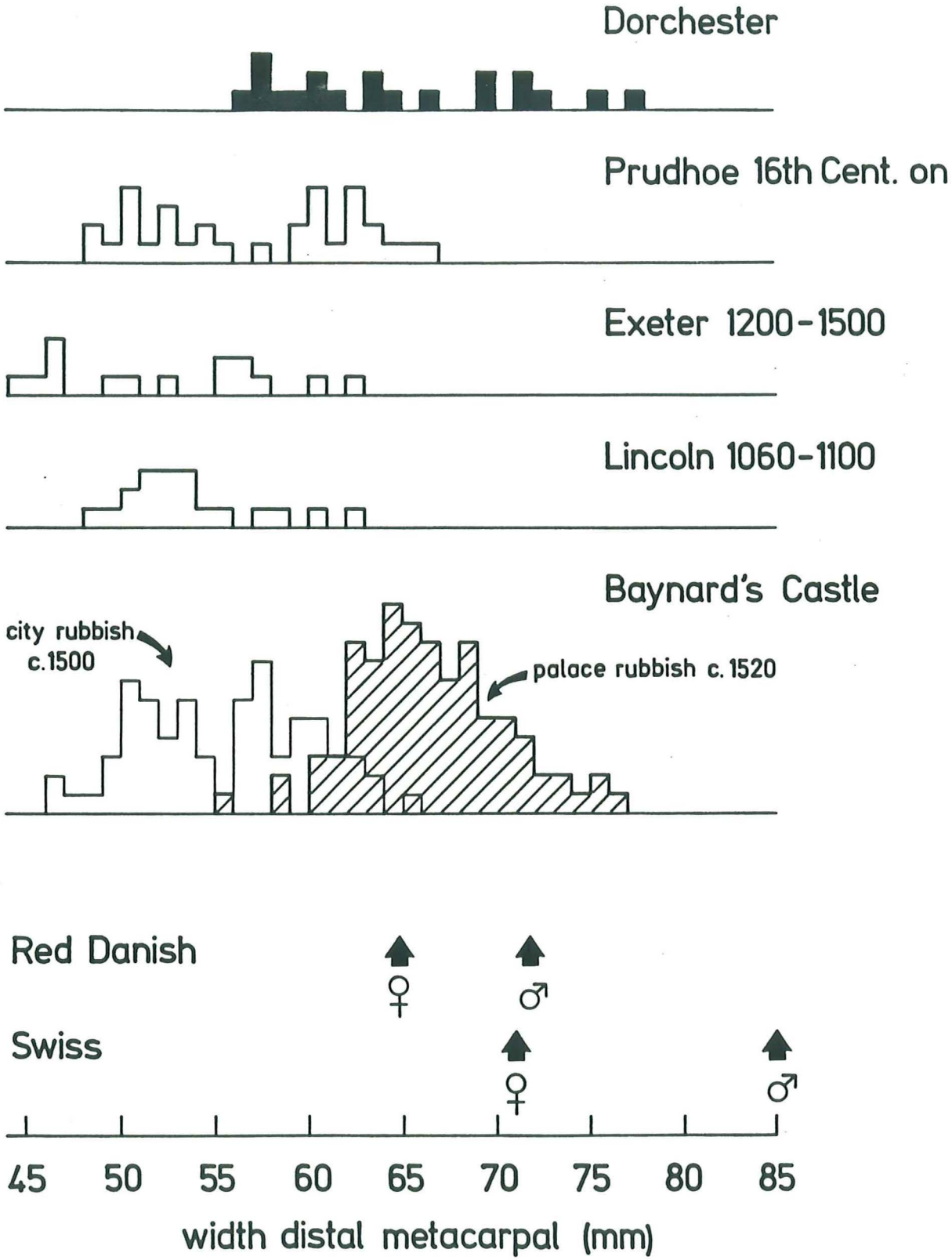


Figure 3 Size variation of some samples of cattle metacarpals. Plots of distal widths (across the condyles) in millimetres of the Dorchester specimens (right side only) and:

Prudhoe Castle, Northumberland, phases 9-11, mid sixteenth century AD onwards (Davis, 1987)

Exeter 1200-1500 AD (Maltby, 1979)

Lincoln 1060-1100 AD (O'Connor, 1982)

Baynard's Castle, city of London: city rubbish c. 1500 AD, palace rubbish c. 1520 AD (cross hatched; Armitage, 1977)

Modern Red Danish females (mean value, n = 28), male (one individual; Higham, 1968)

Modern Swiss females (mean value, n = 13), male (mean, n = 2; Higham, 1968).

Figures 4-8 Dorchester cattle metacarpals. Bivariate scatter diagrams of various measurements in millimetres.
Key:
"a" Dorchester specimens, right side
"A" " " left "
"e" modern Chillingham males
"g" " " females
"i" " Chartley males.

Dorchester cattle had longer metacarpals than modern Chillinghams and Chartleys.

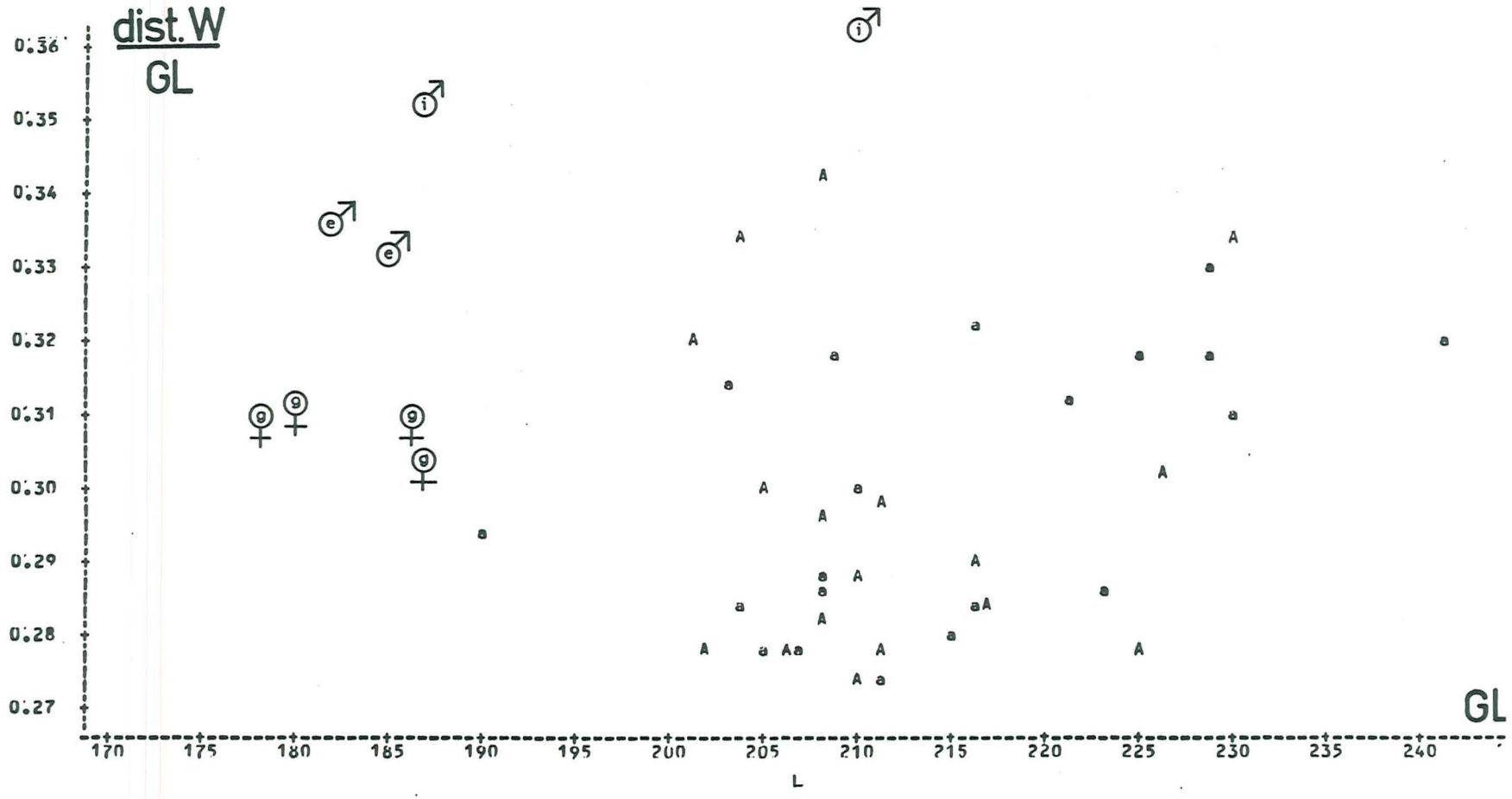
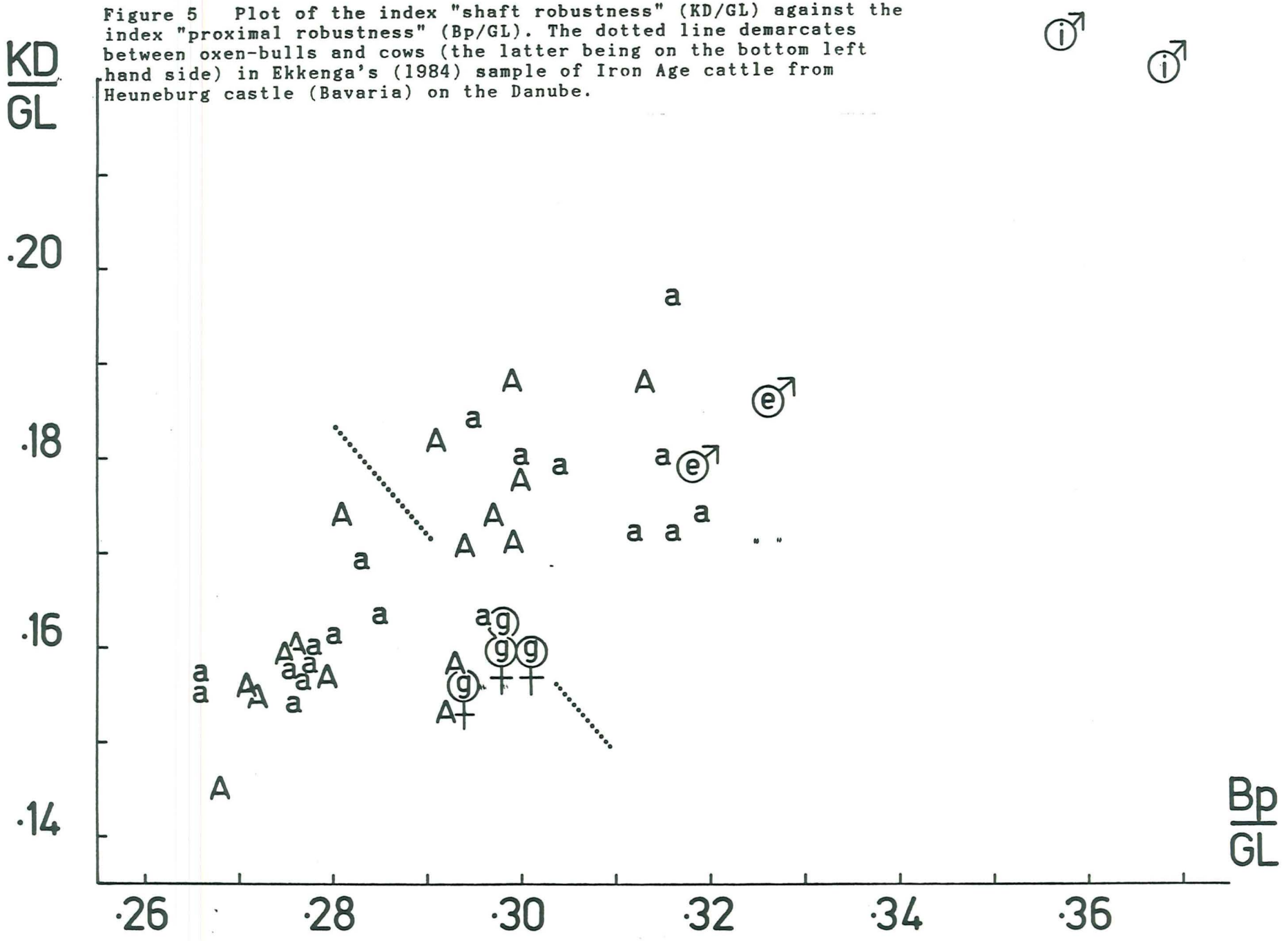


Figure 4 Plot of the index "distal width across the condyles/length" (BFd/GL) against length (GL).

Figure 5 Plot of the index "shaft robustness" (KD/GL) against the index "proximal robustness" (Bp/GL). The dotted line demarcates between oxen-bulls and cows (the latter being on the bottom left hand side) in Ekkenga's (1984) sample of Iron Age cattle from Heuneburg castle (Bavaria) on the Danube.



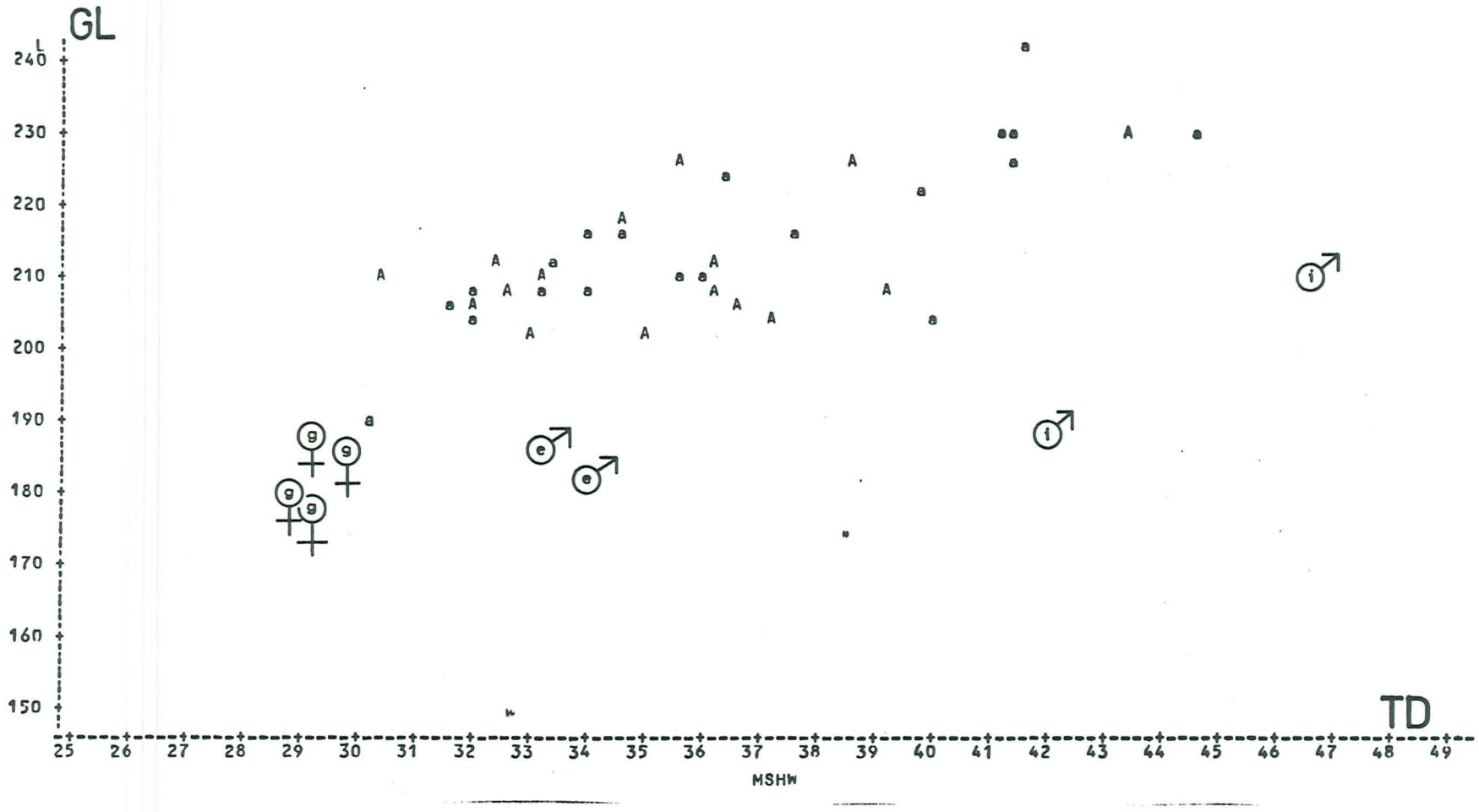


Figure 6 Plot of length (GL) against minimum shaft width (TD).

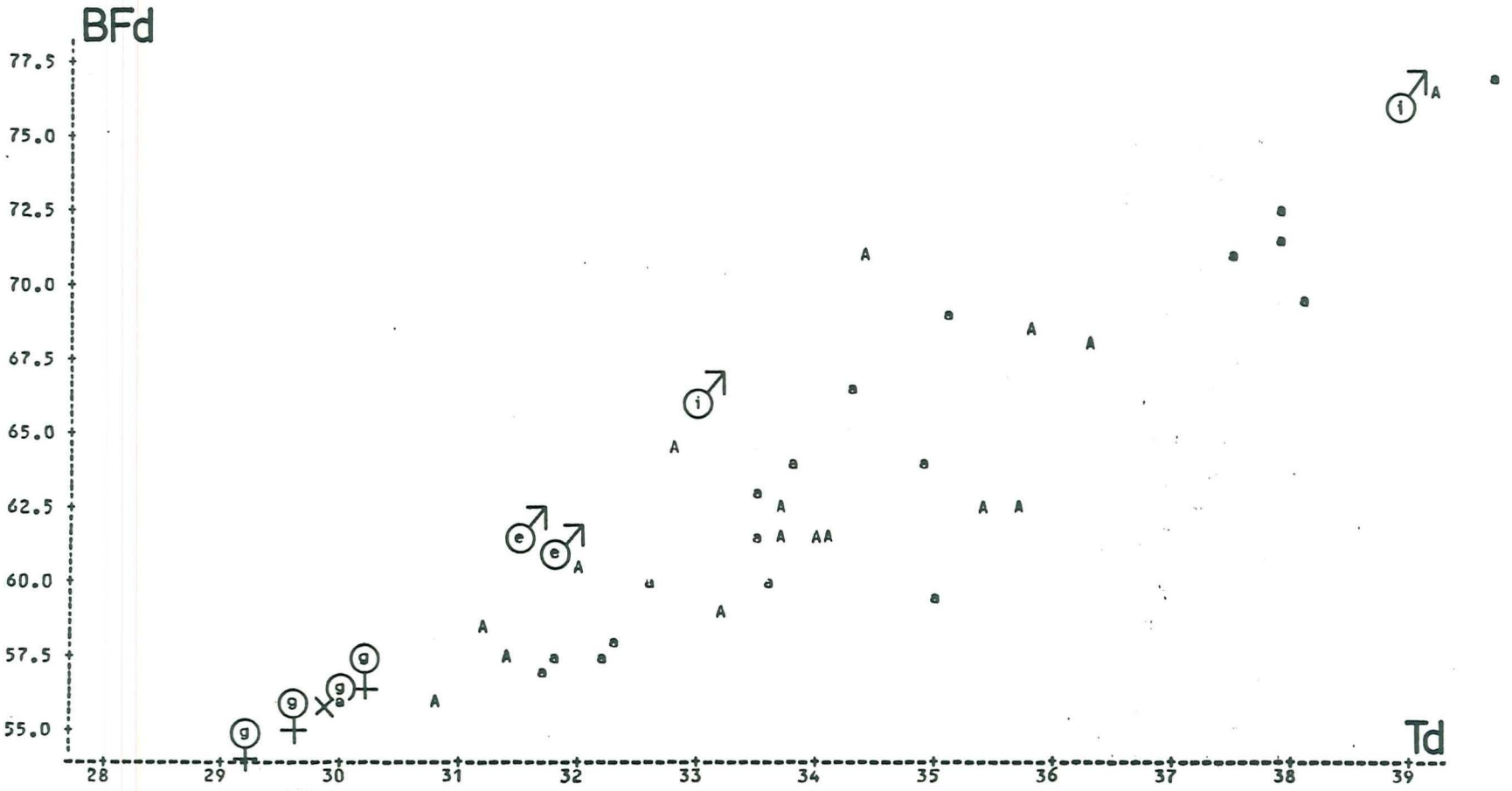


Figure 7 Plot of distal width across the condyles (BFd) against distal depth across the condylar verticilli (Td).

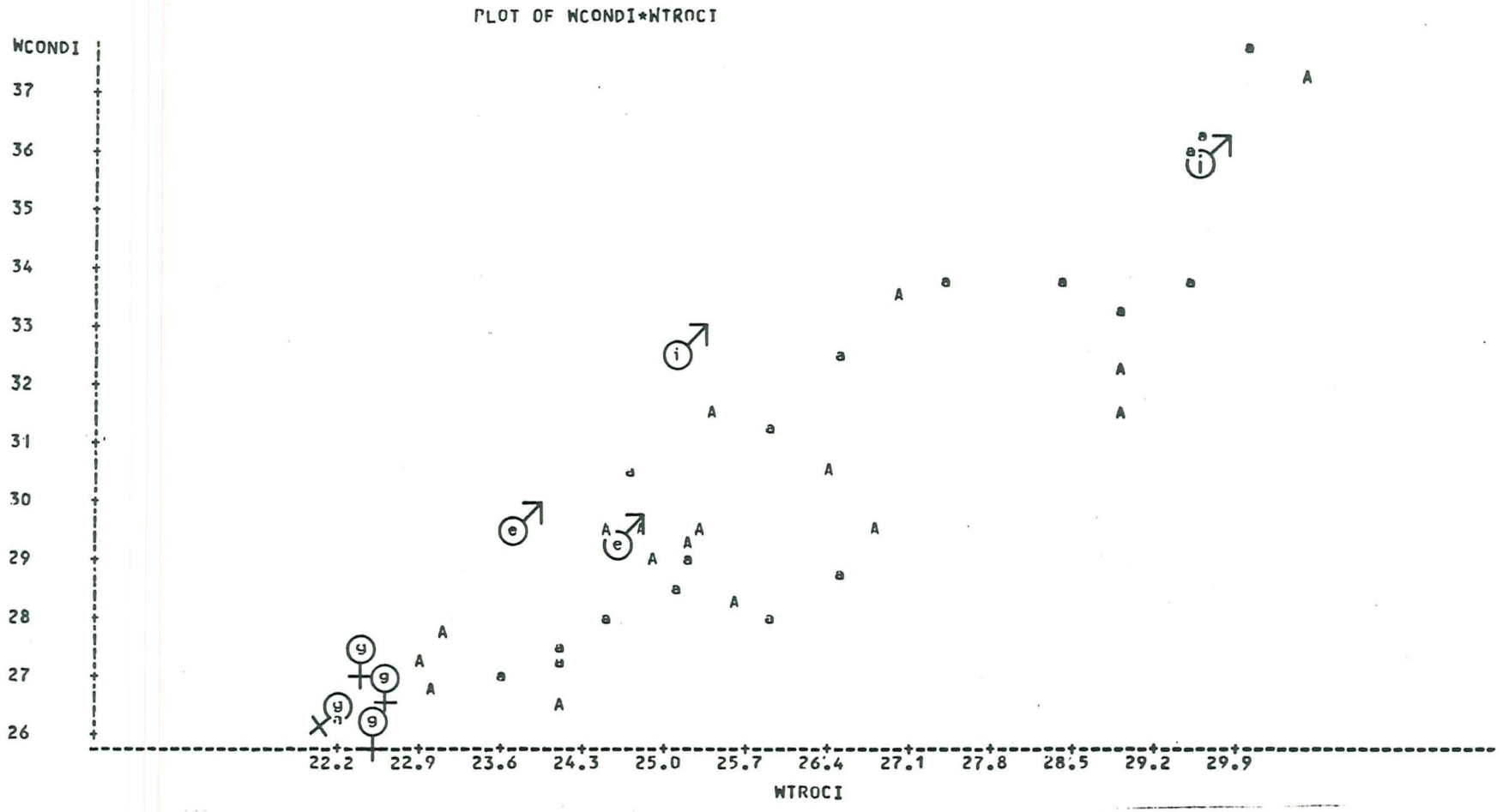


Figure 8 Plot of width of the internal condyle against depth of the internal trochlea.

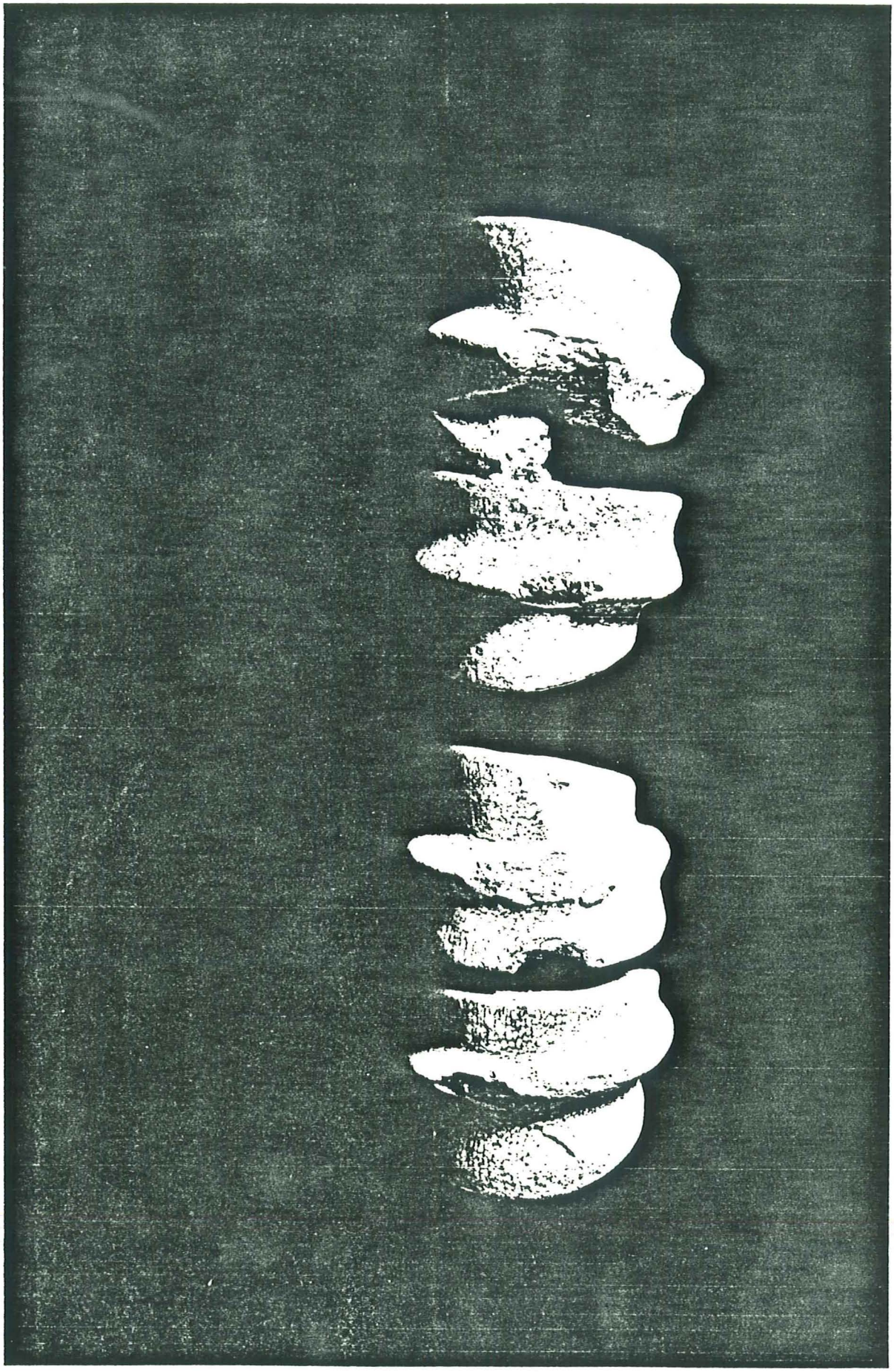


Plate Distal views of two cattle metatarsals to show the damage