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Paul Robert George Stokes

The Roman Fort at South Shields (Arbeia)
A Study in the Spatial Patterning of the Faunal
Remains

Thesis submitted for the Degree
of
Master of Arts
March 1996

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Vol. 2



09 MAY 1997

Paul Robert George Stokes

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This project was designed to interpret the patterning found in the spatial distribution of the deposition of faunal debris at South Shields Roman fort. The results were compared with those of Halstead *et. al.* (1978) and Halstead and Hodder (1982), as they were the only similar studies for a Roman site. They suggested that the spatial patterning of bone waste could be linked to discard after specific activities such as slaughter and butchery, the preparation of food and the consumption of food. An attempt was made to locate these areas in which these specific activities took place within the fort at South Shields.

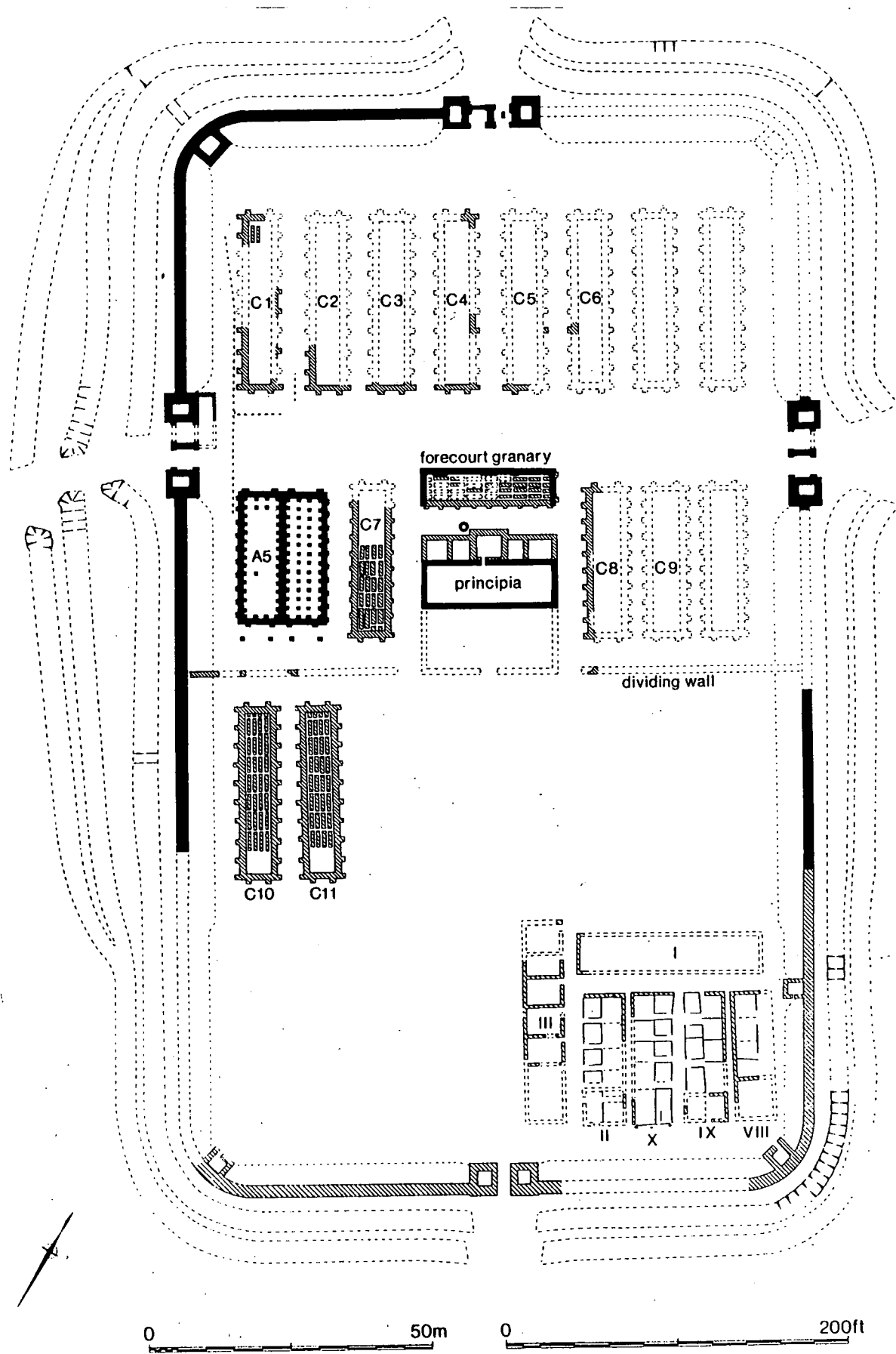
To achieve this aim it was felt necessary look at the evidence for animal husbandry practices and, in particular, to check for chronological variation in the size and conformation of the sheep and cattle. Also to ascertain if there were any changes in the representation of the three main domestic species (cattle, sheep/goat and pig) through time from *c* AD 205 to AD 369. As well examine the evidence for butchery practices, predominantly the dismemberment of cattle, to see whether or not there were any chronological and/or cultural changes.

The Roman Fort at South Shields (Arbeia) A Study in the Spatial Patterning of the Faunal Remains

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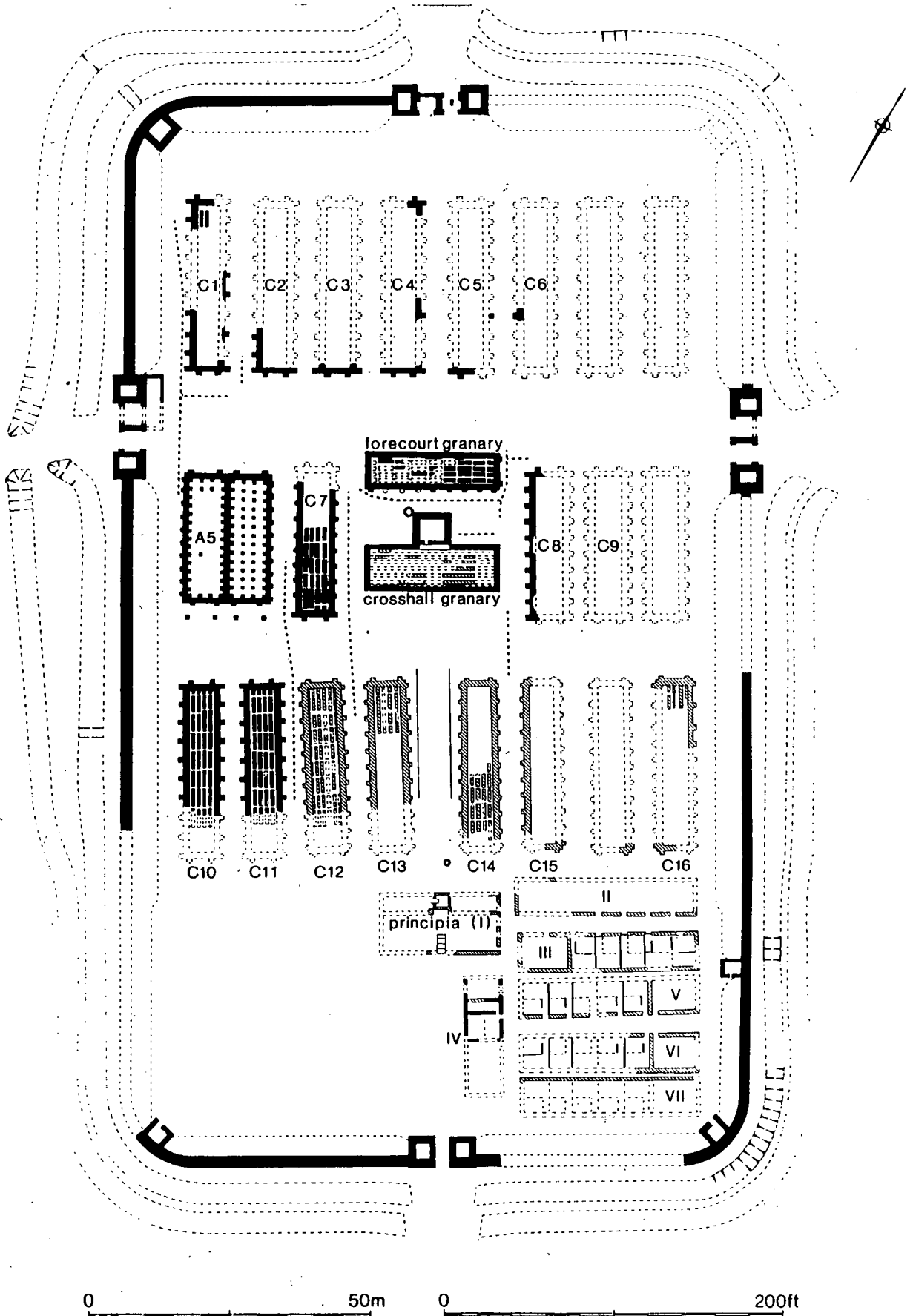
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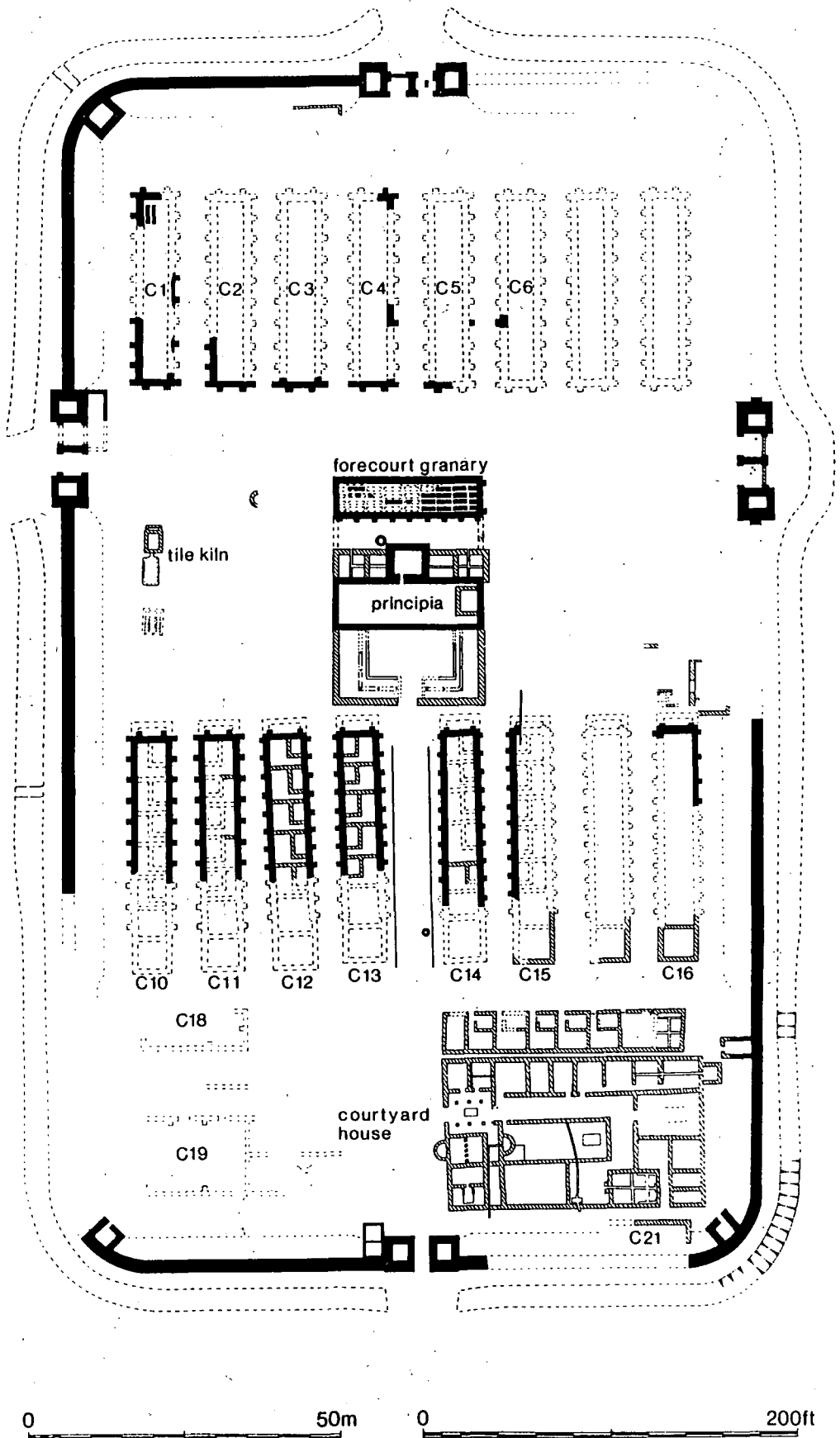
plan 1. The supply base of Period 5 (c205-7 to 222-35) Walls retained from Period 4 in black; walls of Period 5 construction with diagonal lines.
(after Bidwell and Speak, 1994)

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plan 2. The supply base of Period 6 (222-35 to late third or early fourth century) Walls retained from earlier periods in black; walls of Period 6 construction with diagonal lines. (after Bidwell and Speak, 1994)

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plan 3. The fort of Period 7 (late third or early fourth century) Walls retained from earlier periods in black; walls of Period 7 construction with diagonal lines. (after Bidwell and Speak, 1994)

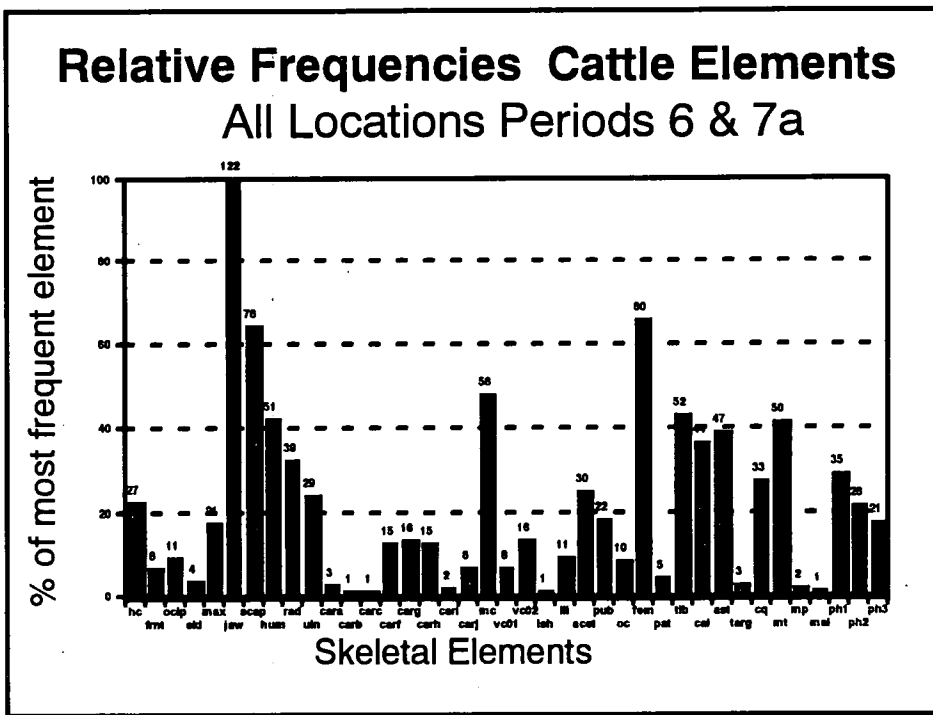


figure 1 Relative frequencies of cattle skeletal elements for all locations

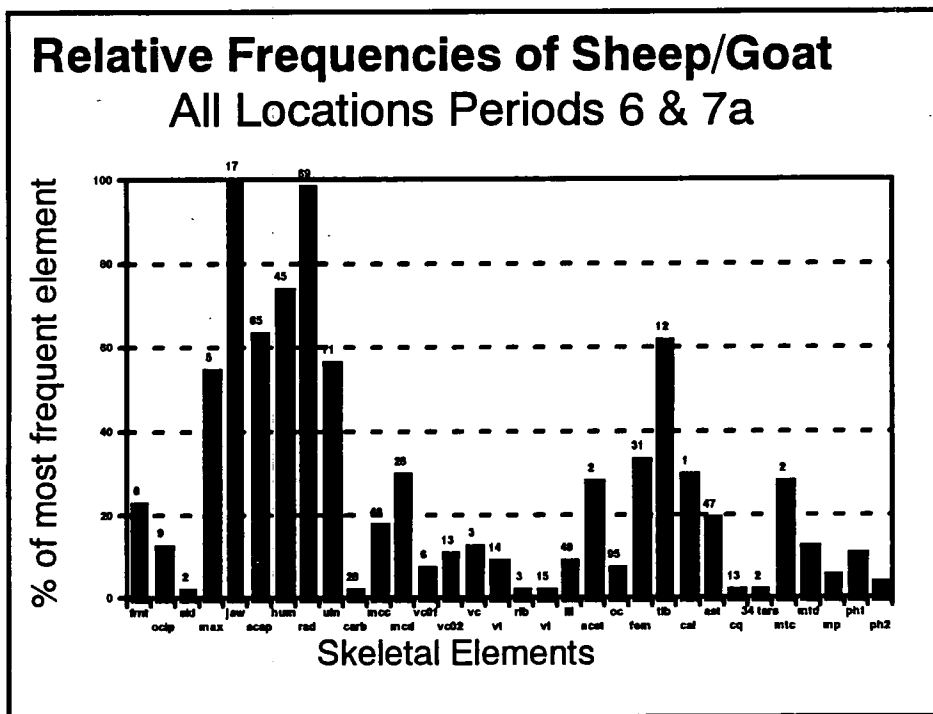


figure 2 Relative frequencies of sheep/goat skeletal elements for all locations



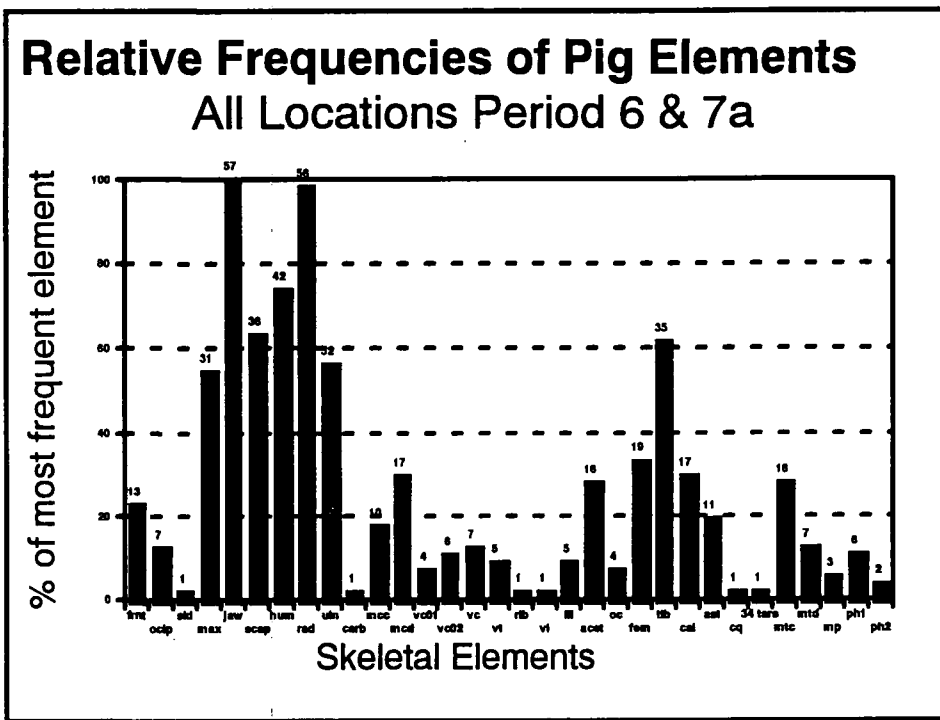
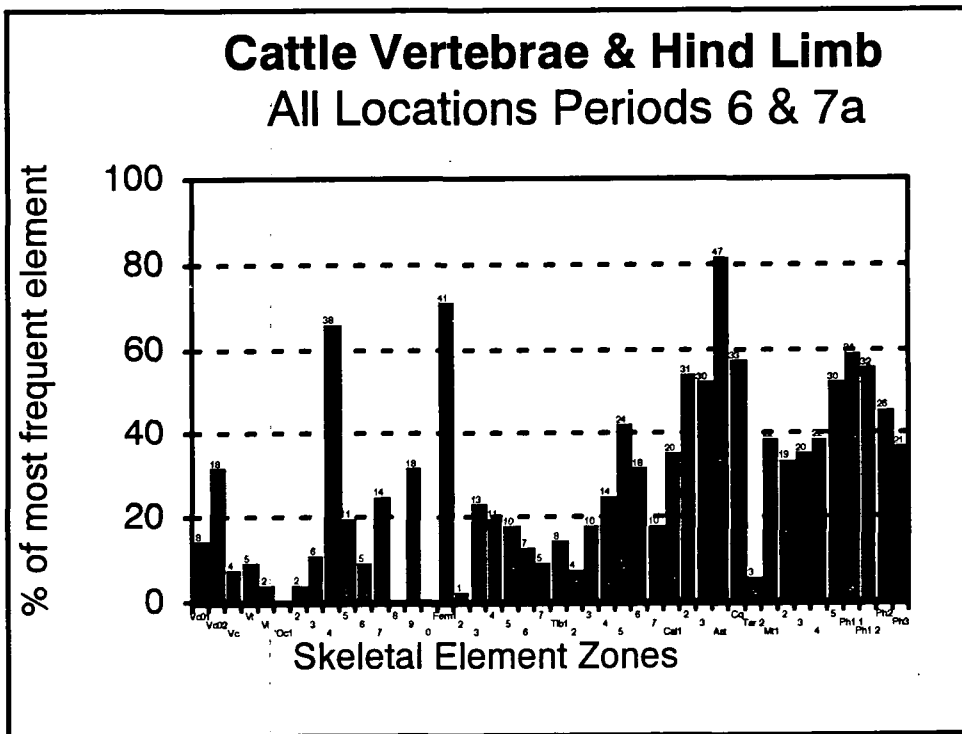
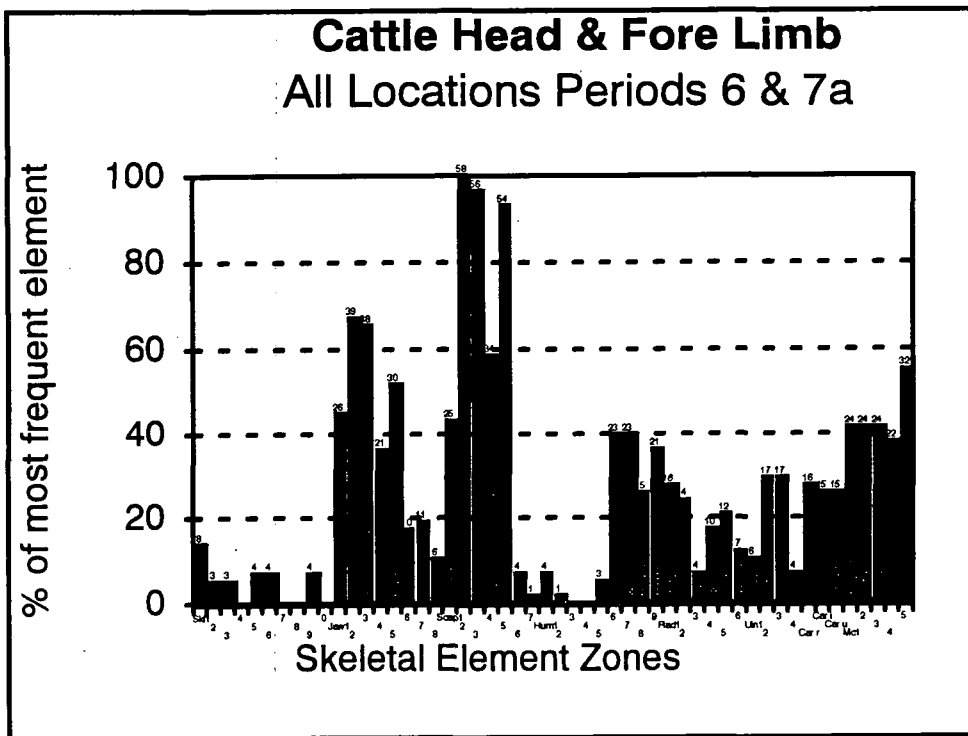


figure 3 Relative frequencies of pig skeletal elements for all locations



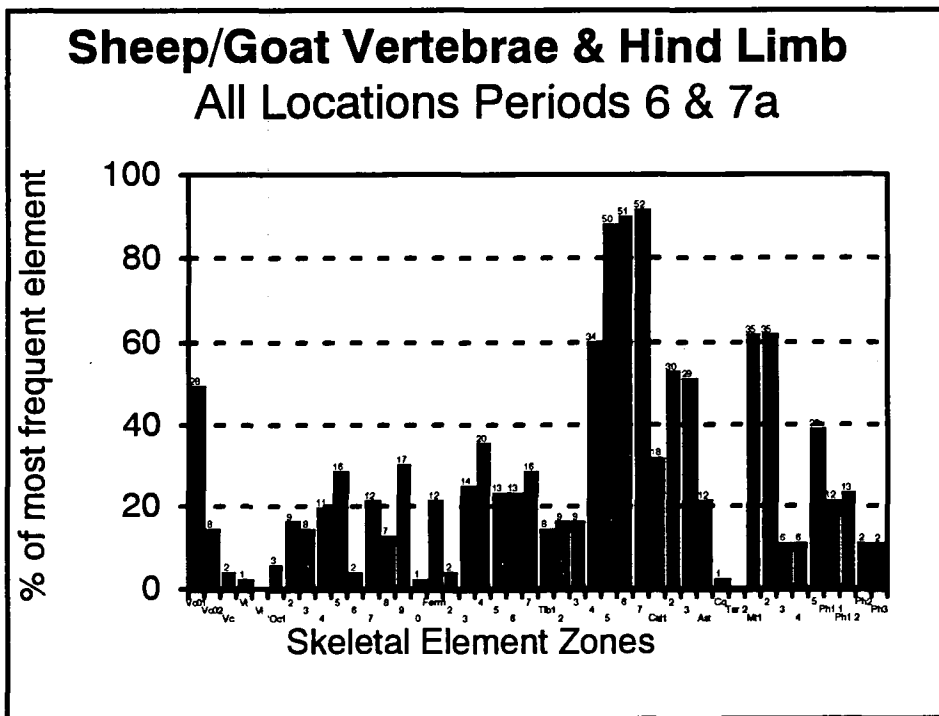
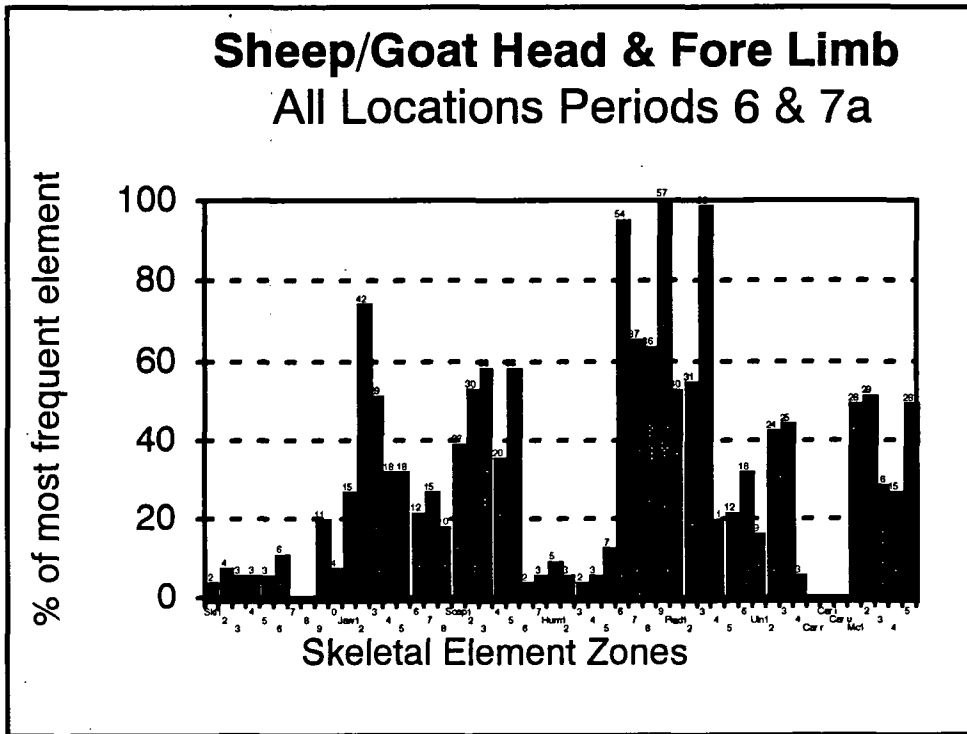


figure 6 & 7 Relative frequencies of sheep/goat skeletal element zones for all locations

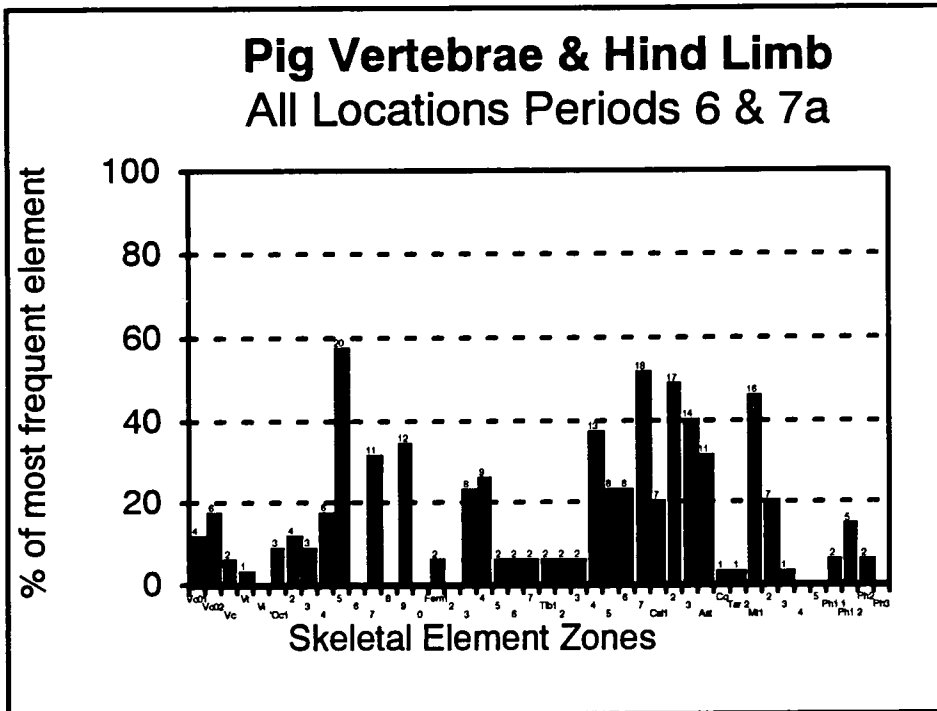
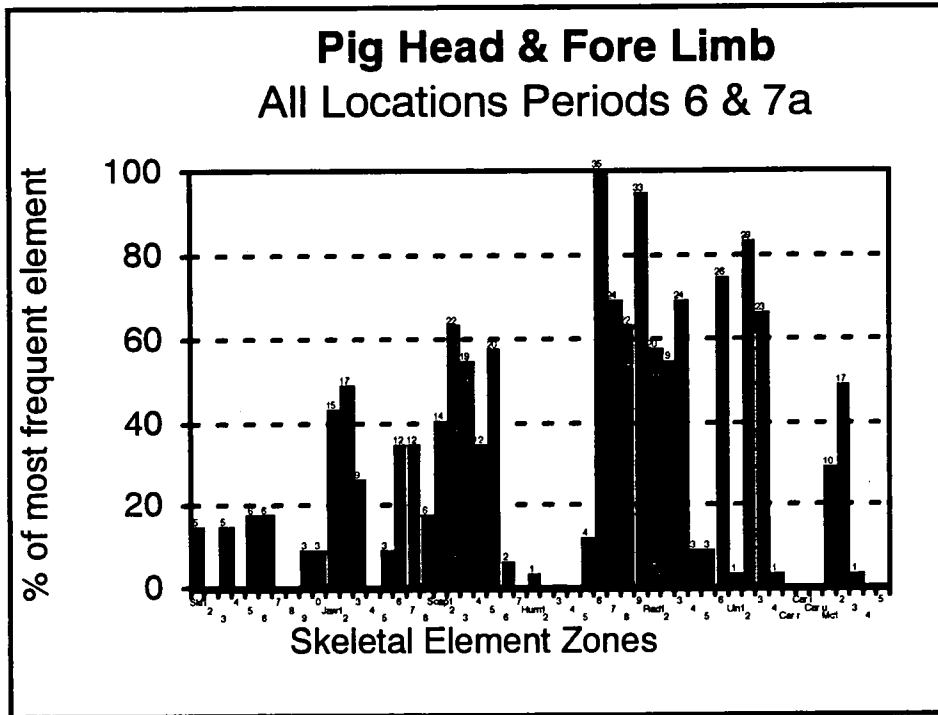


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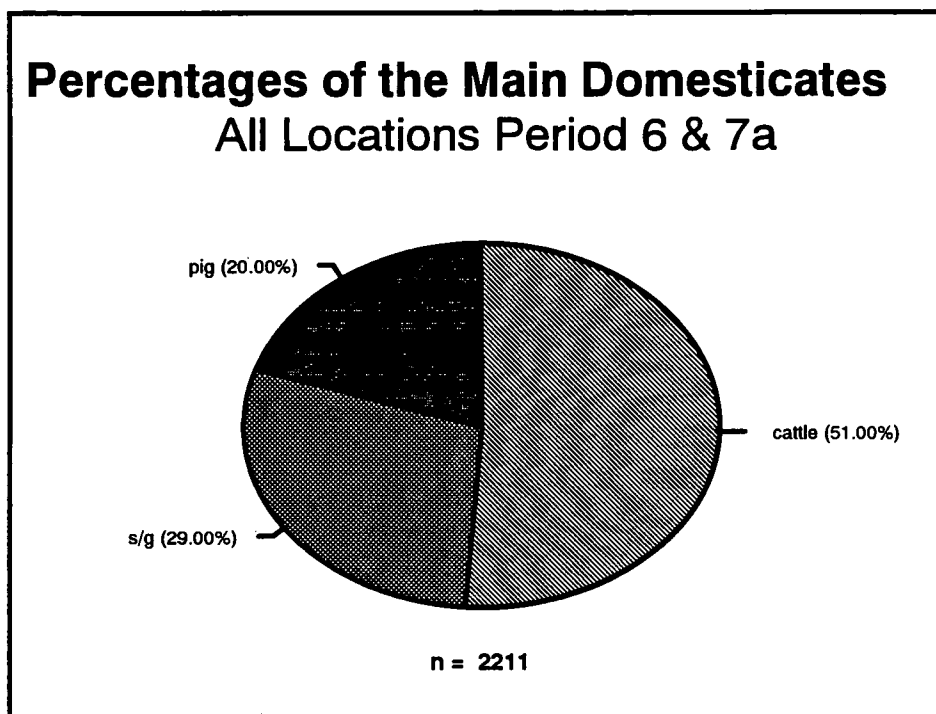


Figure 10 Percentages of the main domestics all locations period 6 & 7a

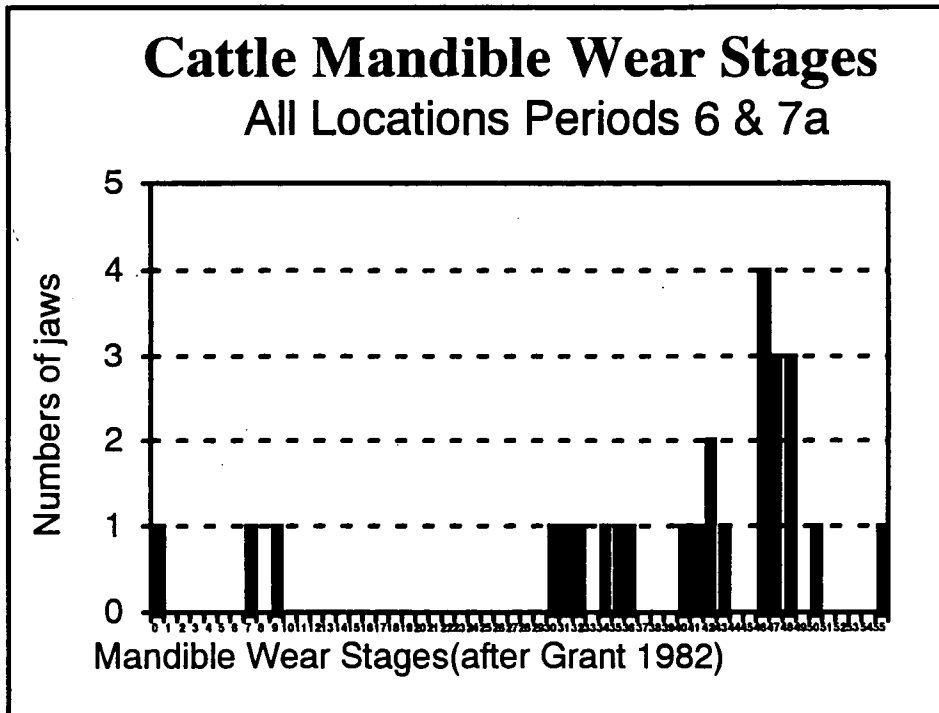


figure 11 Cattle mandible wear stages

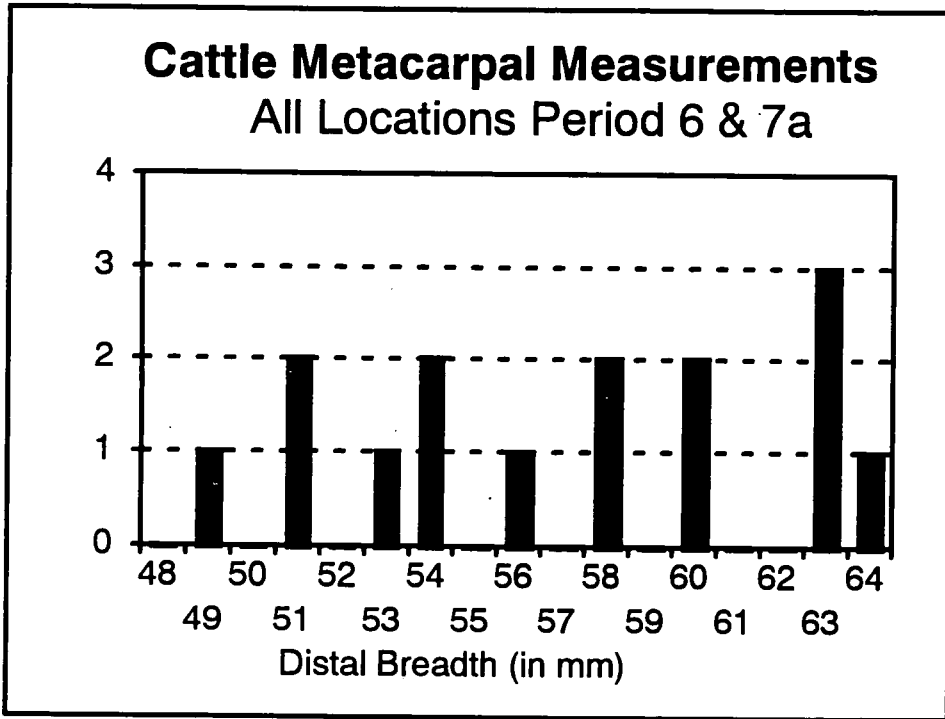


figure 12 Cattle metacarpal distal measurements

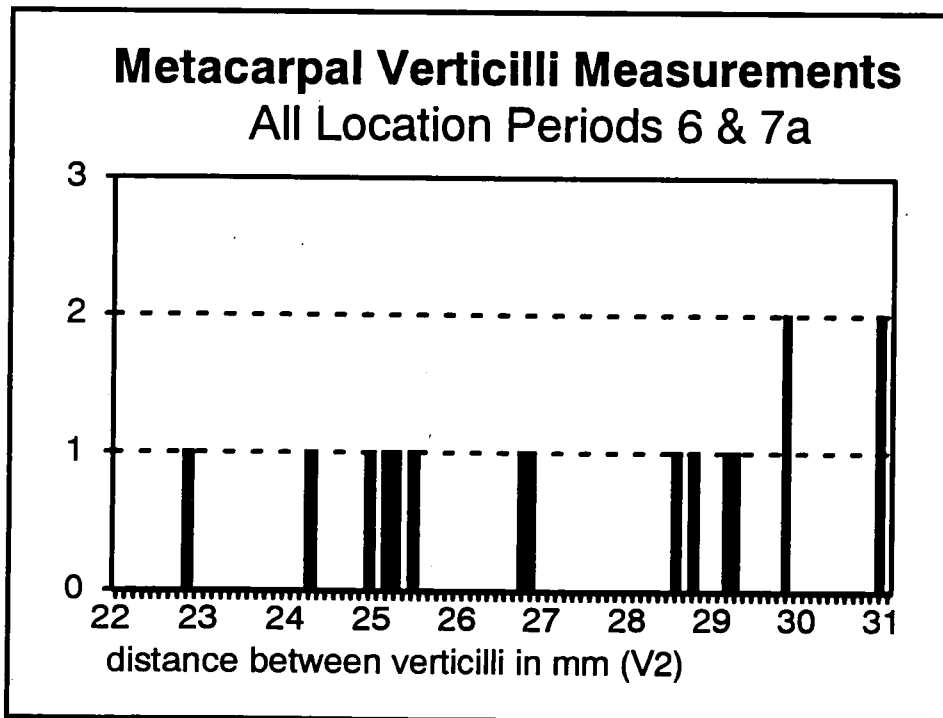


figure 13 Cattle metacarpal verticilli measurements

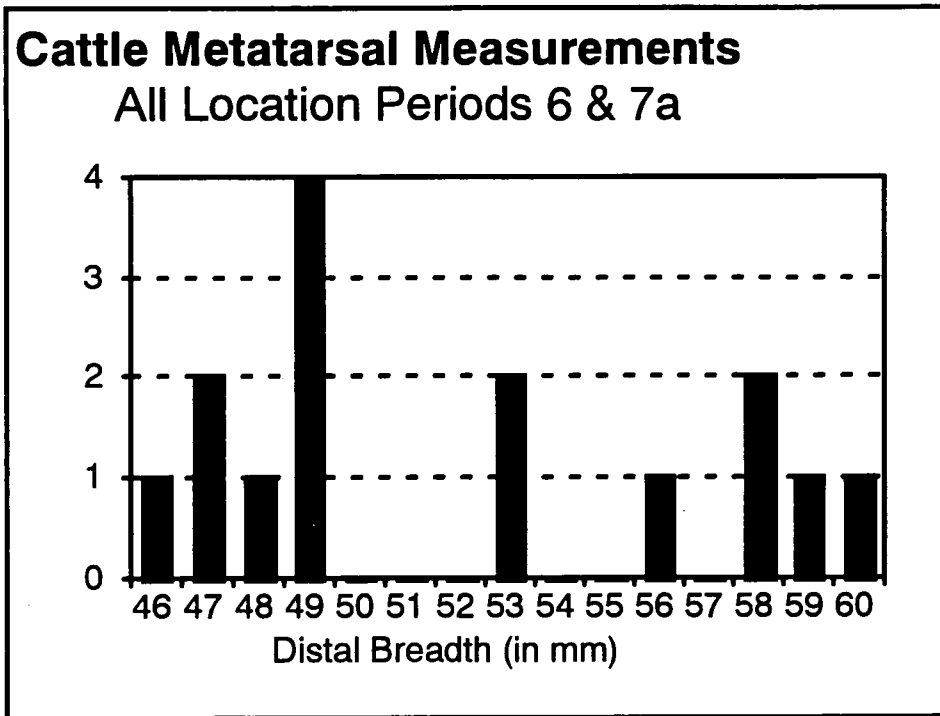


figure 14 Cattle metatarsal distal measurements

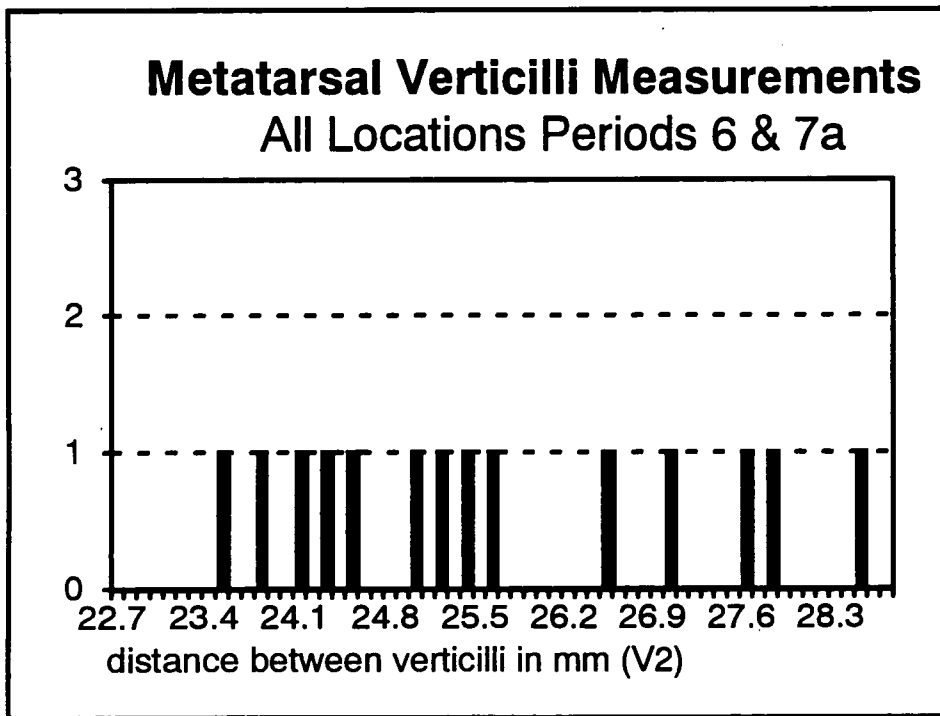


figure 15 Cattle metatarsal verticilli measurements

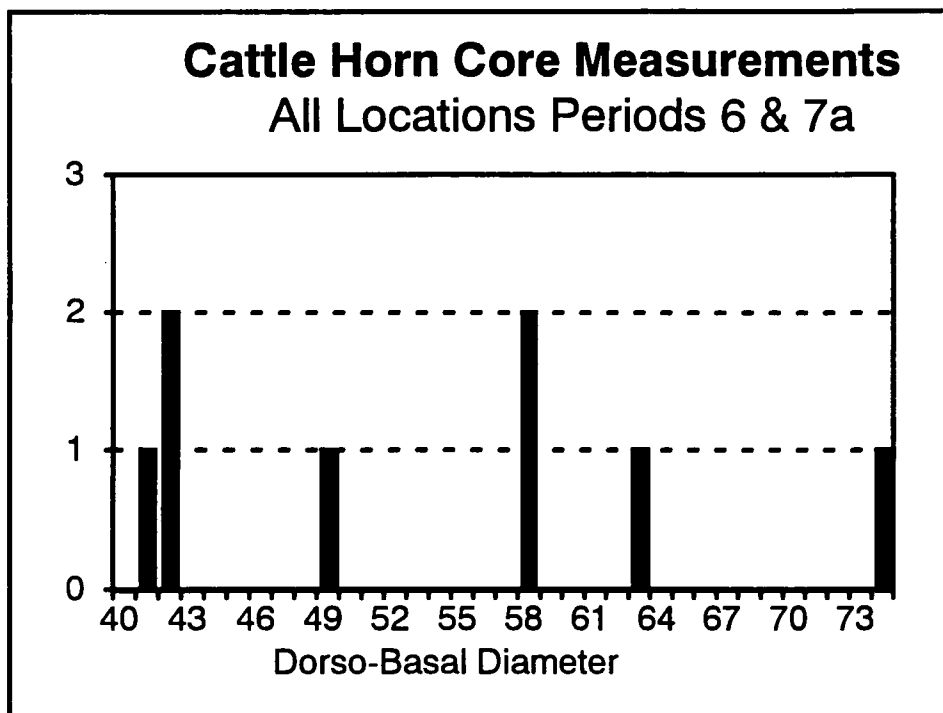


figure 16 Horn core dorso-basal diameter measurements

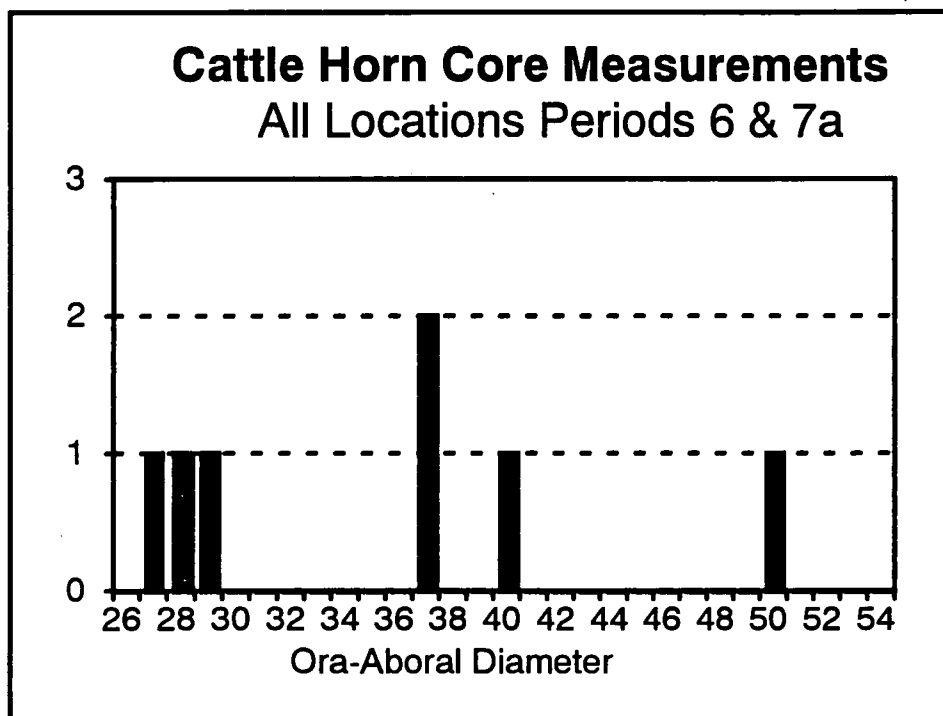


figure 17 Horn core ora-aboral diameter measurements

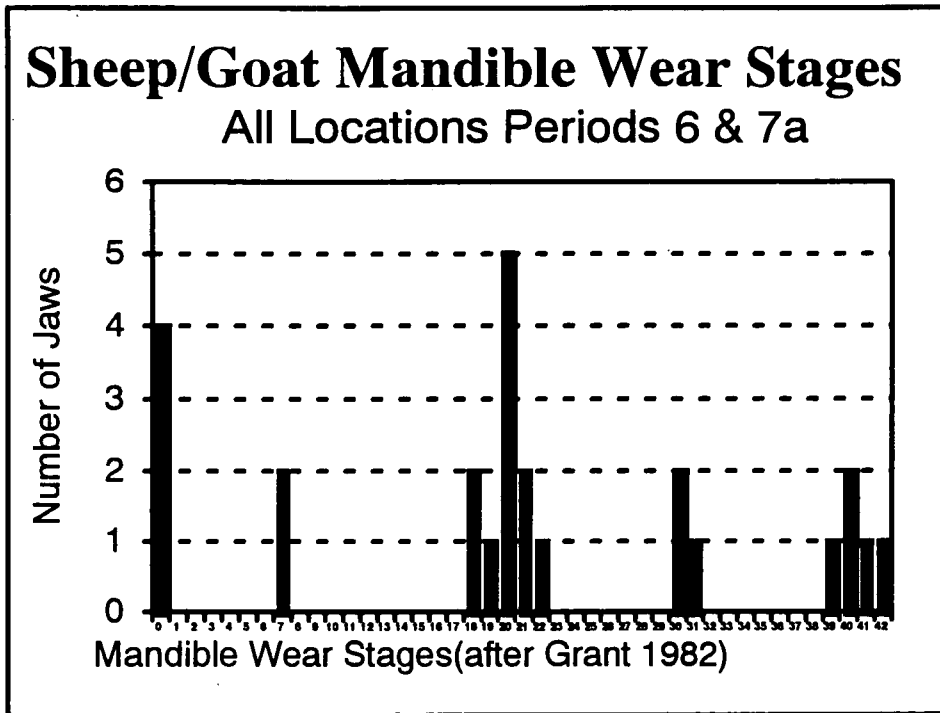


figure 18 Sheep/goat mandible wear stages

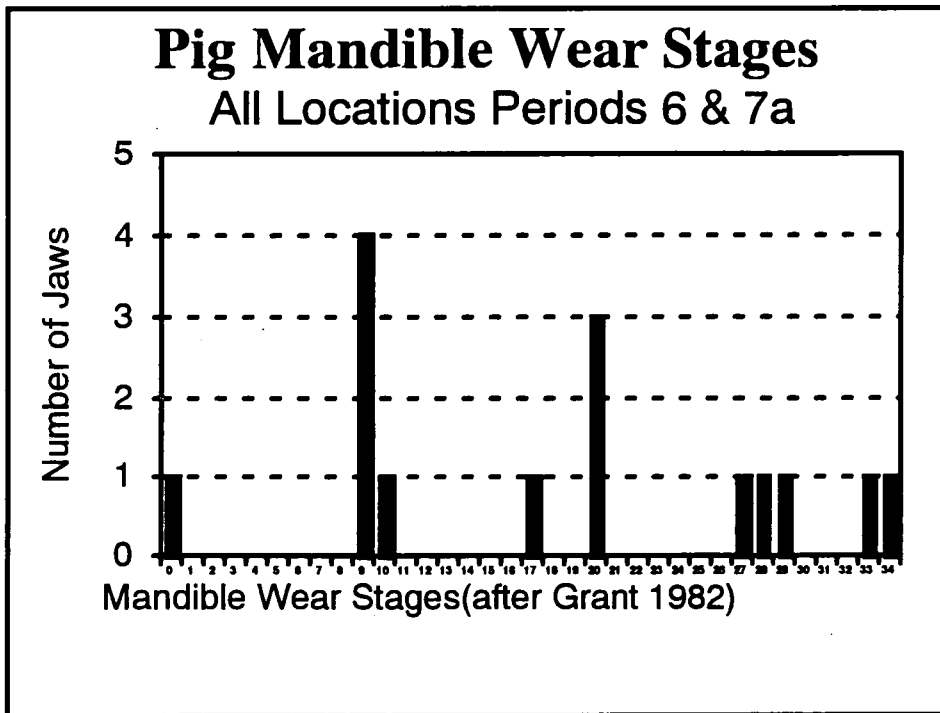
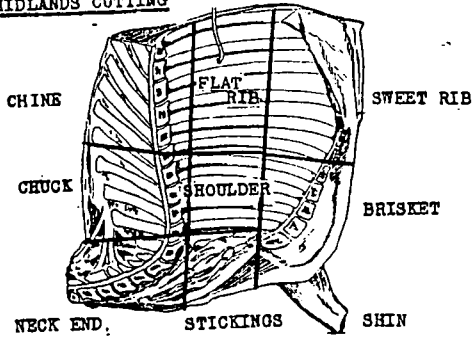


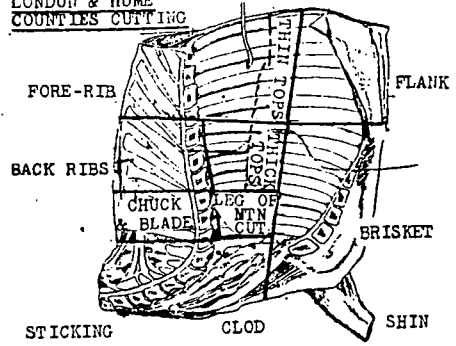
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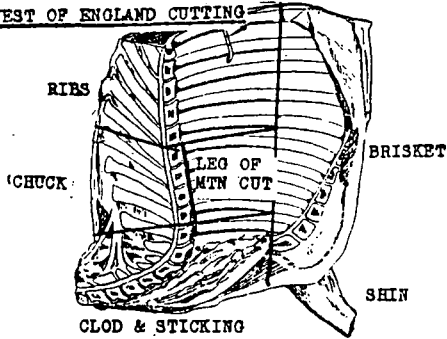
MIDLANDS CUTTING



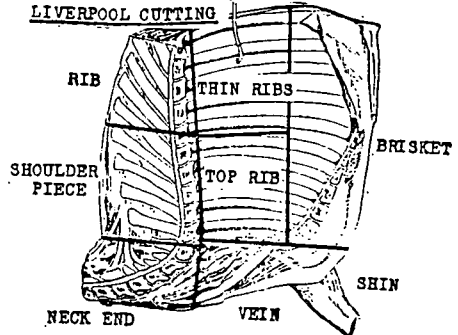
LONDON & HOME COUNTIES CUTTING



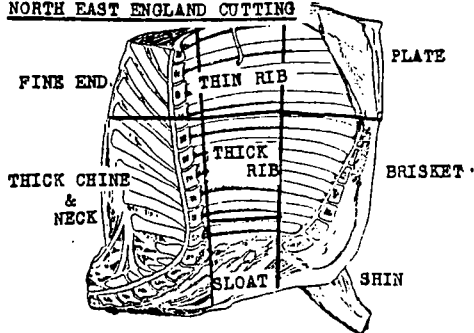
WEST OF ENGLAND CUTTING



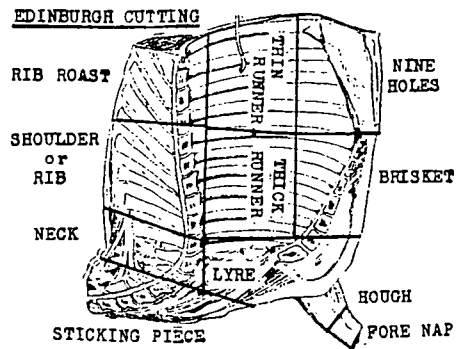
LIVERPOOL CUTTING



NORTH EAST ENGLAND CUTTING



EDINBURGH CUTTING



Methods of Cutting Beef Fores

figure 20 Methods of cutting up beef forequarters (after Gerrard 1945)

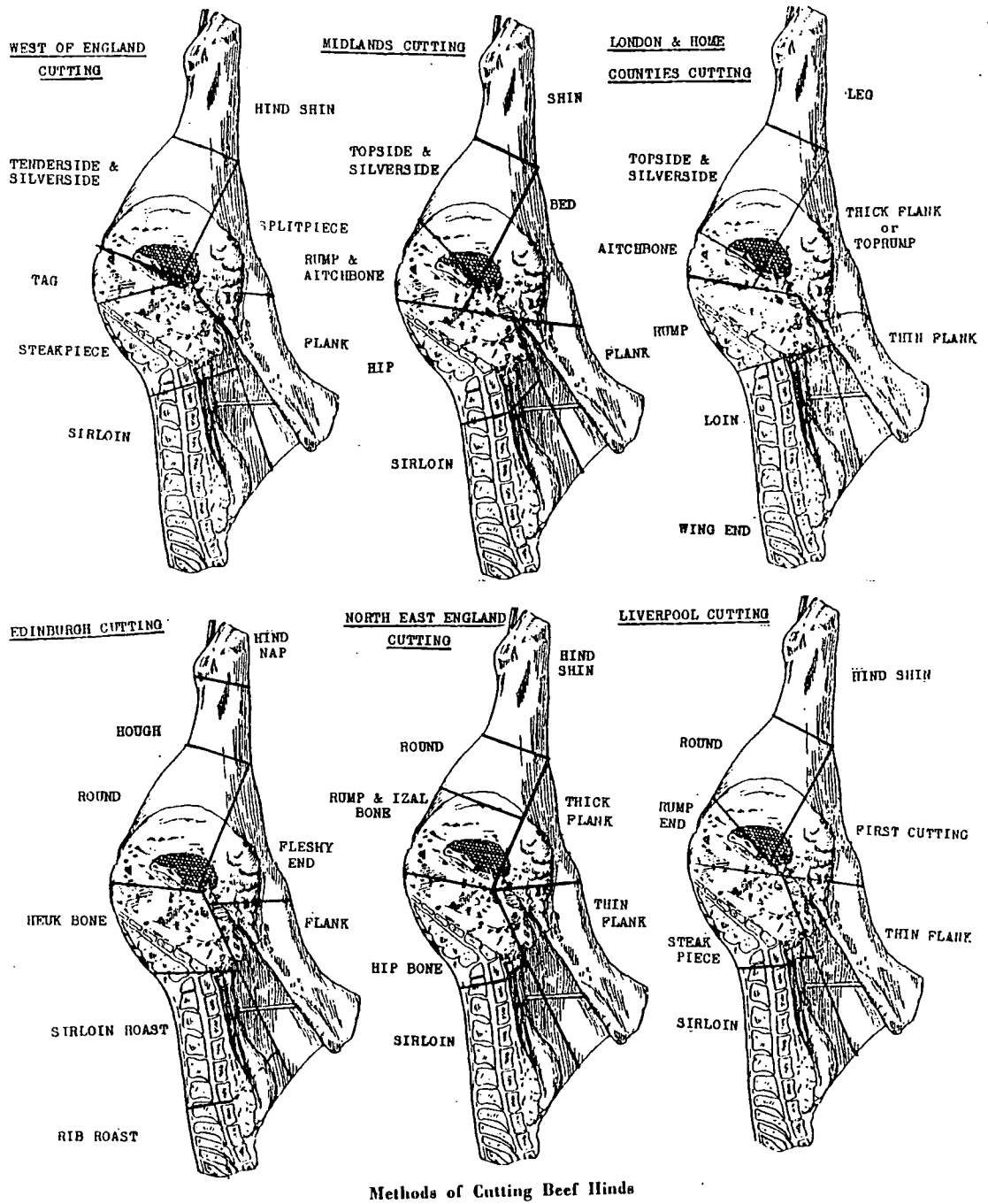
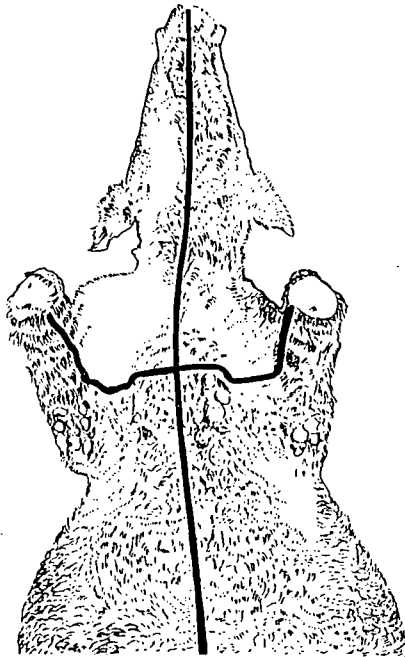
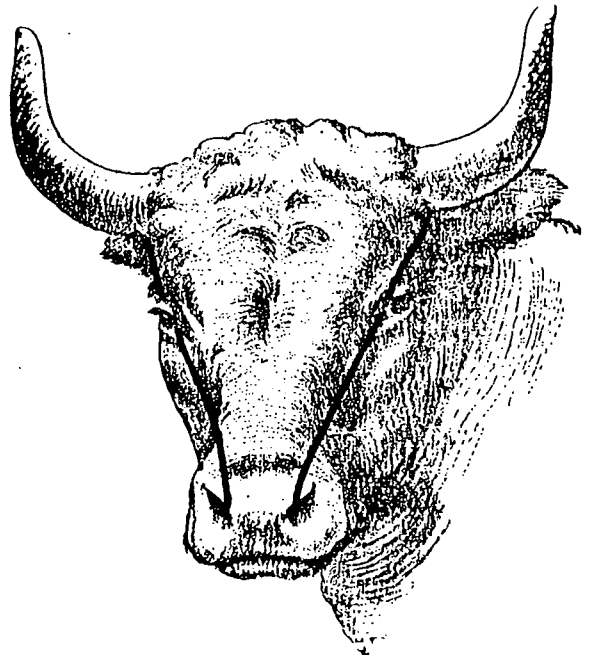


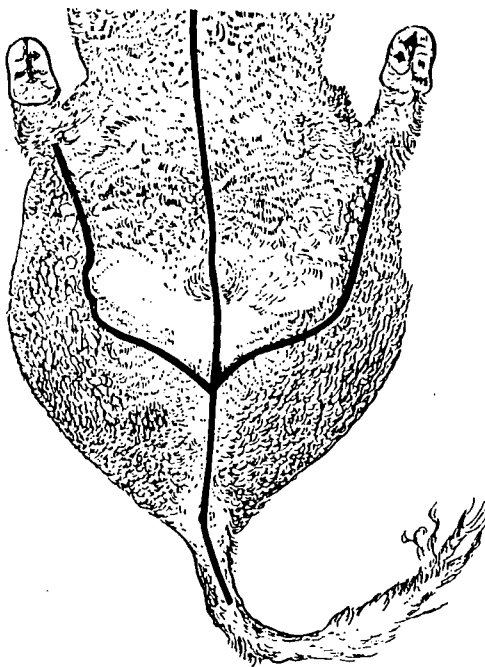
figure 21 Methods of cutting up beef hindquarters (after Gerrard 1945)



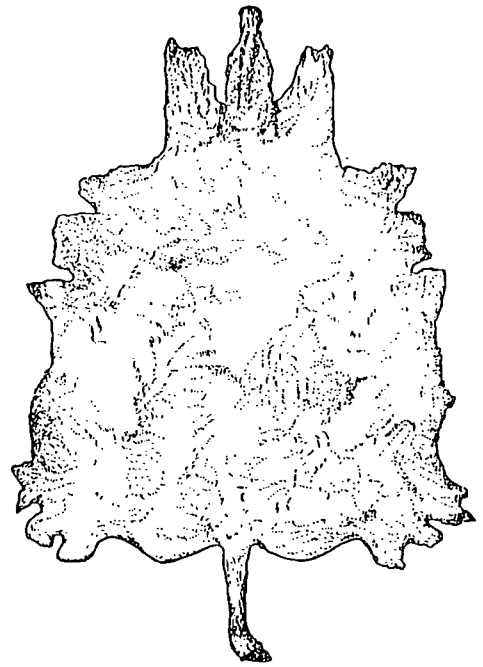
-This method of ripping foreshanks produces a hide with square shoulders, which needs no trimming.



By ripping the head as shown above, full use is made of the face and cheeks.



-Note the slight curve in the rip from the shanks to the centre line. Remember the butt is the most valuable part of the hide.



This is a drawing of the actual hide, ripped. No trimming was necessary. Result, a considerable saving in leather.

figure 22 Ripping lines for removal of hide
(after Gerrard 1950)

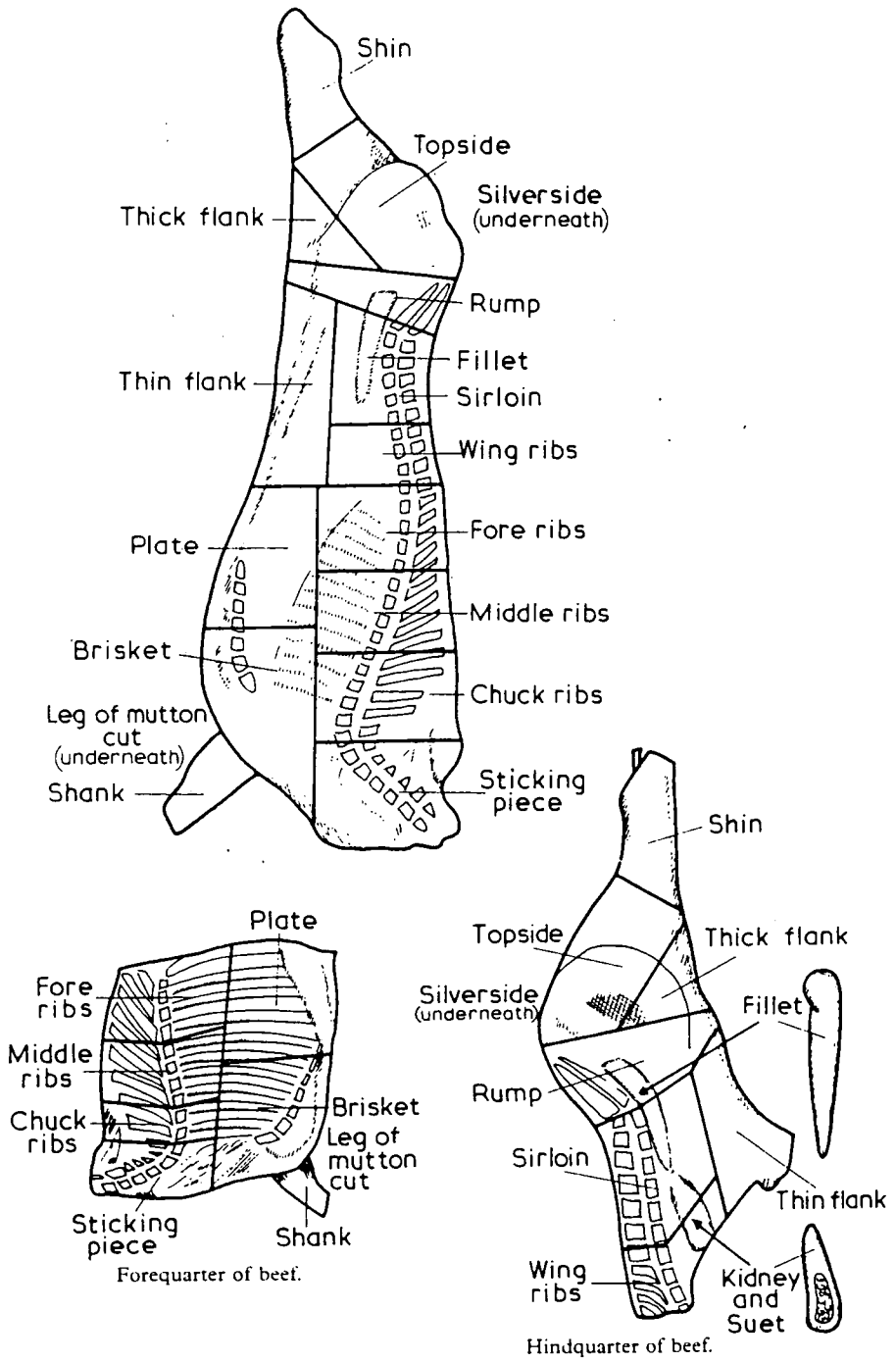


figure 23 Modern beef cuts
(after Kinton & Ceserani)

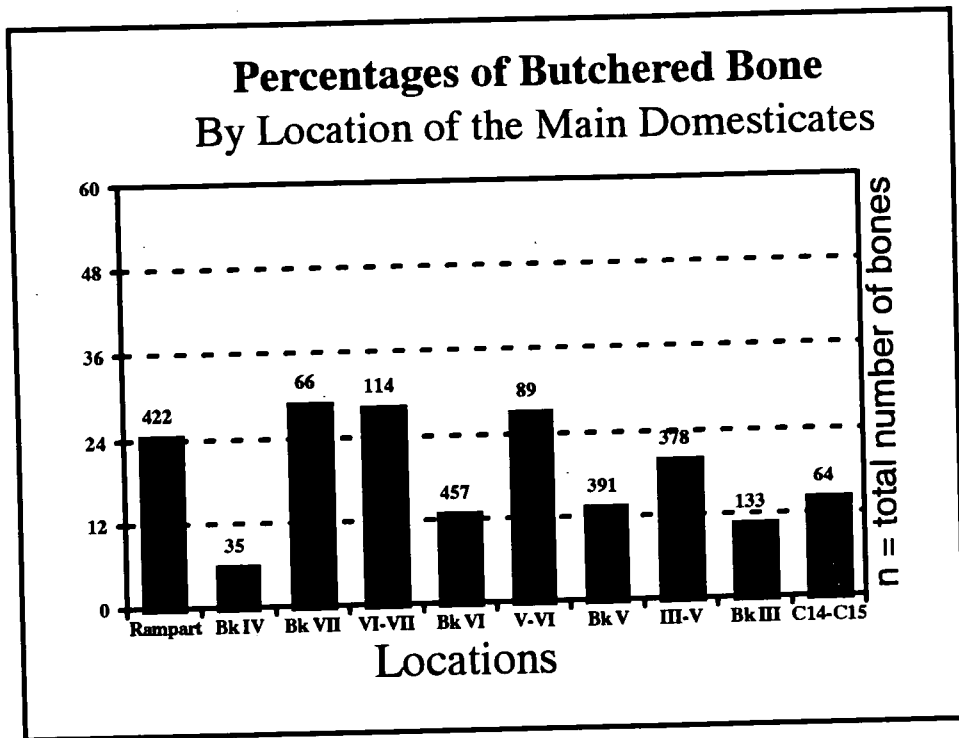


figure 24 Percentages of butchered bone by location for the 3 main domesticates

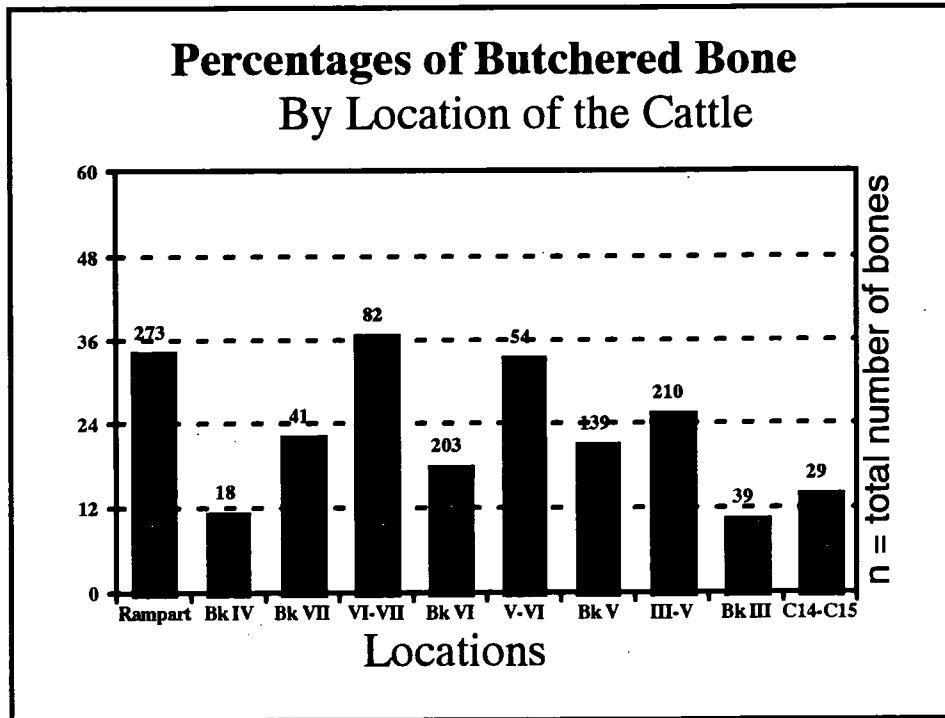


figure 25 Percentages of butchered bone by location for cattle

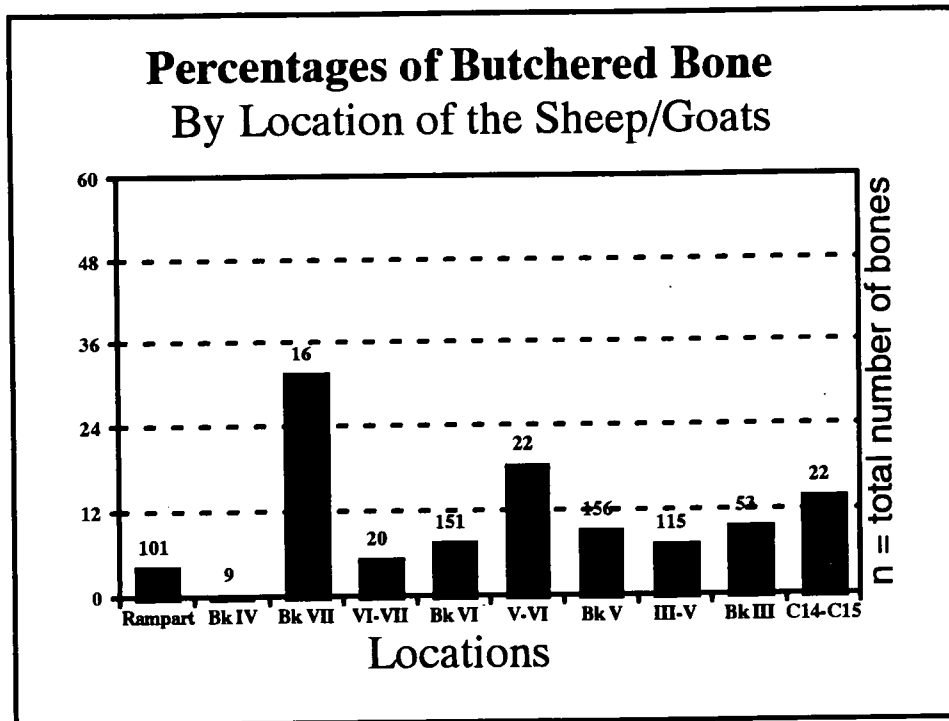


figure 26 Percentages of butchered bone by location for sheep/goat

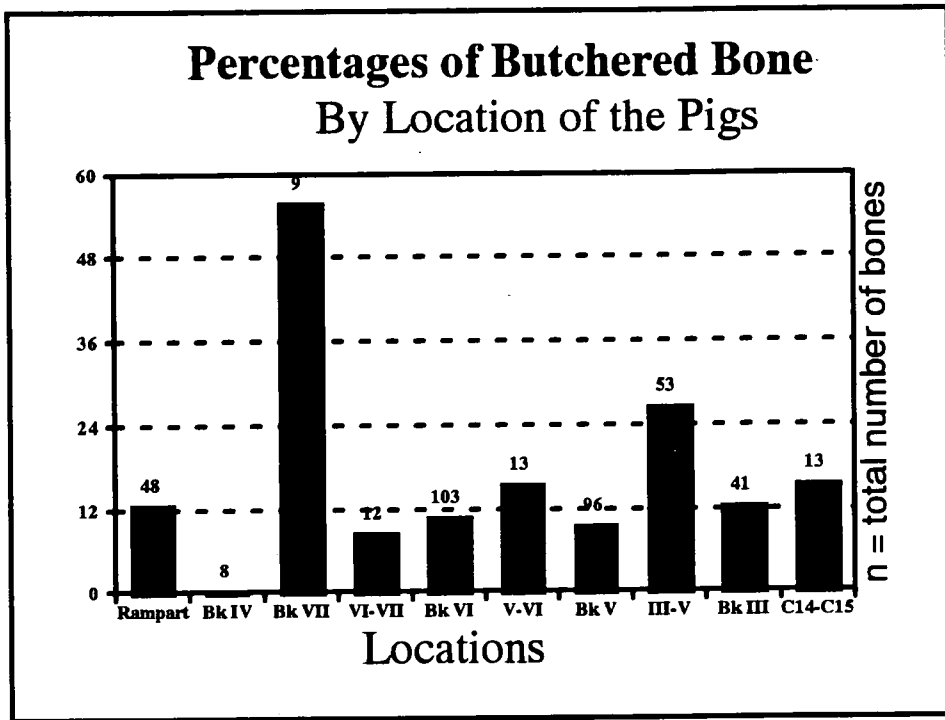


figure 27 Percentages of butchered bone by location for pig

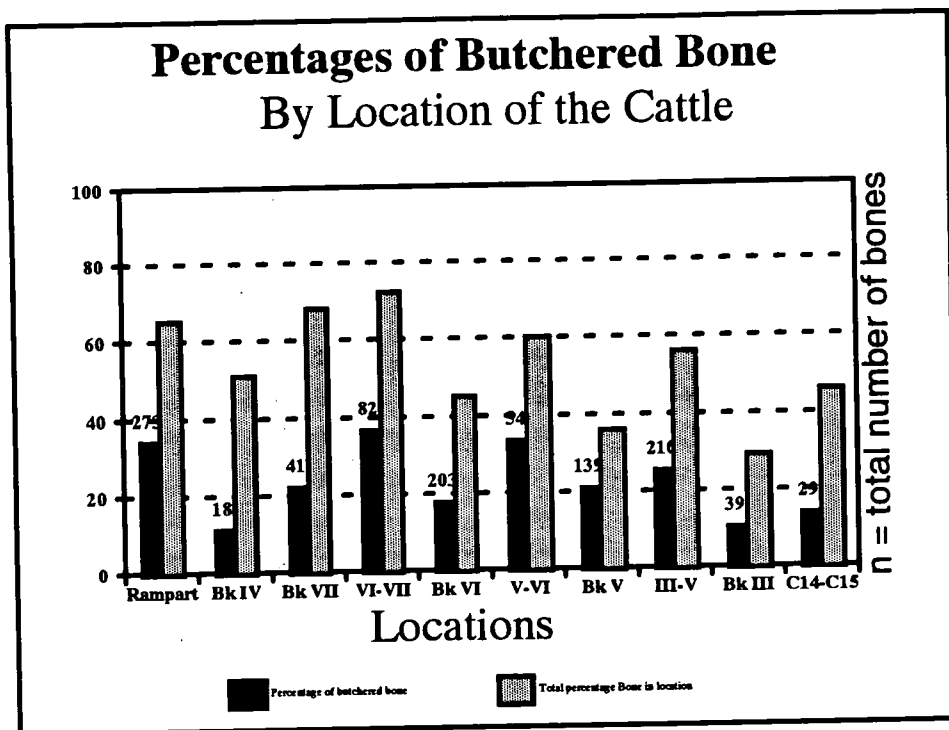


figure 28

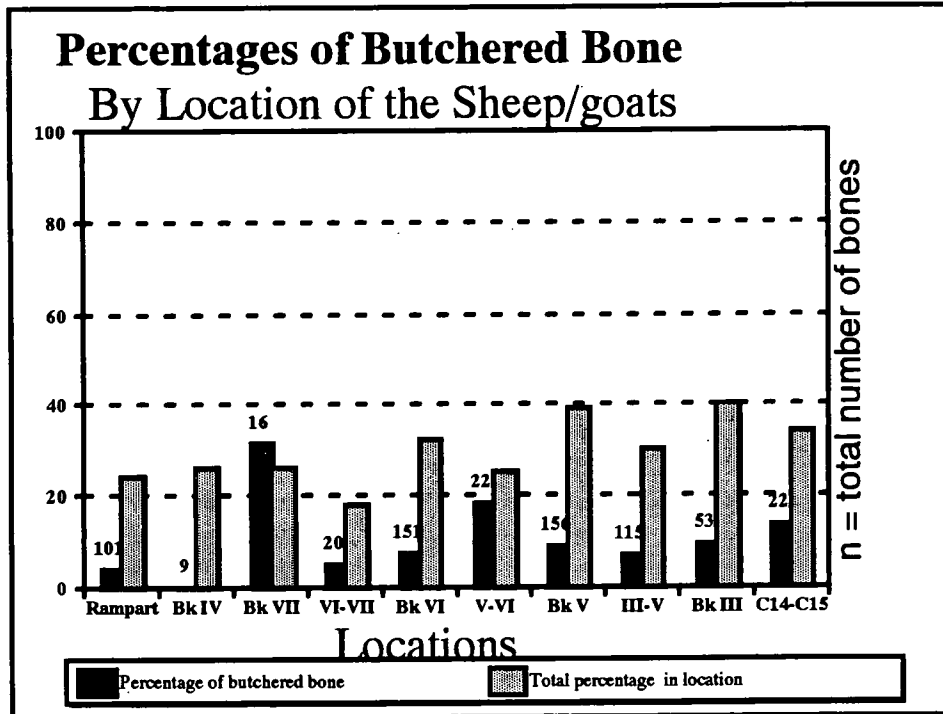


figure 29

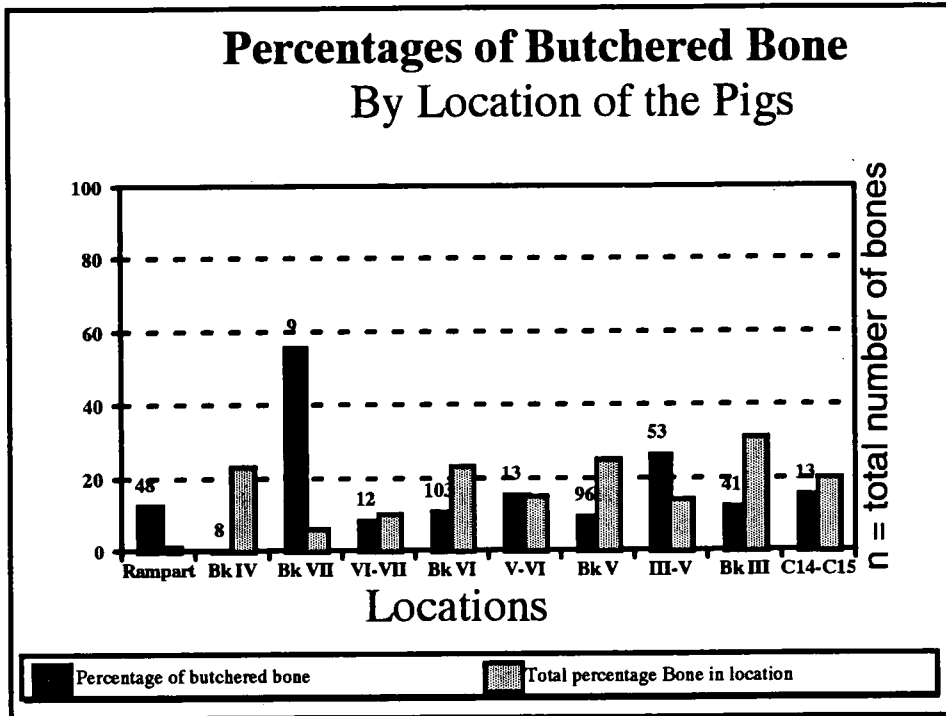


figure 30

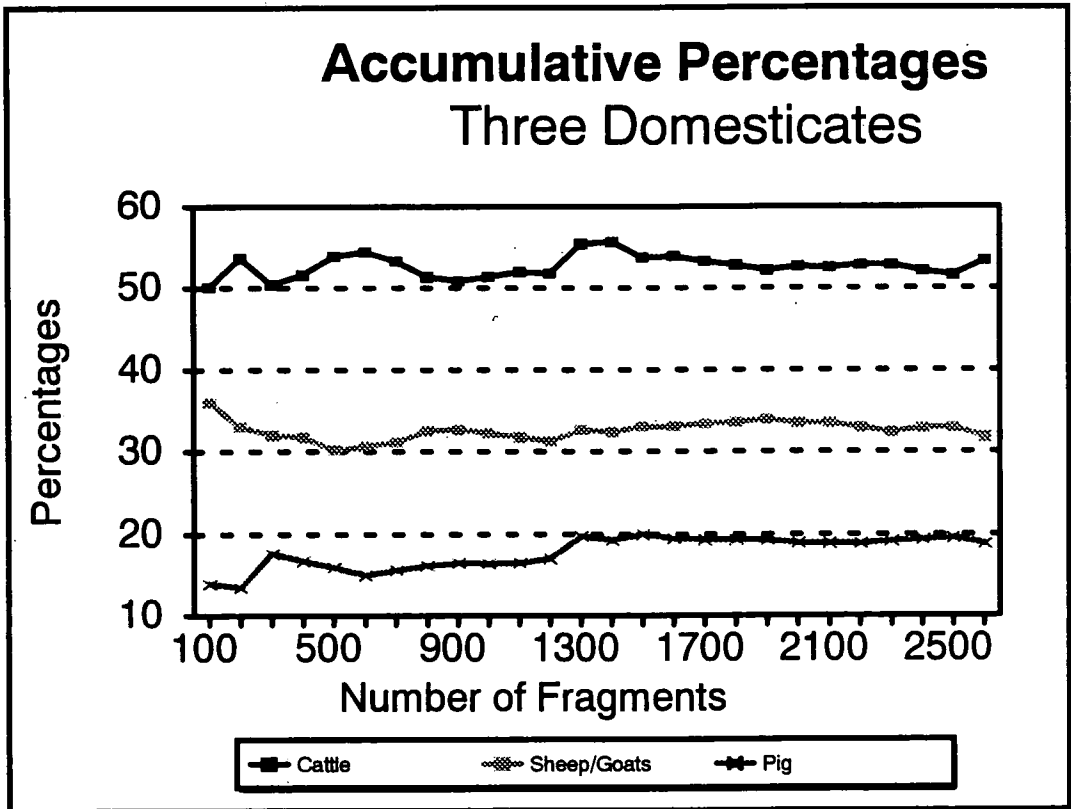
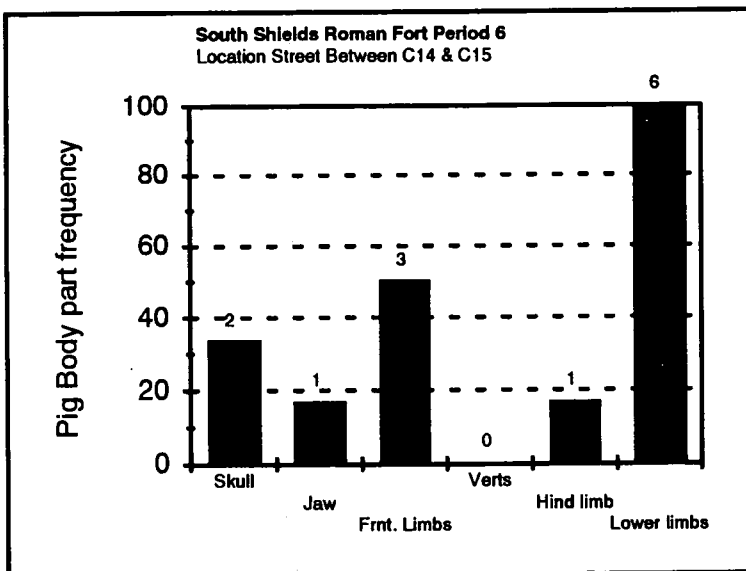
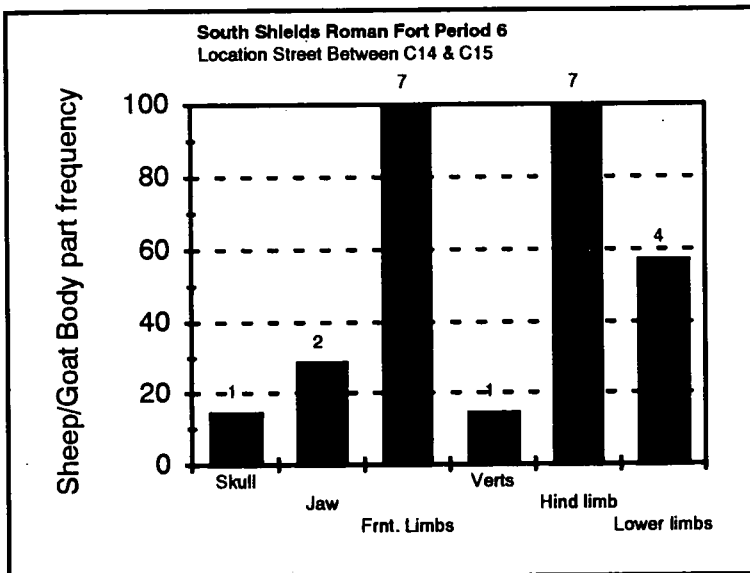
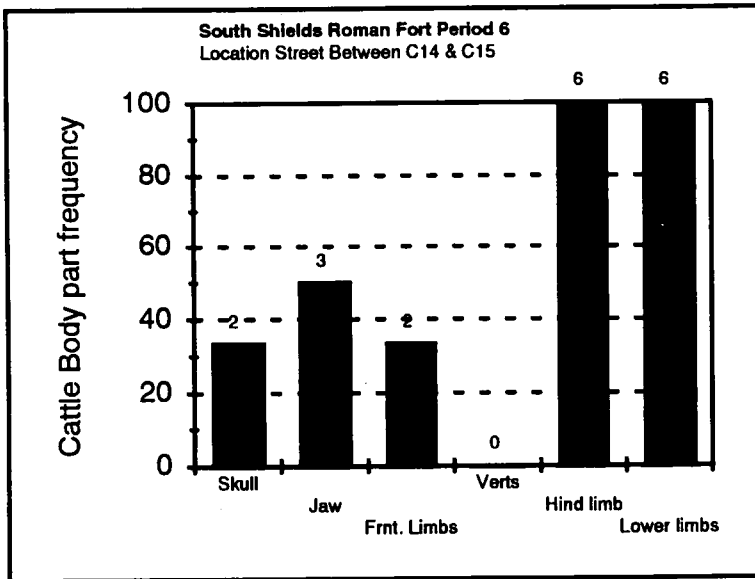


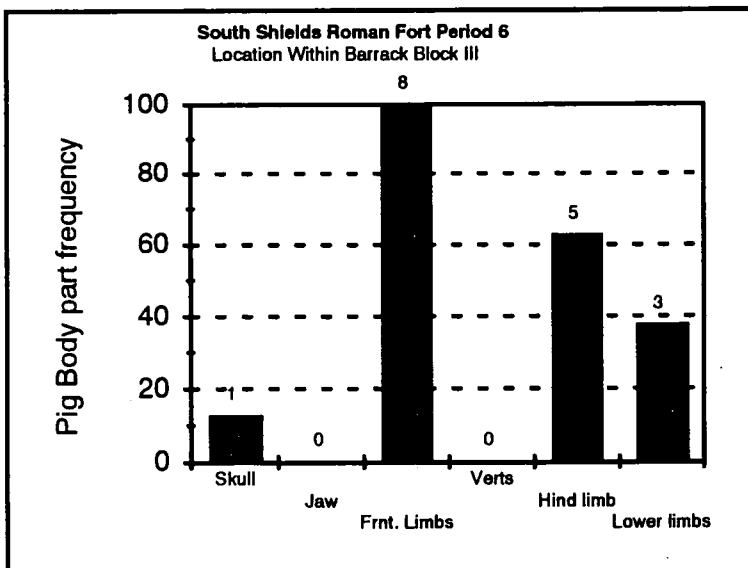
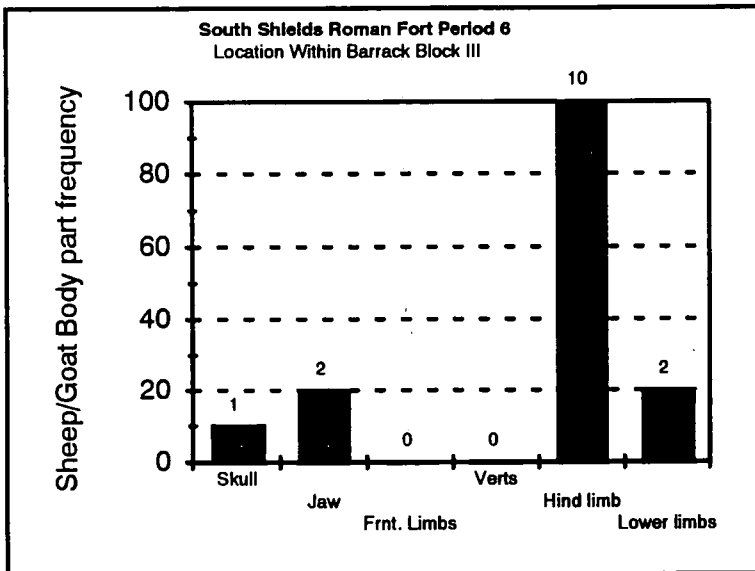
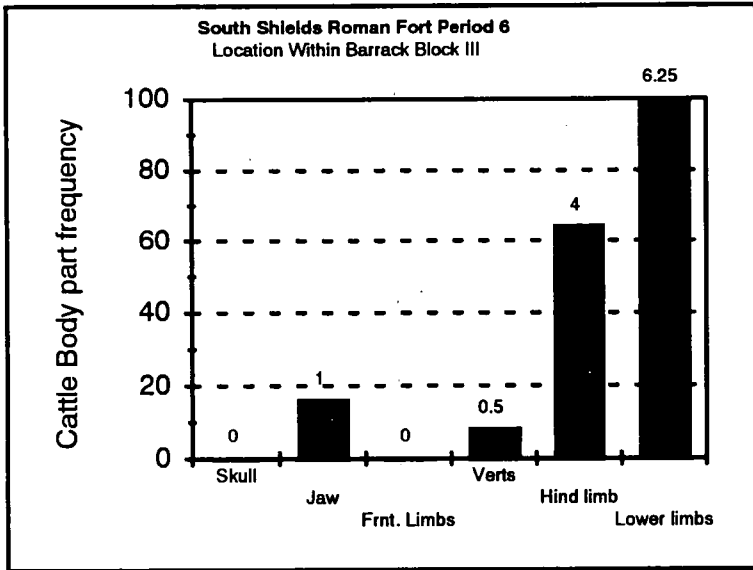
figure 31 Accumulative percentages of bone recorded

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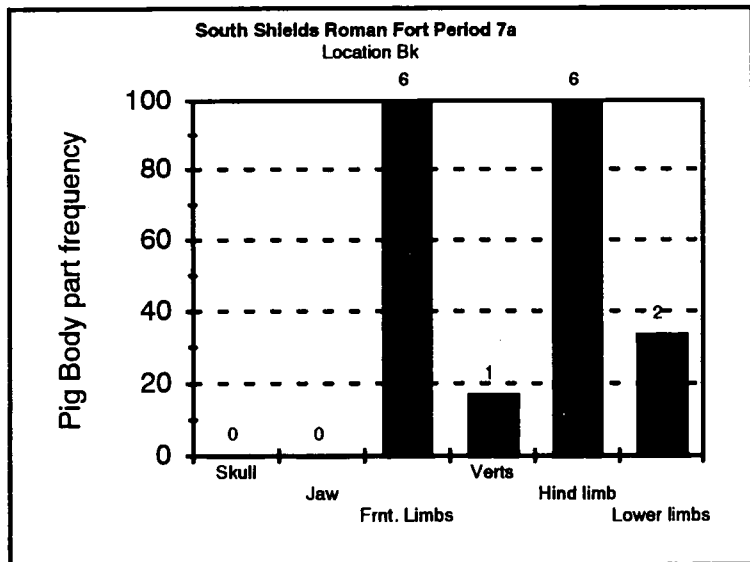
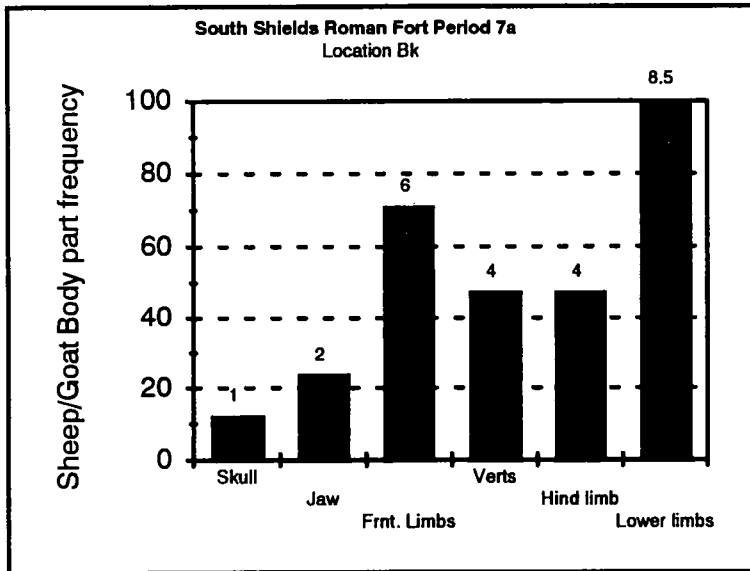
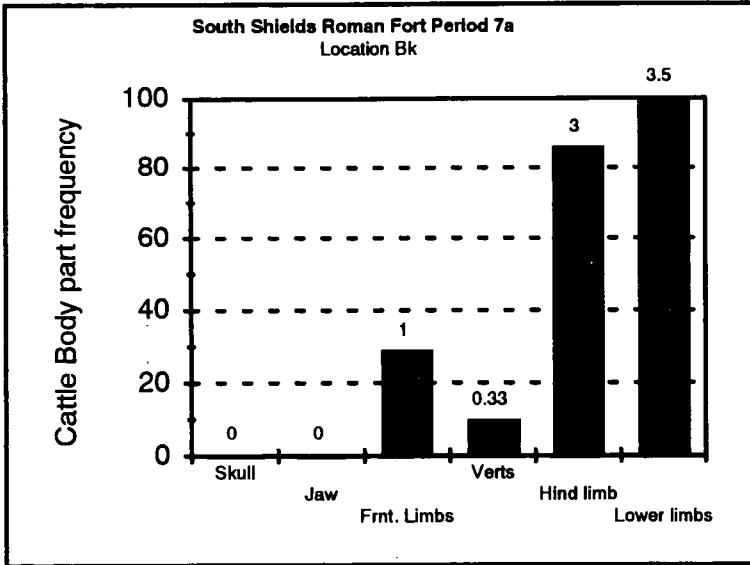
figures 32 to 34 Body part frequencies for the three domesticates location C14/C15

Stokes: Spatial patterning of faunal remains from South Shields fort



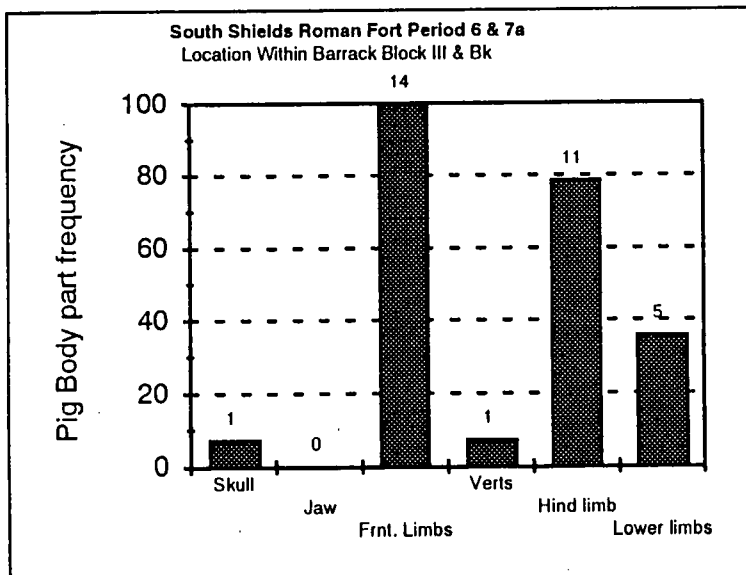
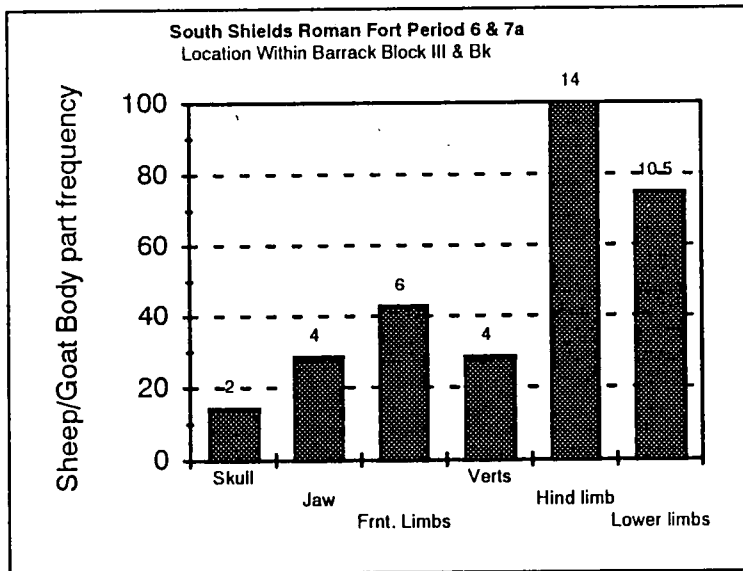
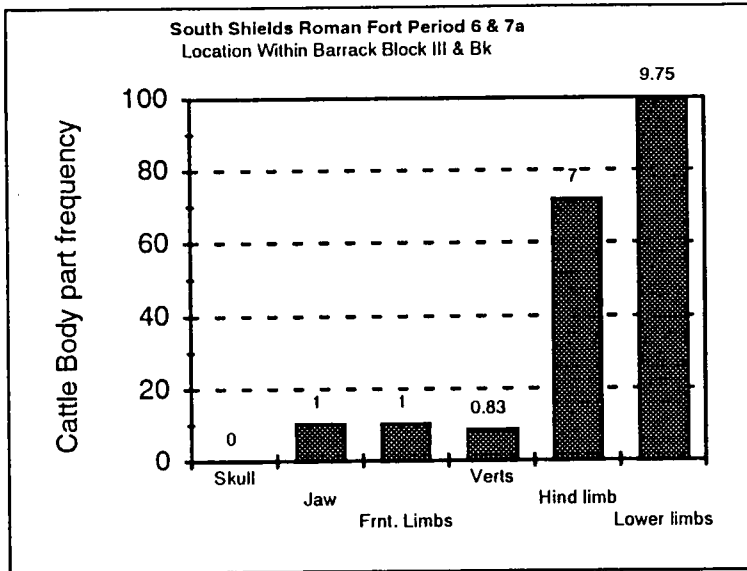
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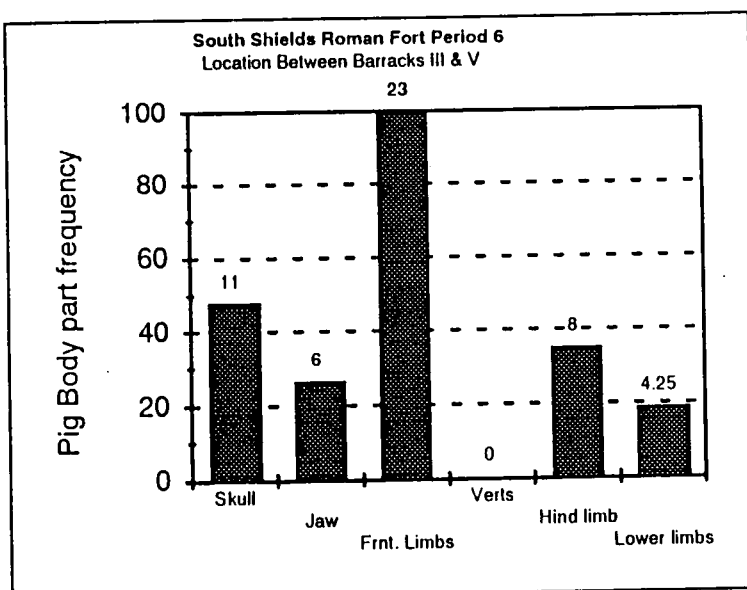
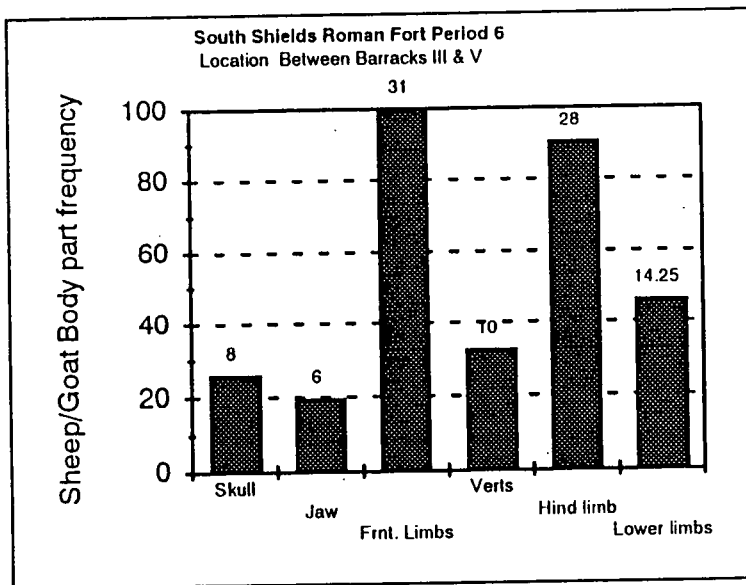
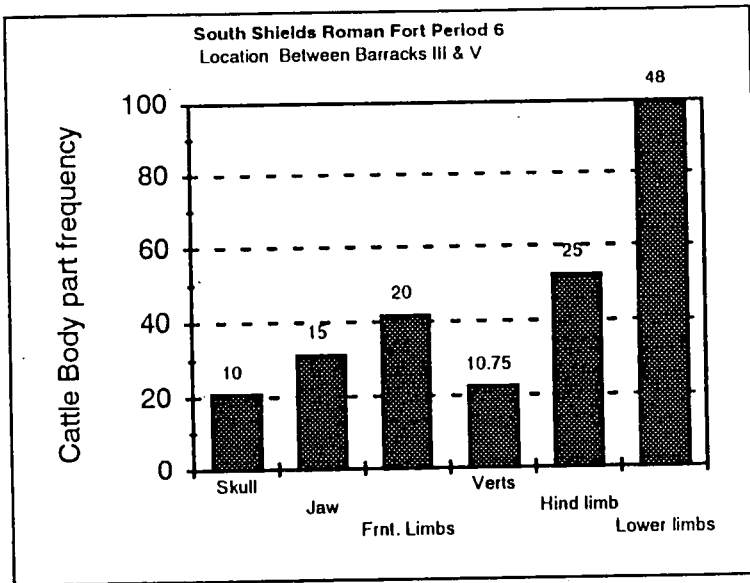
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Stokes: Spatial patterning of faunal remains from South Shields fort



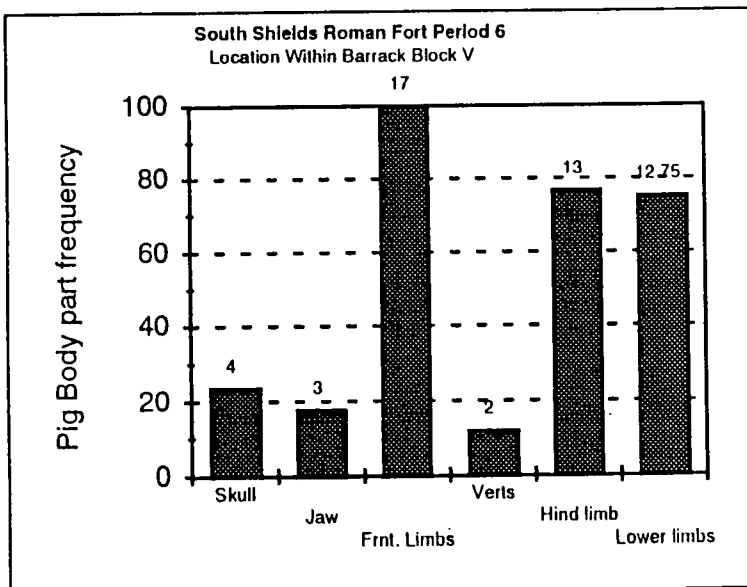
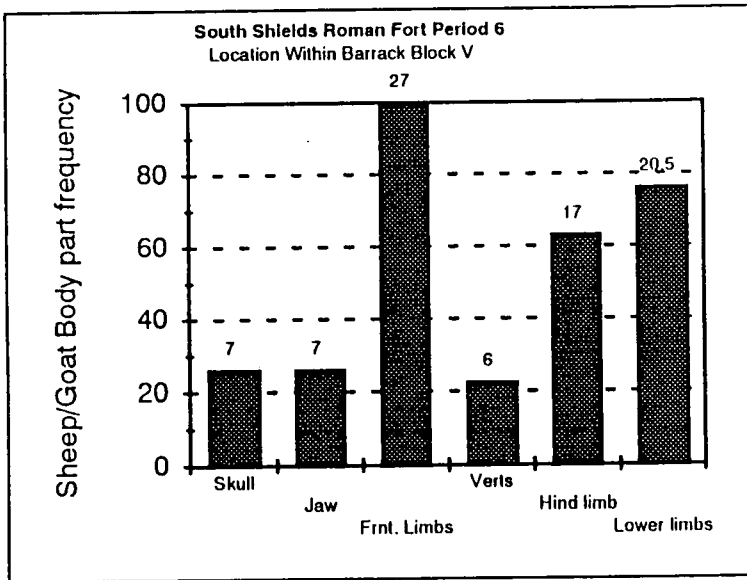
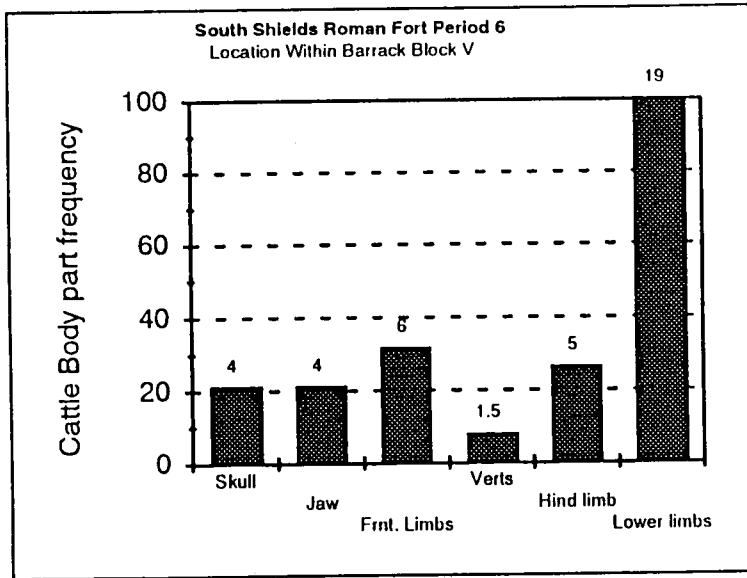
figures 41 to 43 Body part frequencies for the three domesticates location Bk3 & Bk

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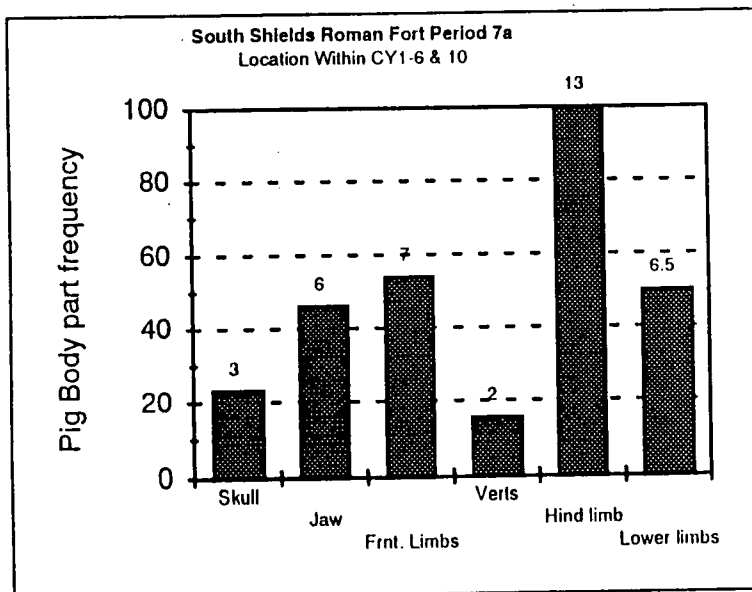
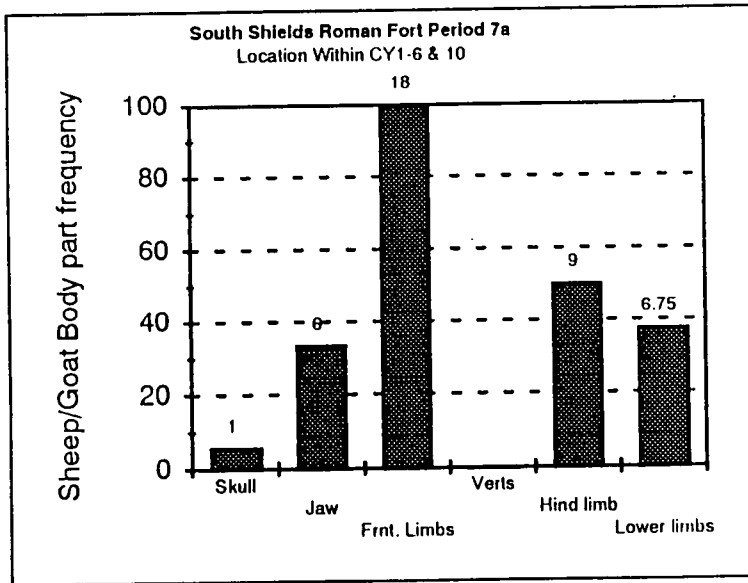
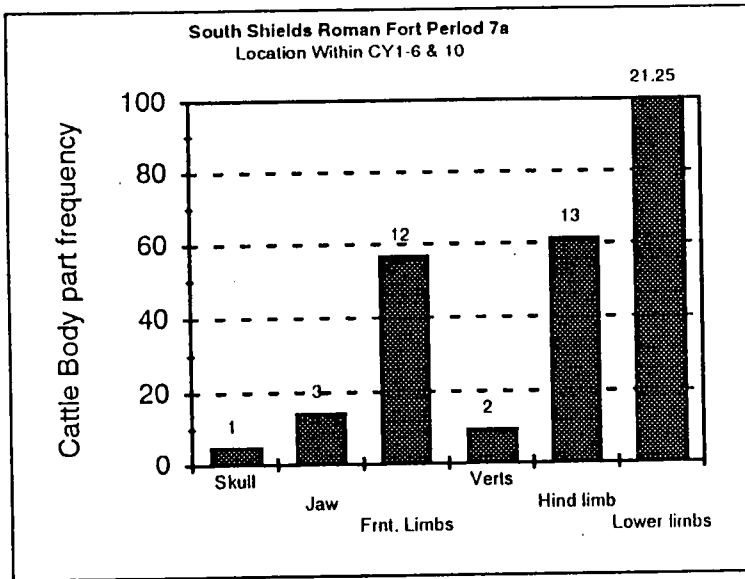
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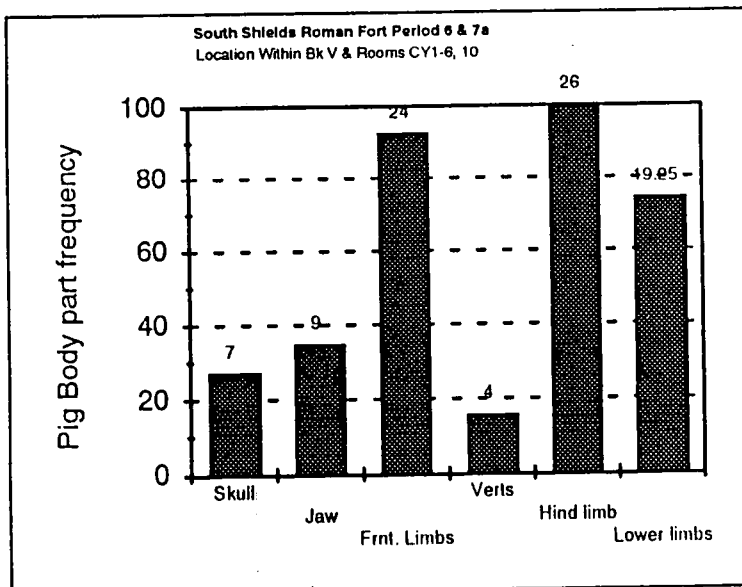
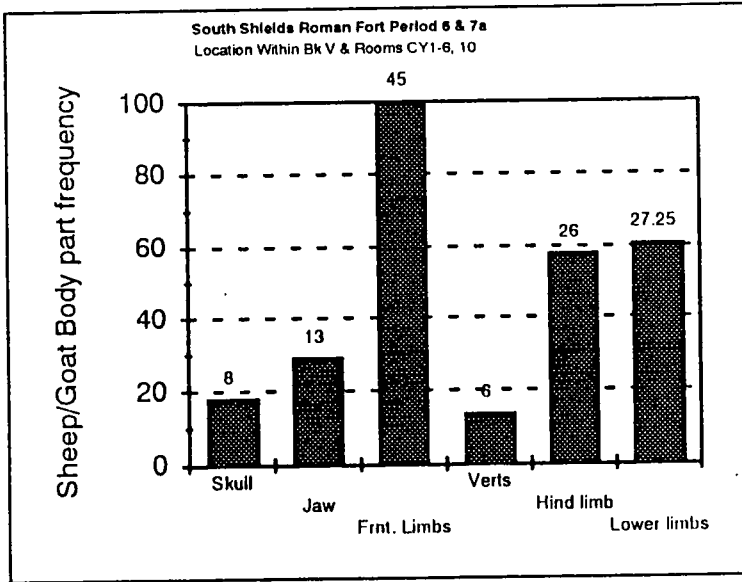
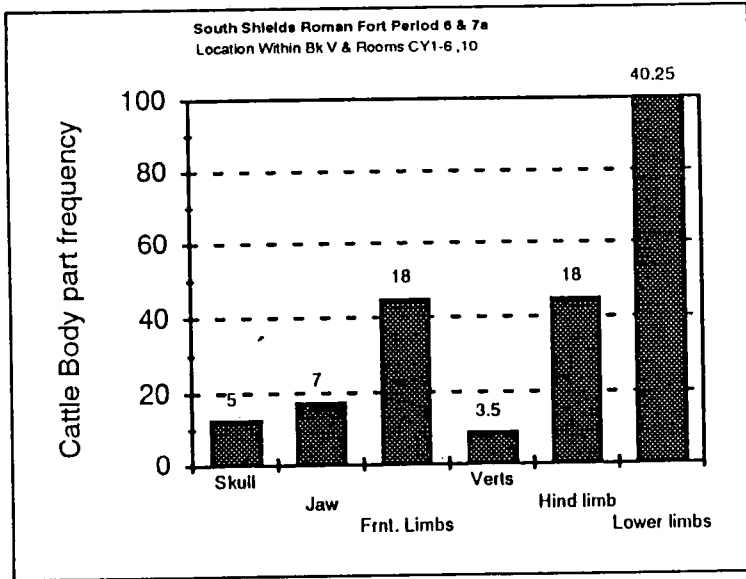
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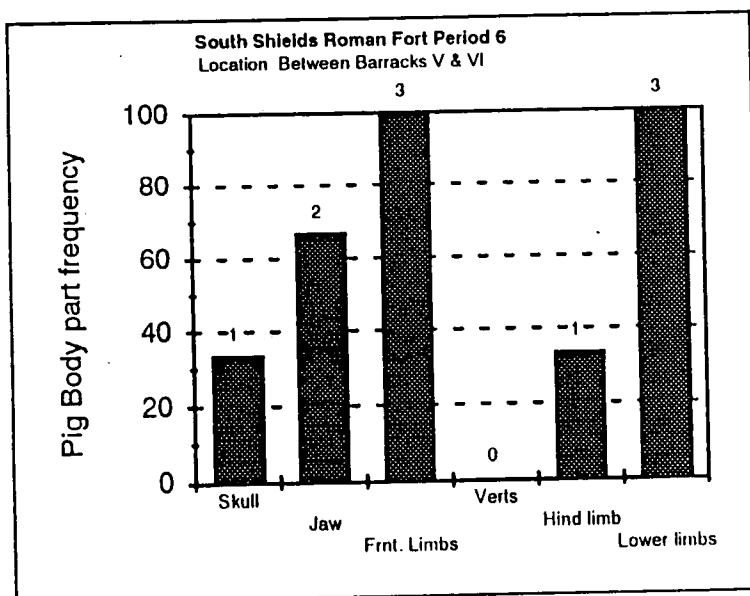
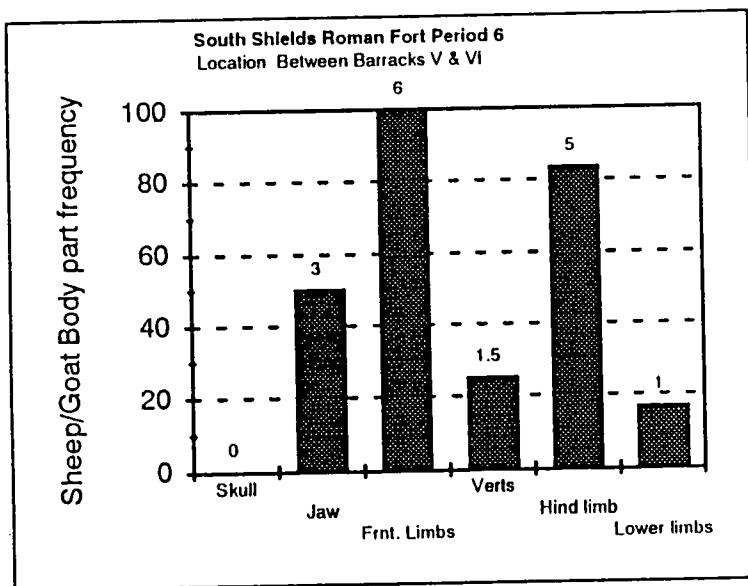
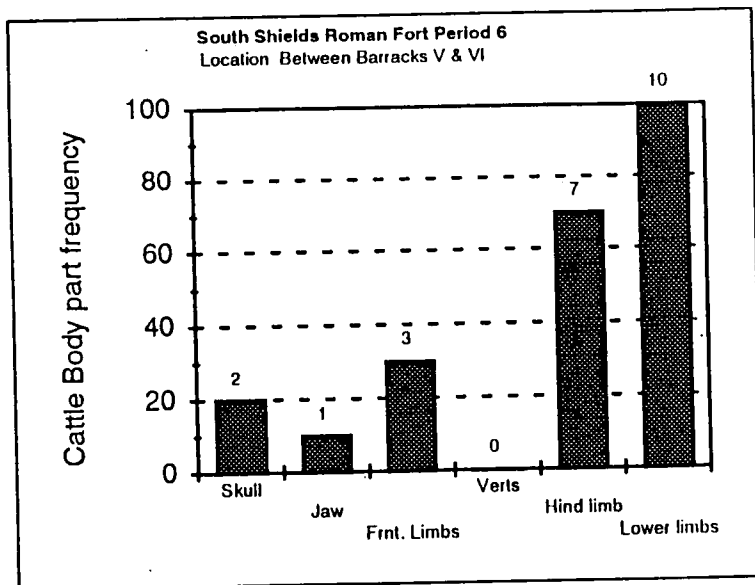
figures 50 to 52 Body part frequencies for the three domesticates location CY1-6 & 10

Stokes: Spatial patterning of faunal remains from South Shields fort



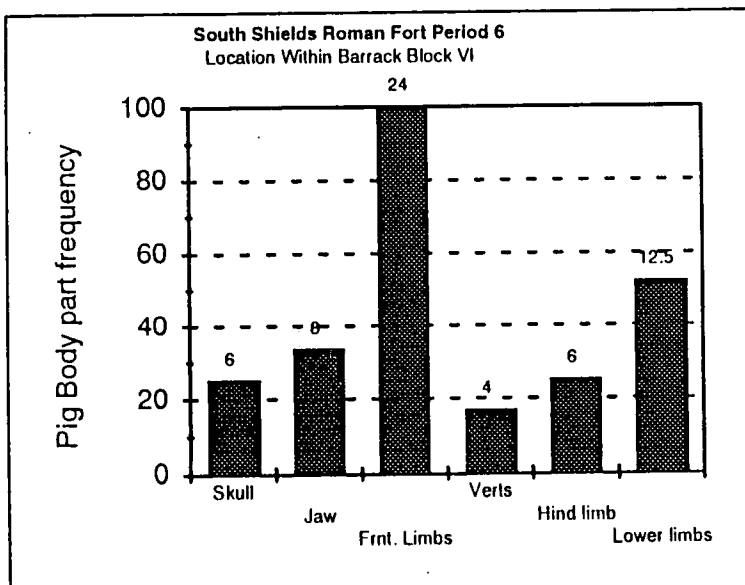
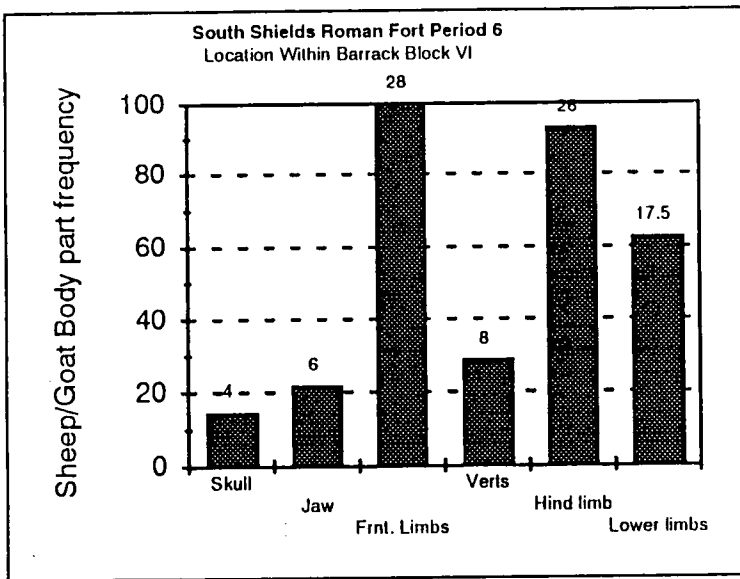
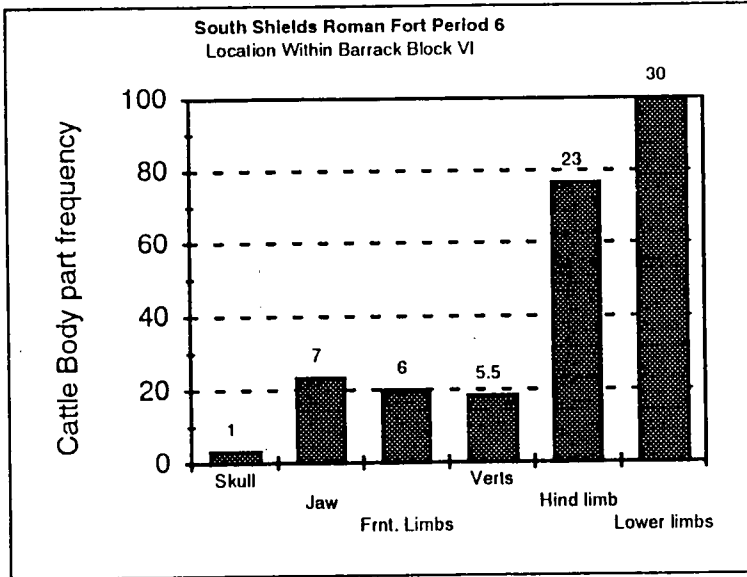
figures 53 to 55 Body part frequencies for the three domesticates location Bk V & CY

Stokes: Spatial patterning of faunal remains from South Shields fort



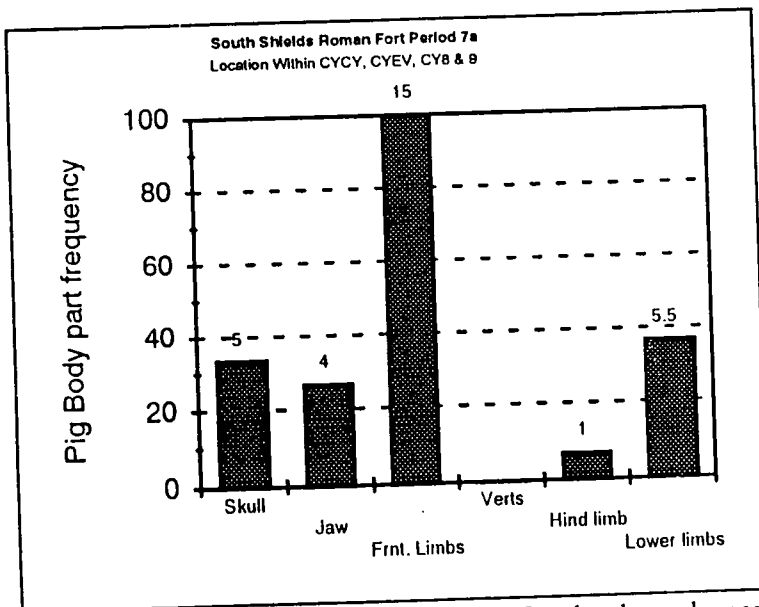
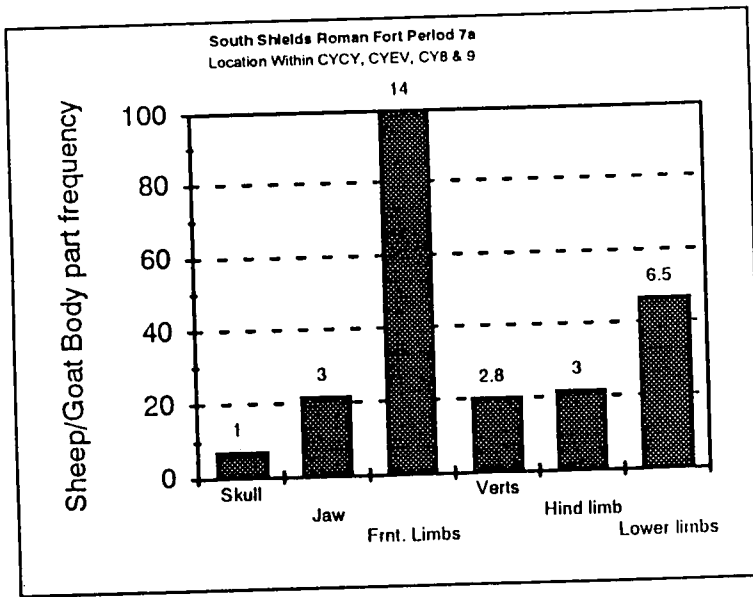
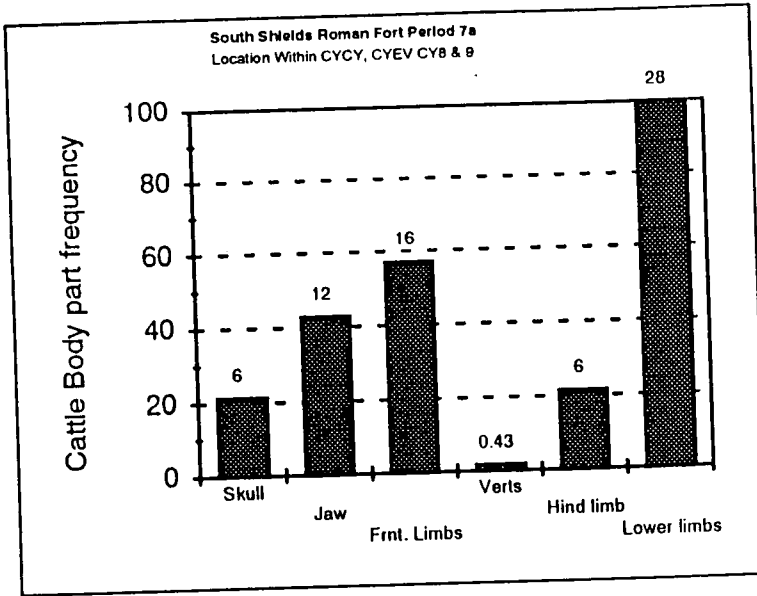
figures 56 to 58 Body part frequencies for the three domesticates location Bk V-VI

Stokes: Spatial patterning of faunal remains from South Shields fort



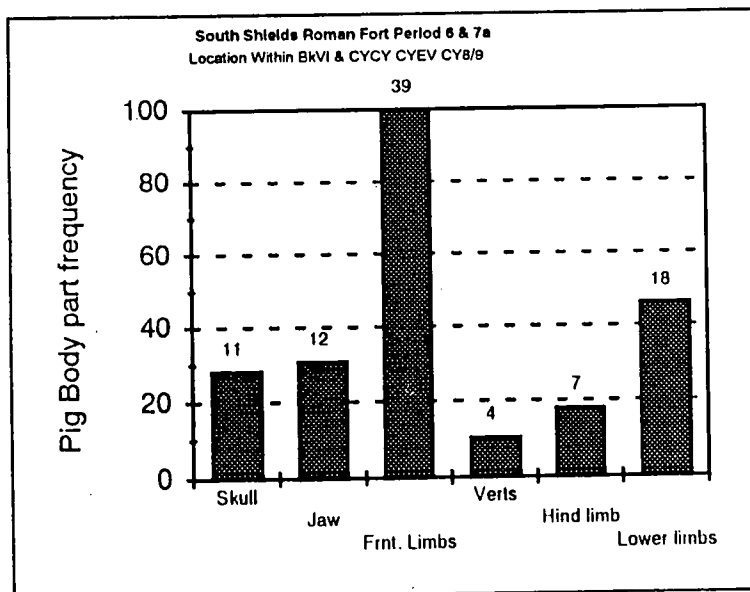
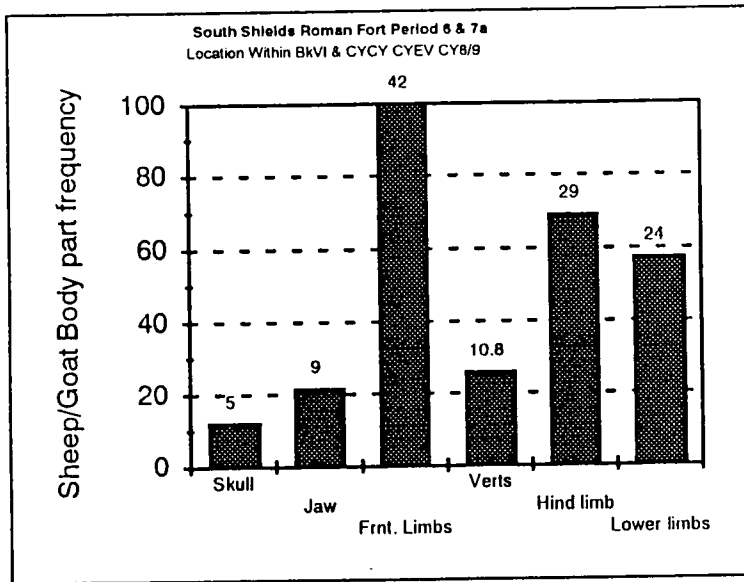
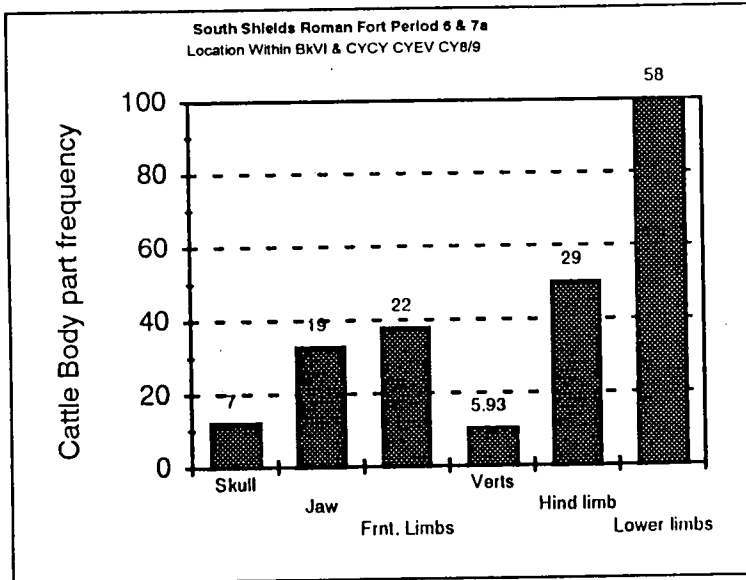
figures 59 to 61 Body part frequencies for the three domesticates location Bk VI

Stokes: Spatial patterning of faunal remains from South Shields fort



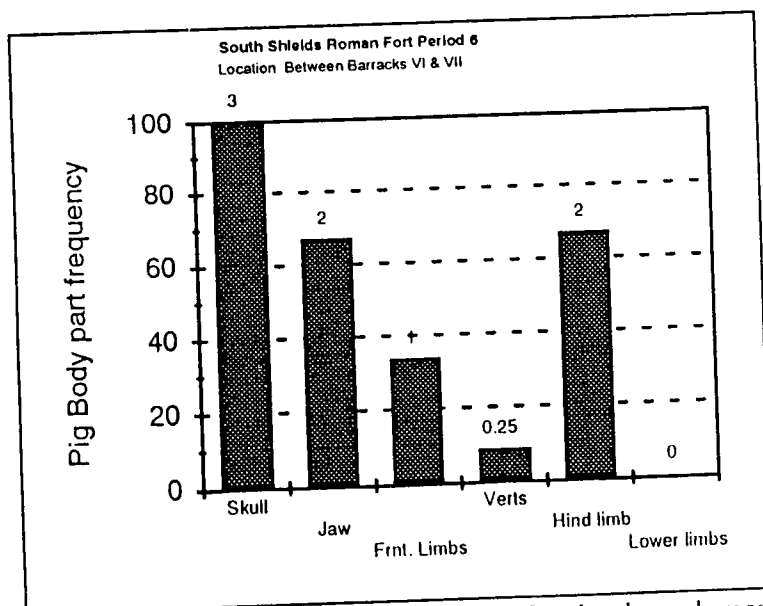
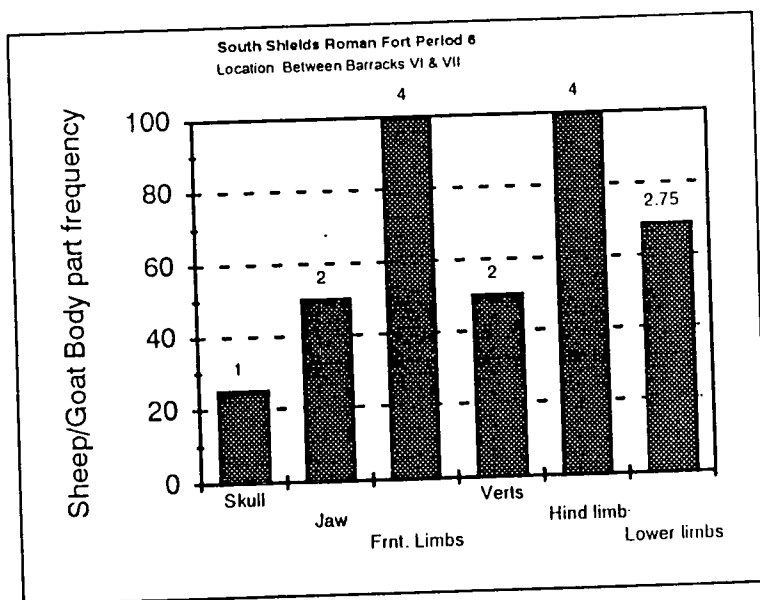
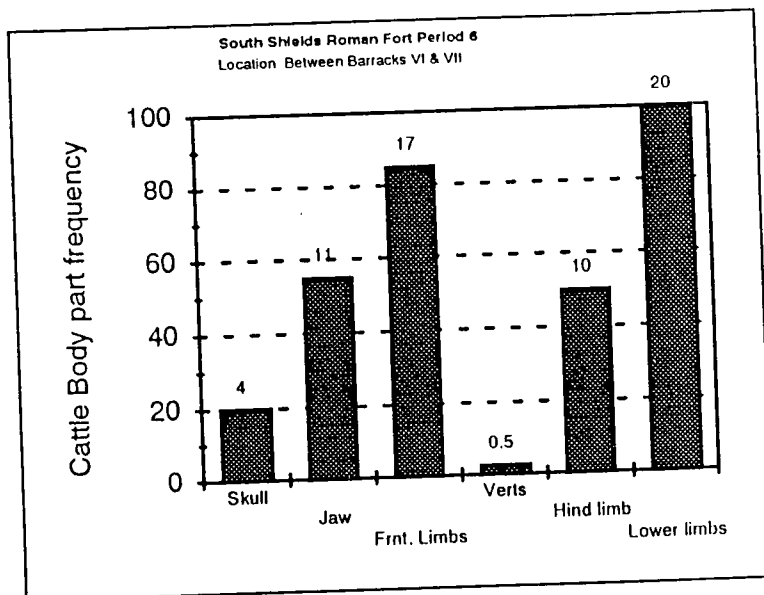
figures 62 to 64 Body part frequencies for the three domesticates location CYCY

Stokes: Spatial patterning of faunal remains from South Shields fort



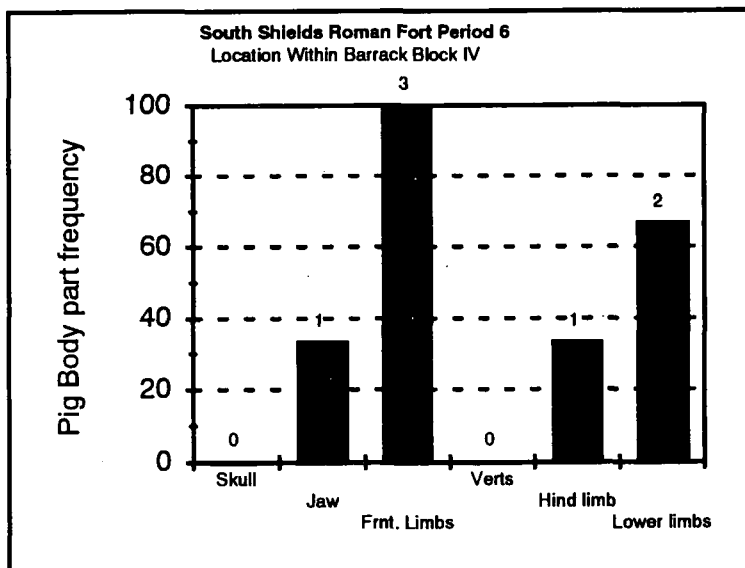
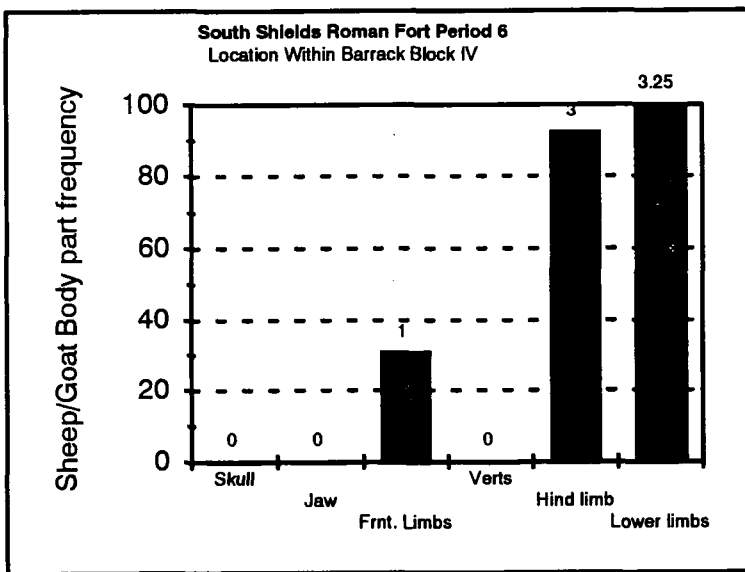
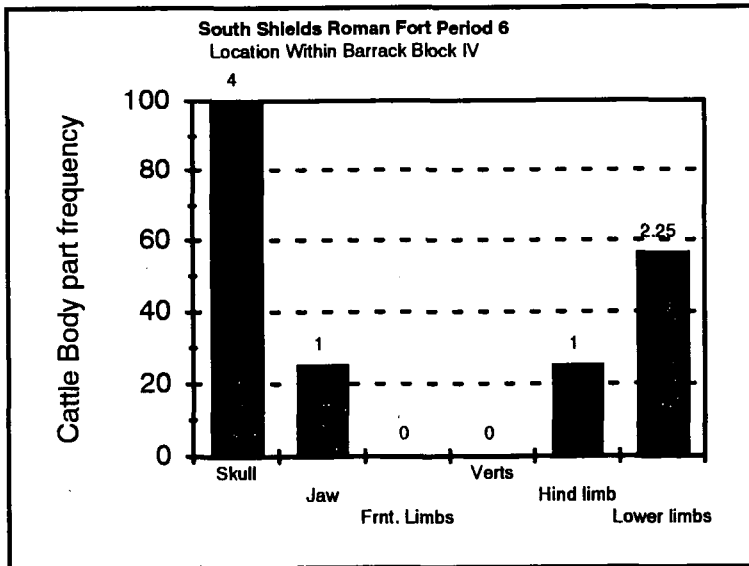
figures 65 to 67 Body part frequencies for the three domesticates location Bk VI CYCY

Stokes: Spatial patterning of faunal remains from South Shields fort



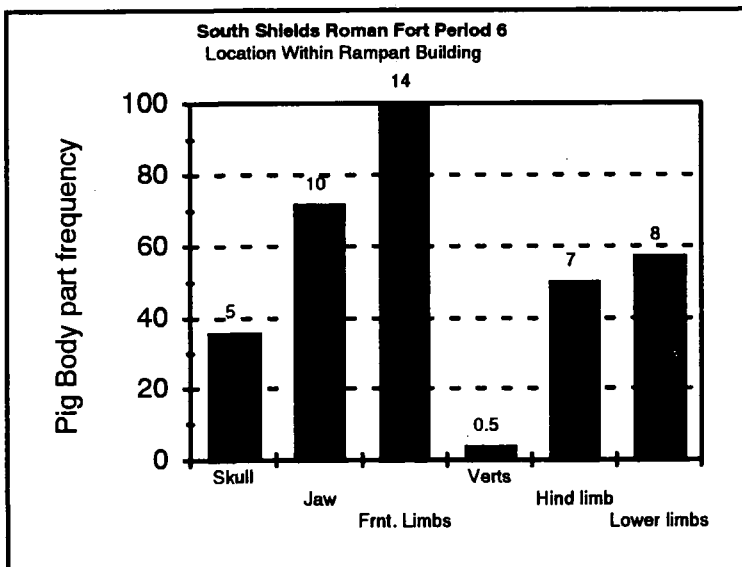
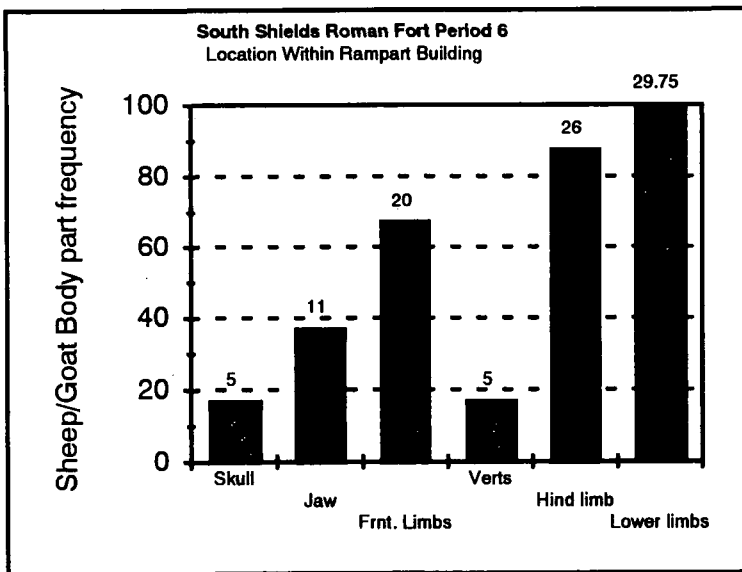
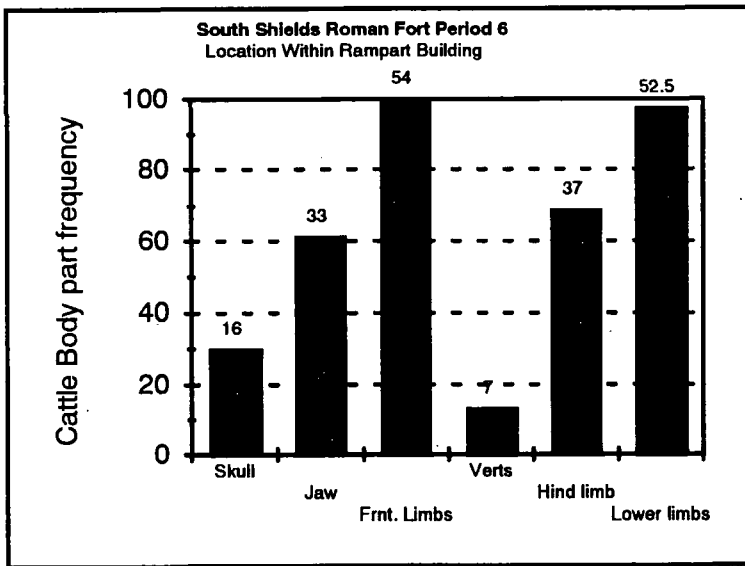
figures 68 to 70 Body part frequencies for the three domesticates location Bk VI-VII

Stokes: Spatial patterning of faunal remains from South Shields fort



figures 71 to 73 Body part frequencies for the three domesticates location Bk IV

Stokes: Spatial patterning of faunal remains from South Shields fort



figures 74 to 76 Body part frequencies for the three domesticates location rampart building

Stokes: Spatial patterning of faunal remains from South Shields fort

South Shields Roman Fort Period 6

Location Street between C14 & C15

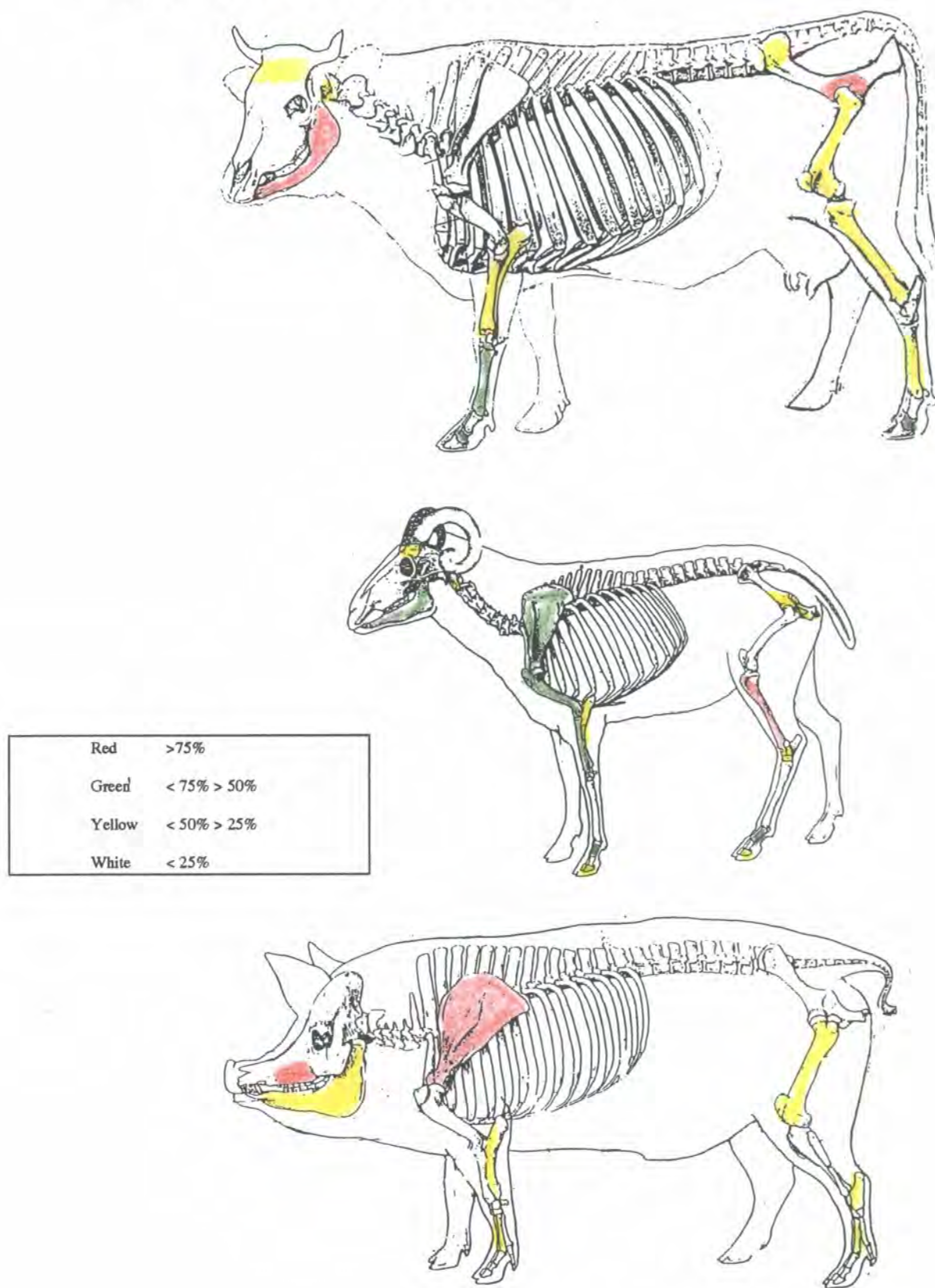


figure 77 Diagrammatic frequency for location C14/C15

Stokes: Spatial patterning of faunal remains from South Shields fort

South Shields Roman Fort Period 6 Location Within Barrack Block III

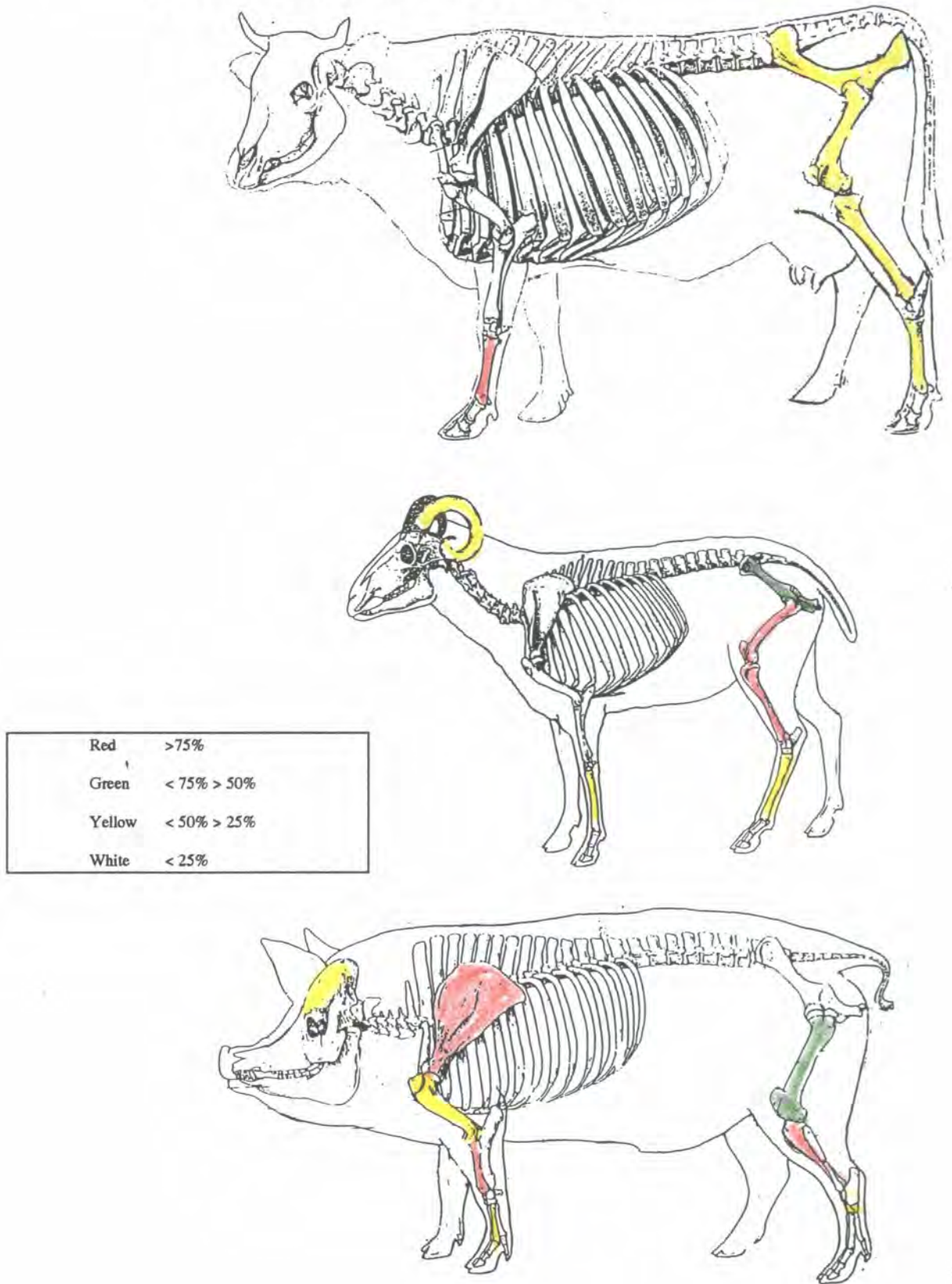


figure 78 Diagrammatic frequency for location Bk III

Stokes: Spatial patterning of faunal remains from South Shields fort

South Shields Roman Fort Period 6

Location Within Bk

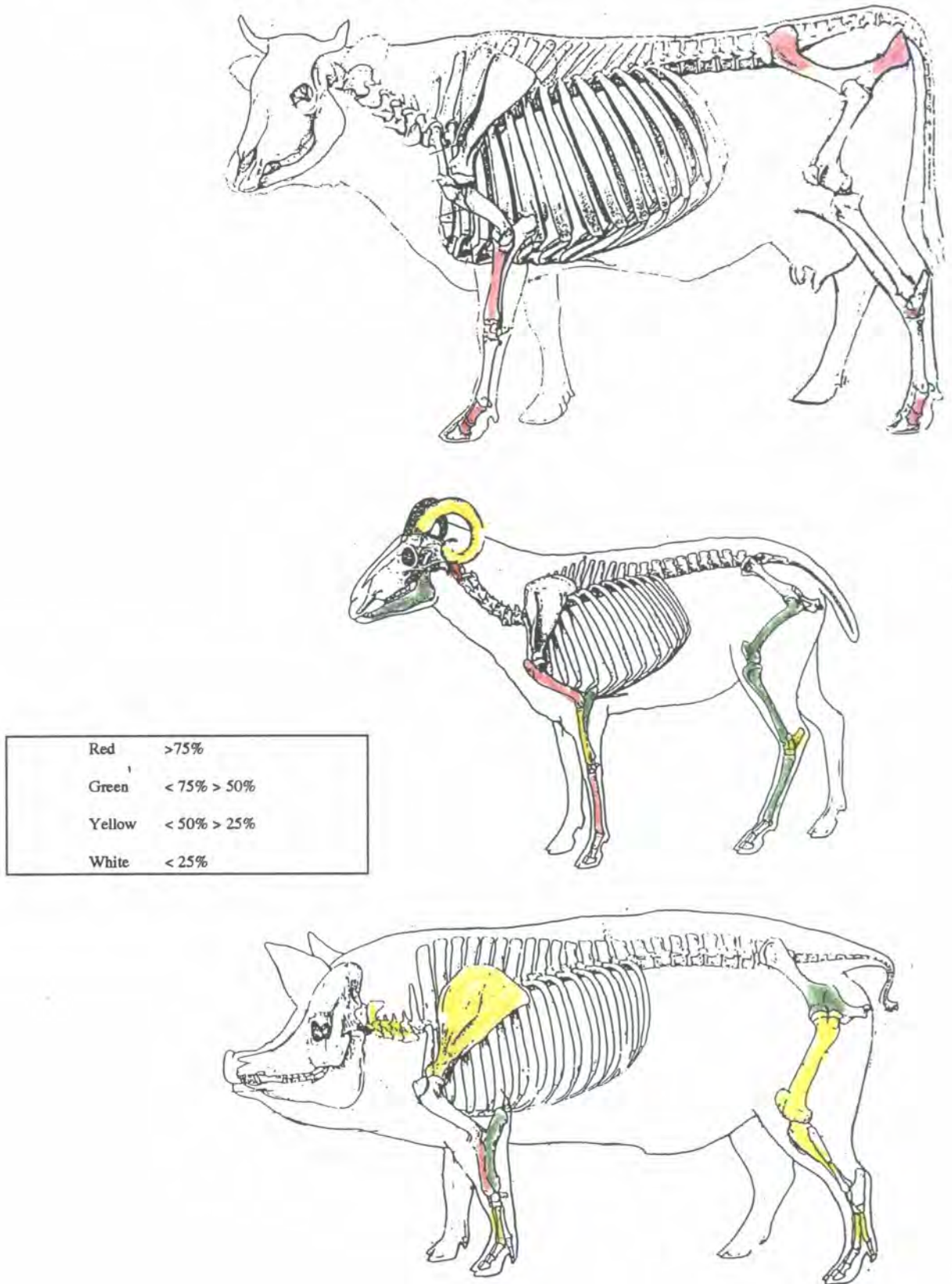


figure 79 Diagrammatic frequency for location Bk

Stokes: Spatial patterning of faunal remains from South Shields fort
South Shields Roman Fort Period 6 & 7a
Location Within Bk III & Bk

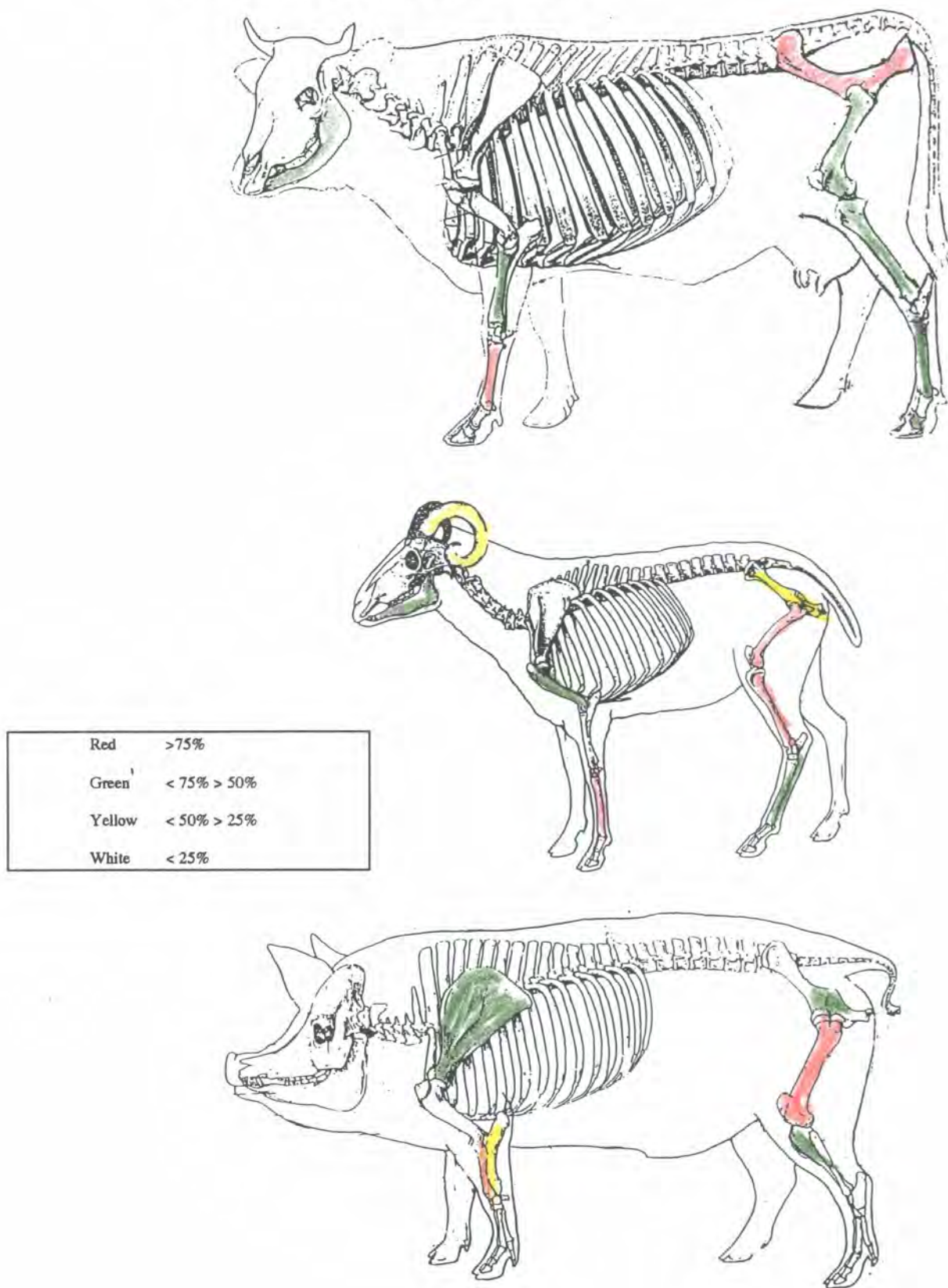


figure 80 Diagrammatic frequency for location Barrack Blocks III & Bk

Stokes: Spatial patterning of faunal remains from South Shields fort

South Shields Roman Fort Period 6

Location Between Bk III & V

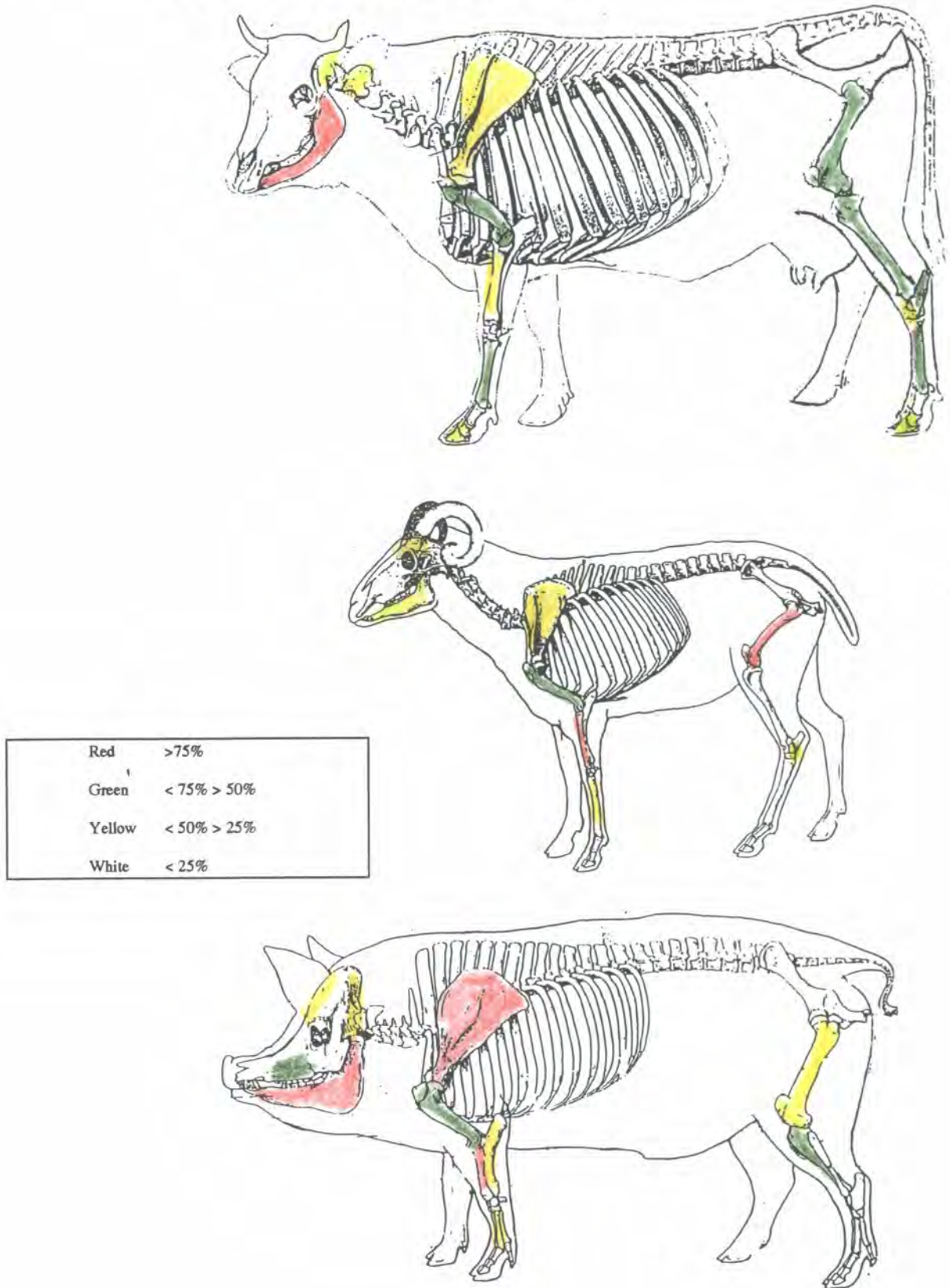


figure 81 Diagrammatic frequency for location Between Bk III & V

Stokes: Spatial patterning of faunal remains from South Shields fort

South Shields Roman Fort Period 6

Location Within Barrack Block V

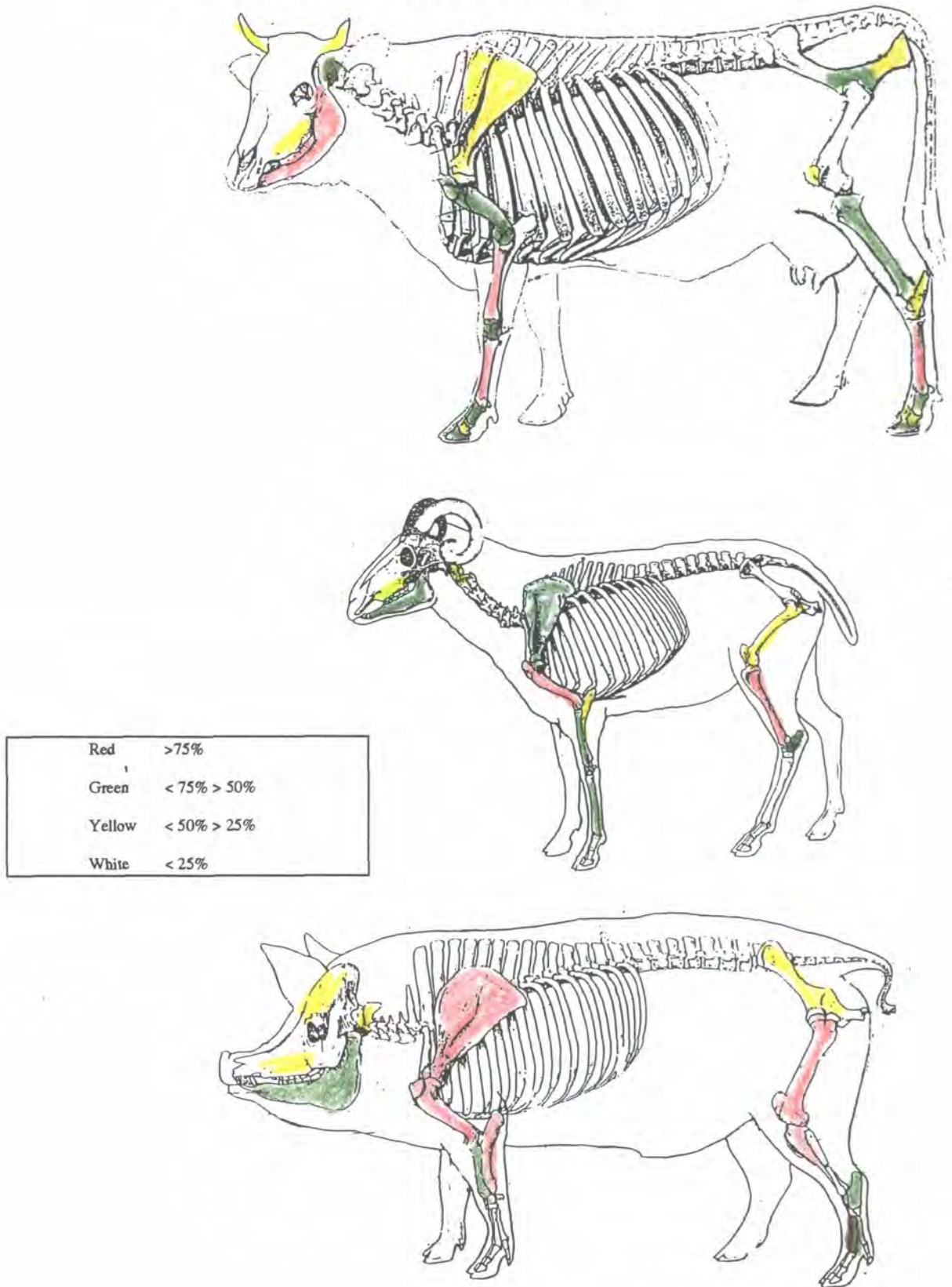


figure 82 Diagrammatic frequency for location Within Barrack Block V

Stokes: Spatial patterning of faunal remains from South Shields fort

South Shields Roman Fort Period 7a

Location CY 1-6 & CY10

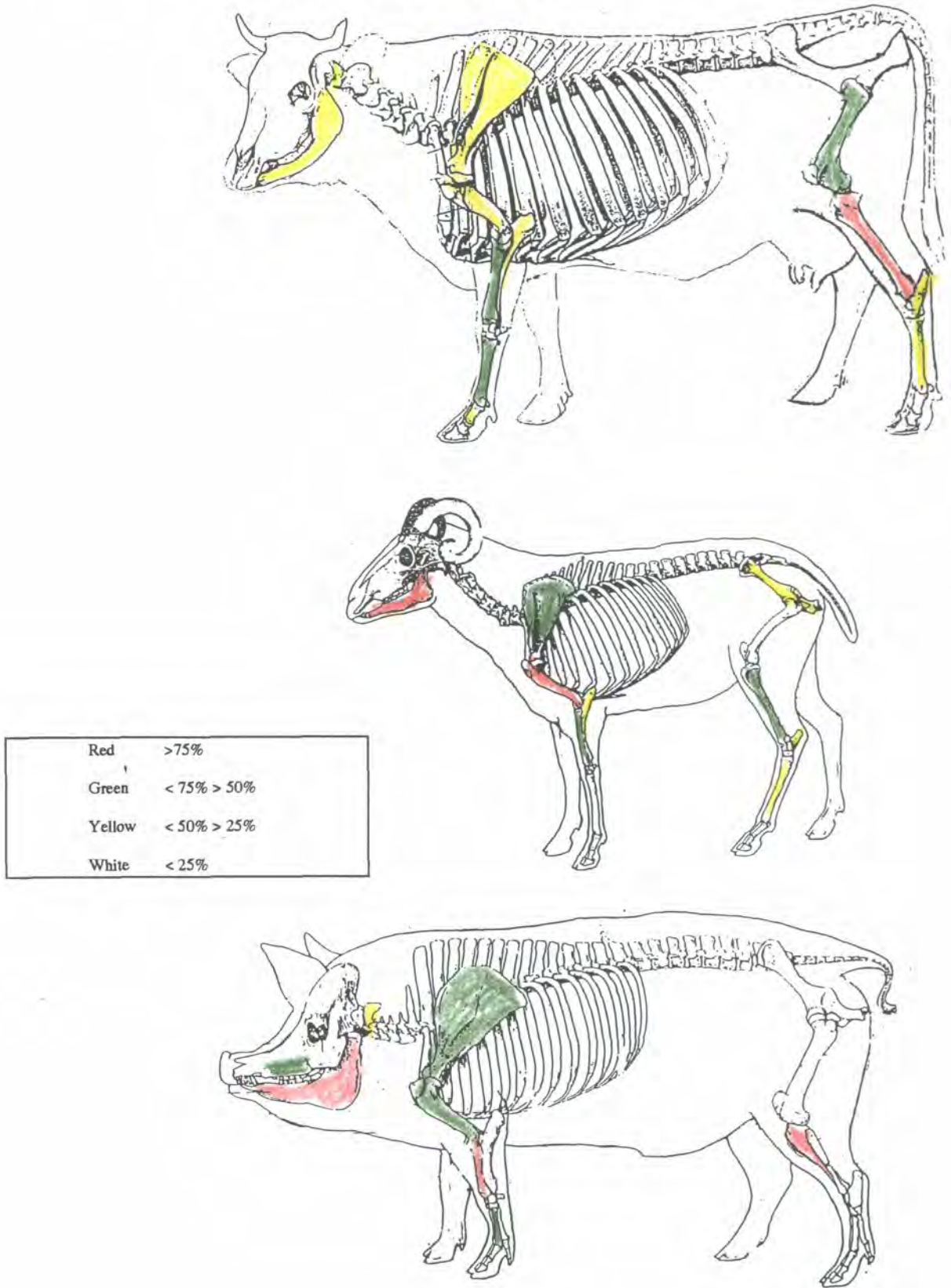


figure 83 Diagrammatic frequency for location CY1-6 & CY10

Stokes: Spatial patterning of faunal remains from South Shields fort
South Shields Roman Fort Period 6 & 7a
Location Bk V & CY 1-6 & CY10

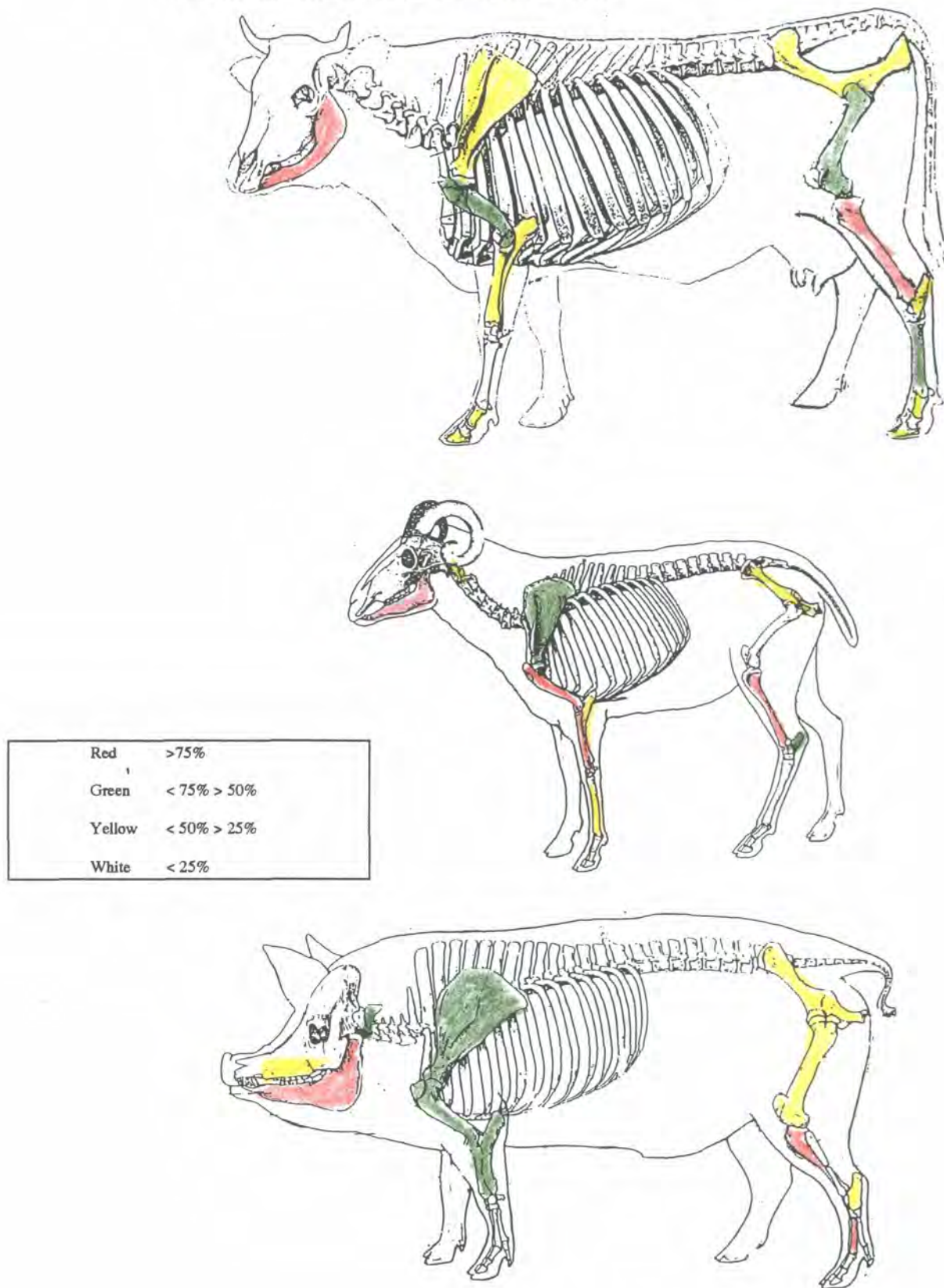


figure 84 Diagrammatic frequency for location Bk V & CY1-6 & CY10

Stokes: Spatial patterning of faunal remains from South Shields fort
South Shields Roman Fort Period 6 & 7a
Location Between Barracks V & VI

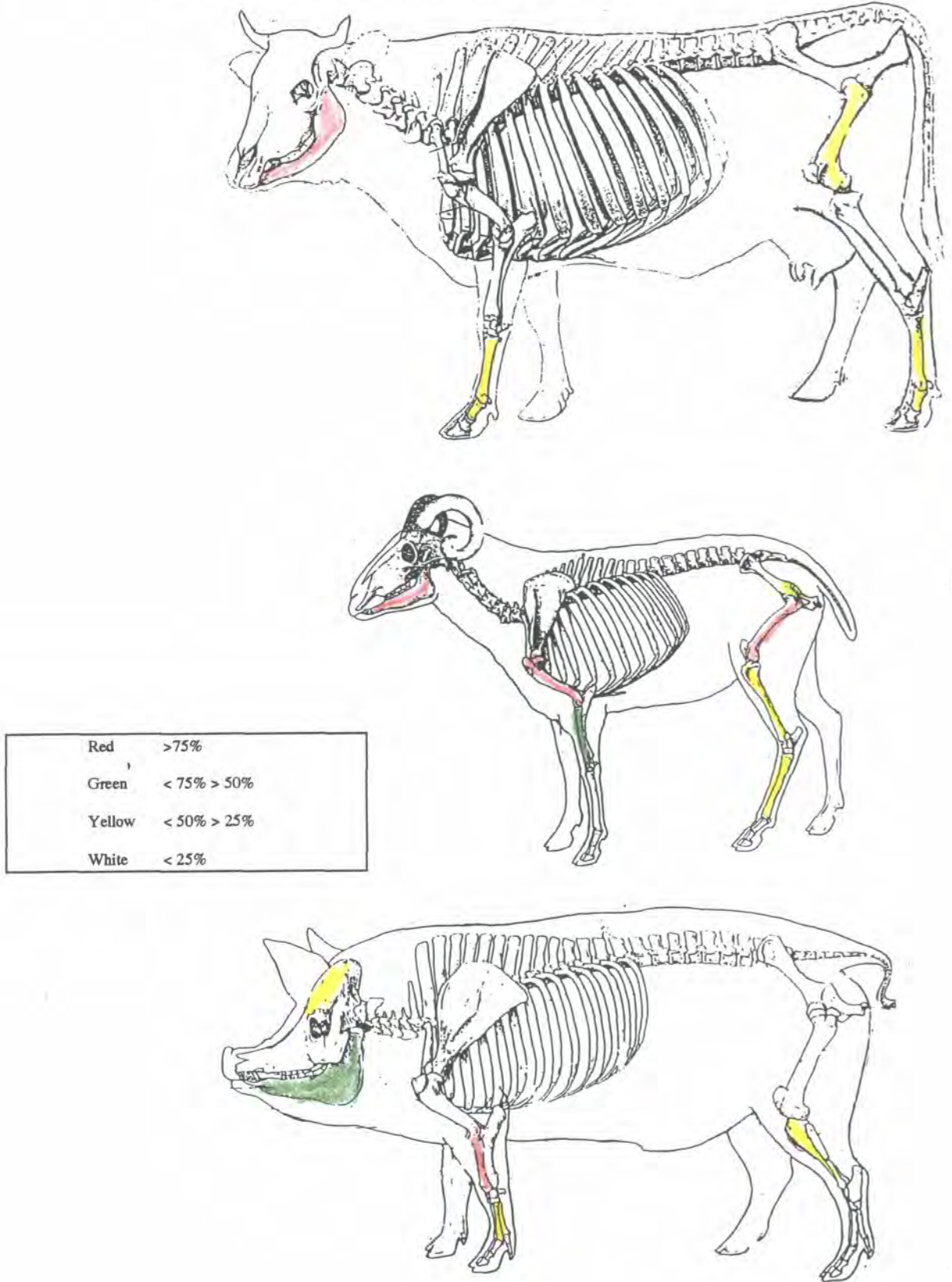


figure 85 Diagrammatic frequency for location Between Barracks V & VI

Stokes: Spatial patterning of faunal remains from South Shields fort
South Shields Roman Fort Period 6 & 7a
Location Within Barrack Block VI

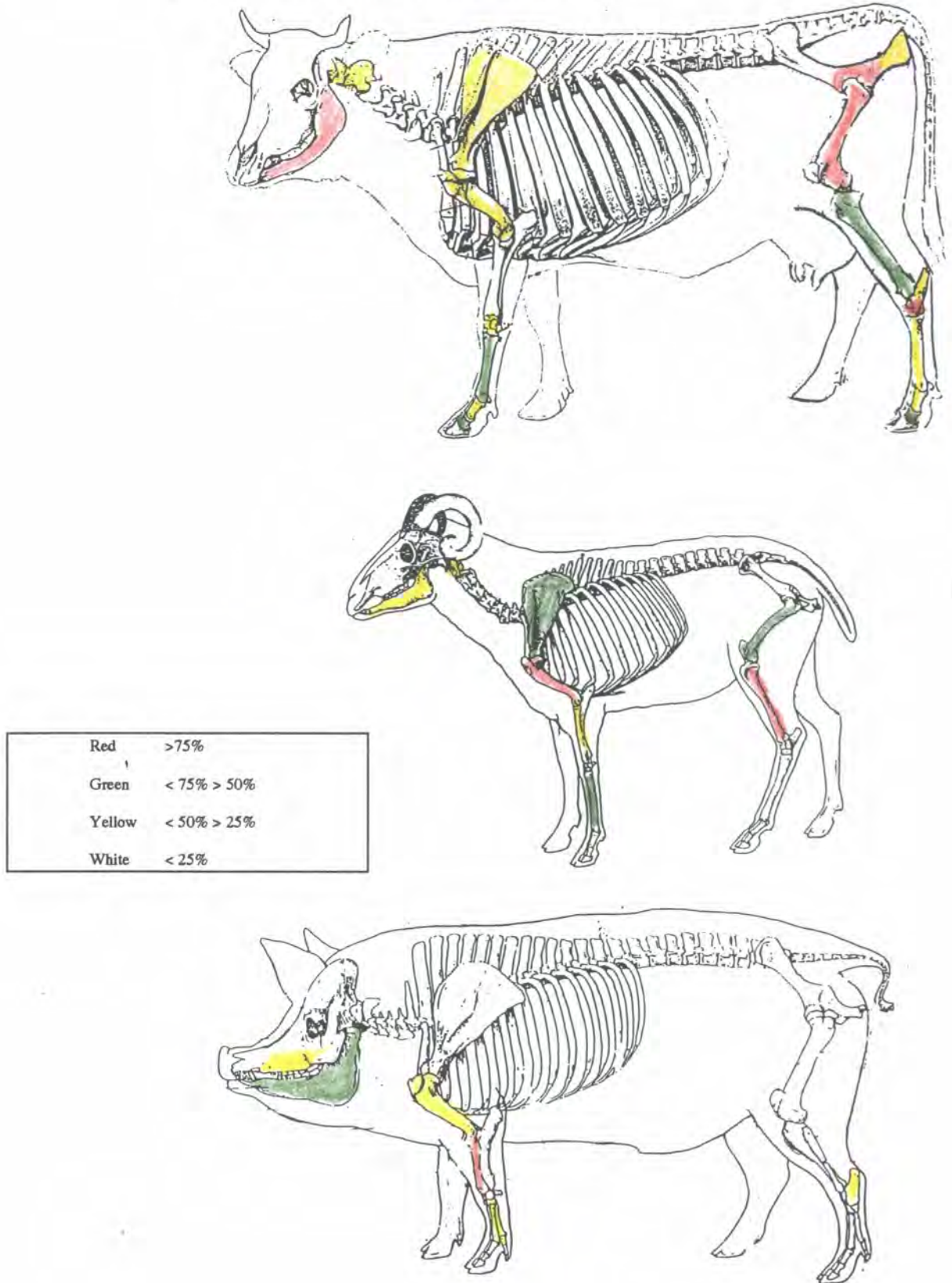


figure 86 Diagrammatic frequency for location Within Barrack Block VI

Stokes: Spatial patterning of faunal remains from South Shields fort

South Shields Roman Fort Period 7a

Location CYCY, CYEV, CY8 & 9

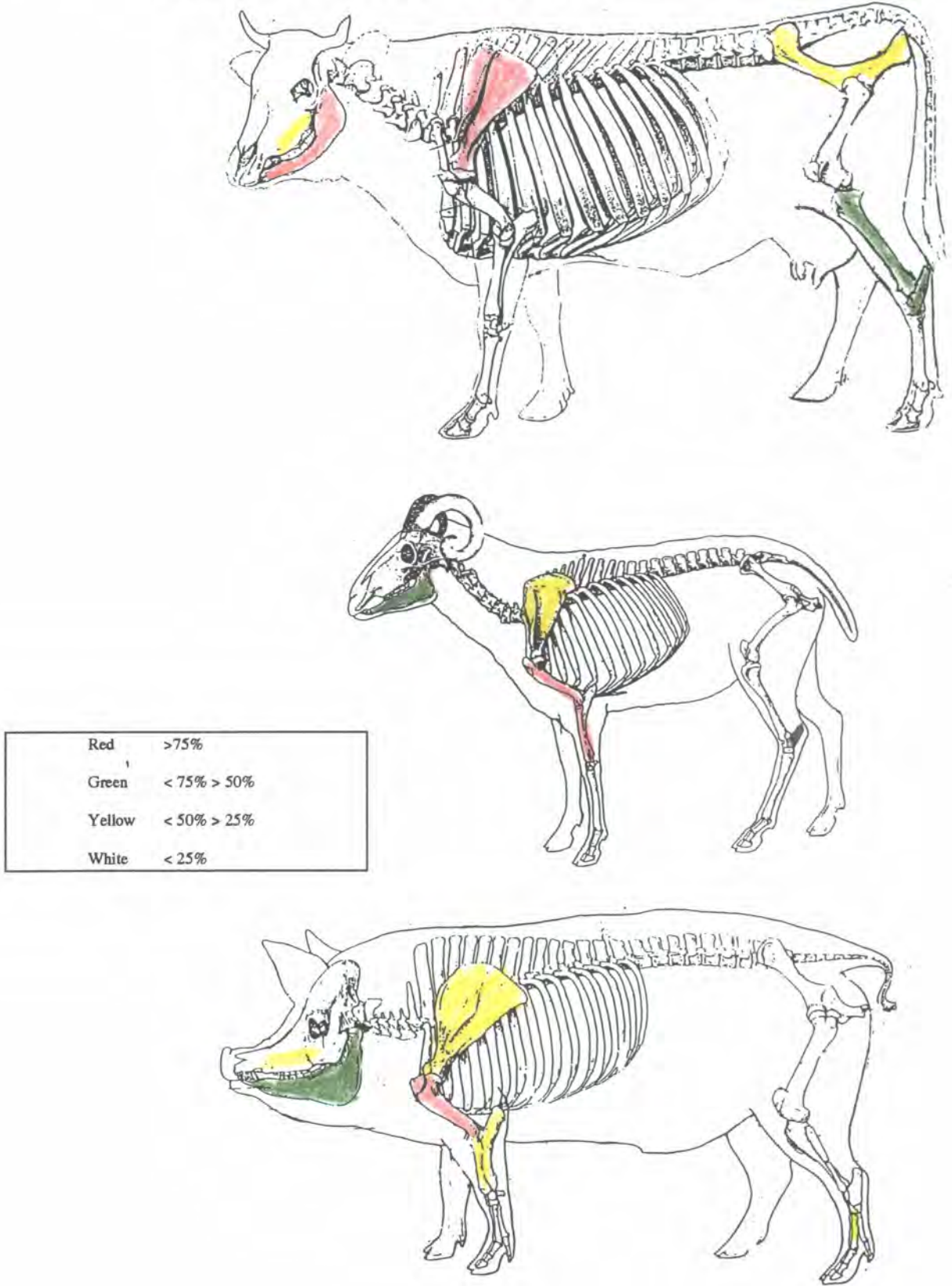


figure 87 Diagrammatic frequency for location Within CYCY, CYEV, CY8 & 9

Stokes: Spatial patterning of faunal remains from South Shields fort
South Shields Roman Fort Periods 7a
Location CYCY, CYEV, CY8 & 9

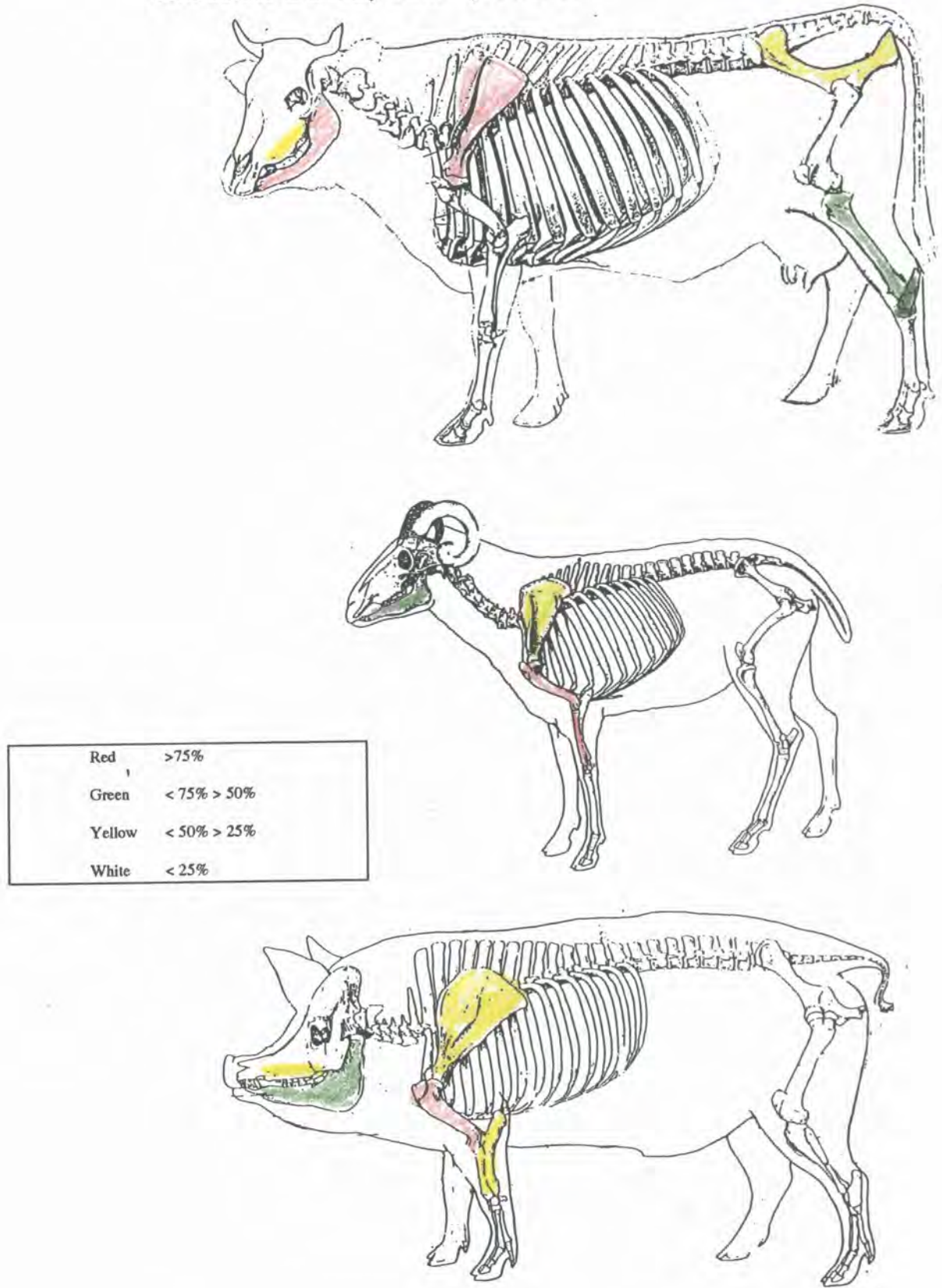


figure 87 Diagrammatic frequency for location CYCY,CYEV,CY8&9

Stokes: Spatial patterning of faunal remains from South Shields fort
South Shields Roman Fort Periods 6 & 7a
Location Bk VI & CYCY, CYEV, CY8 & 9

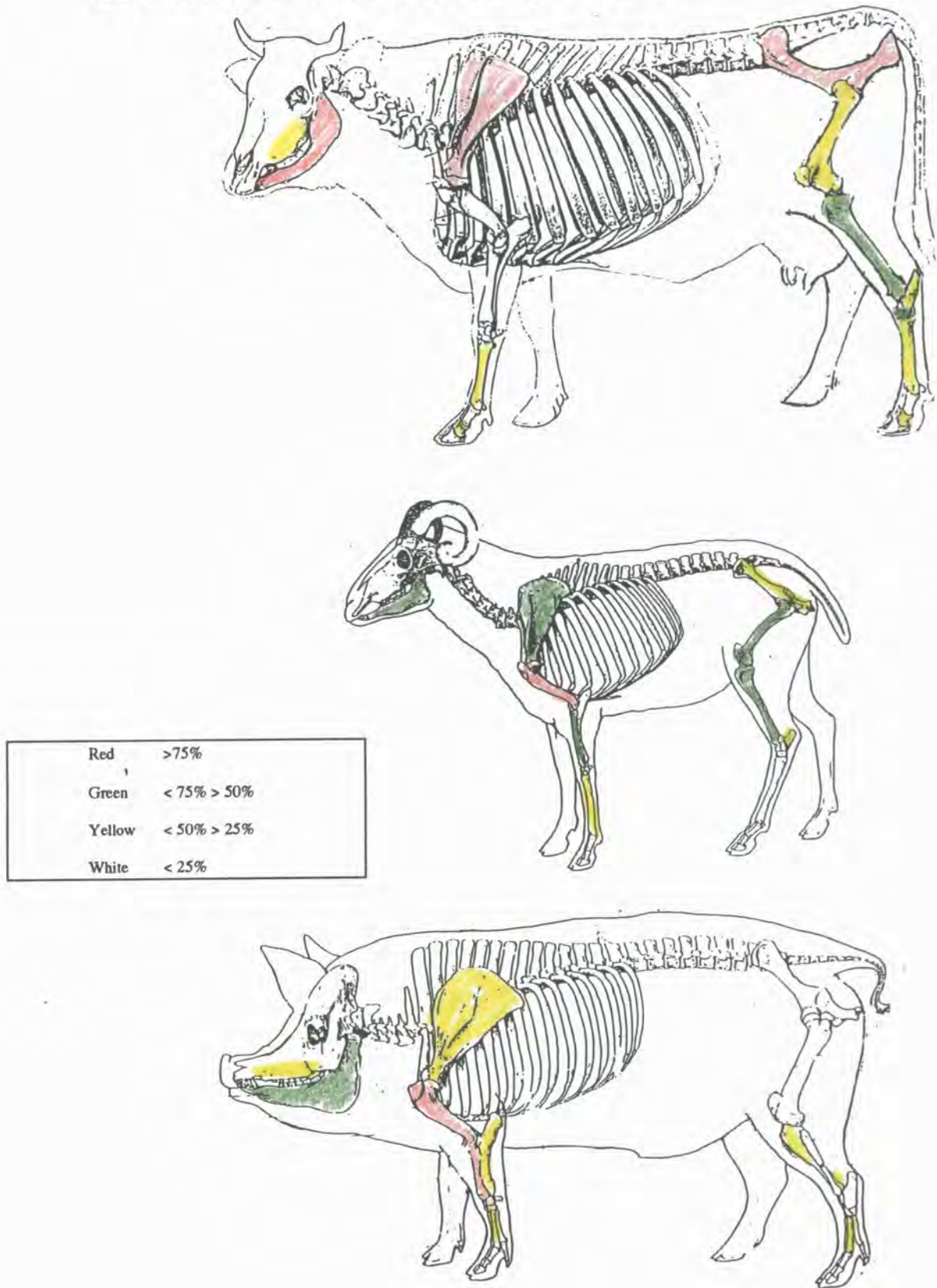


figure 88 Diagrammatic frequency for location Bk VI & CYCY, CYEV, CY8 & 9

Stokes: Spatial patterning of faunal remains from South Shields fort

South Shields Roman Fort Periods 6 Location Between Barracks VI & VII

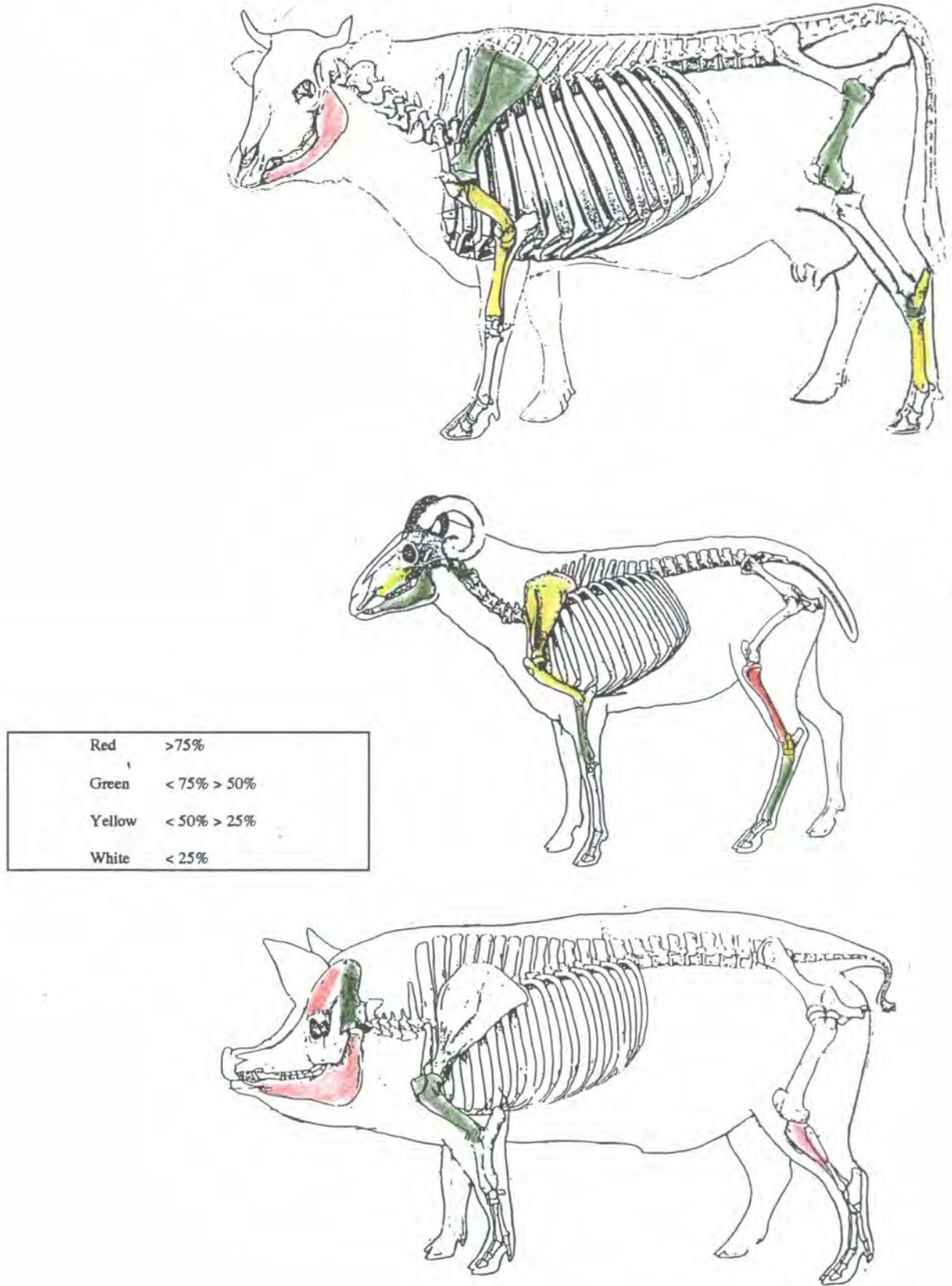


figure 89 Diagrammatic frequency for location Bk VI & VII

Stokes: Spatial patterning of faunal remains from South Shields fort

South Shields Roman Fort Periods 6

Location Within Barrack IV

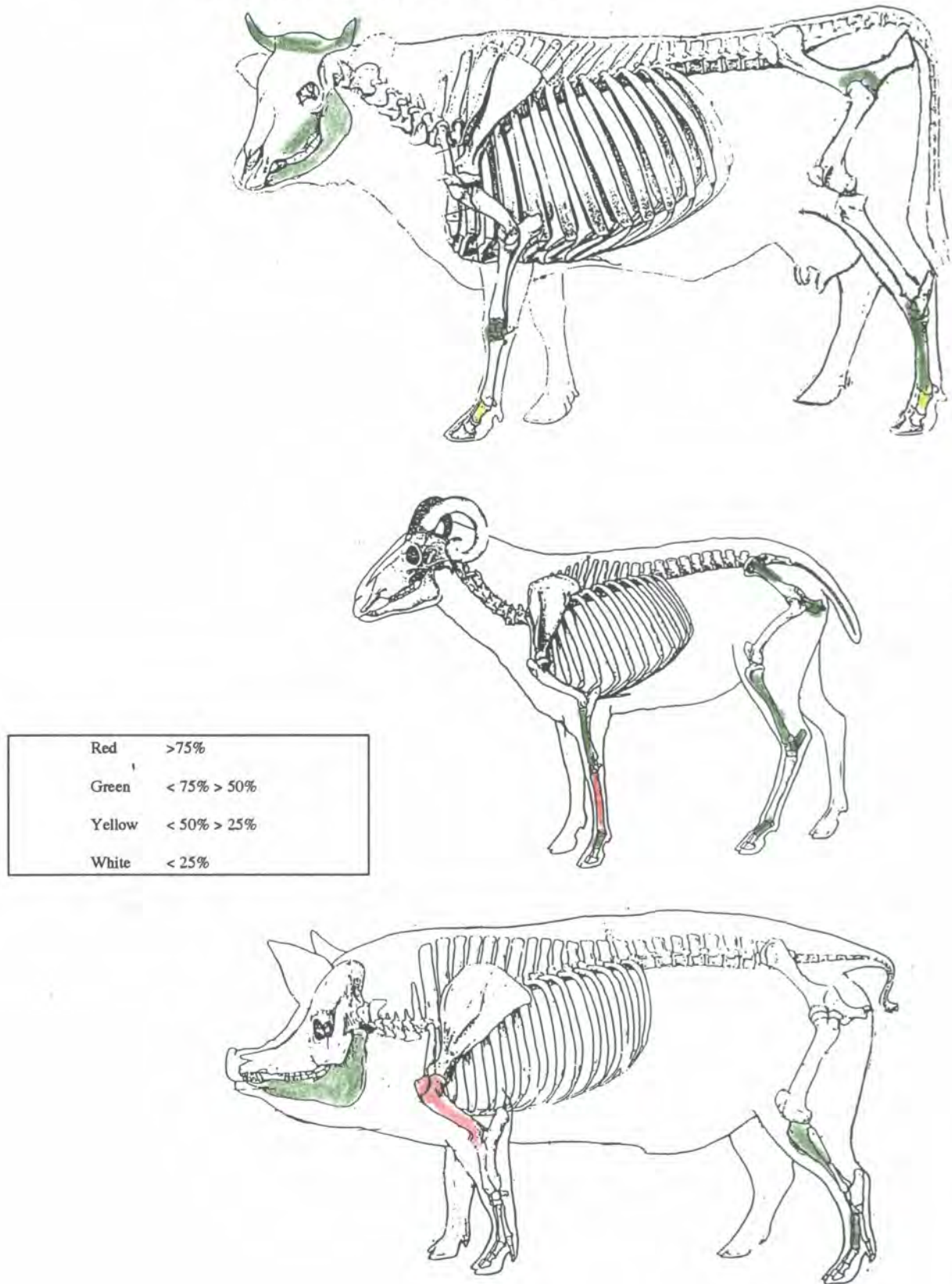


figure 90 Diagrammatic frequency for location Barrack Block IV

Stokes: Spatial patterning of faunal remains from South Shields fort

South Shields Roman Fort Periods 6

Location Rampart Buiding

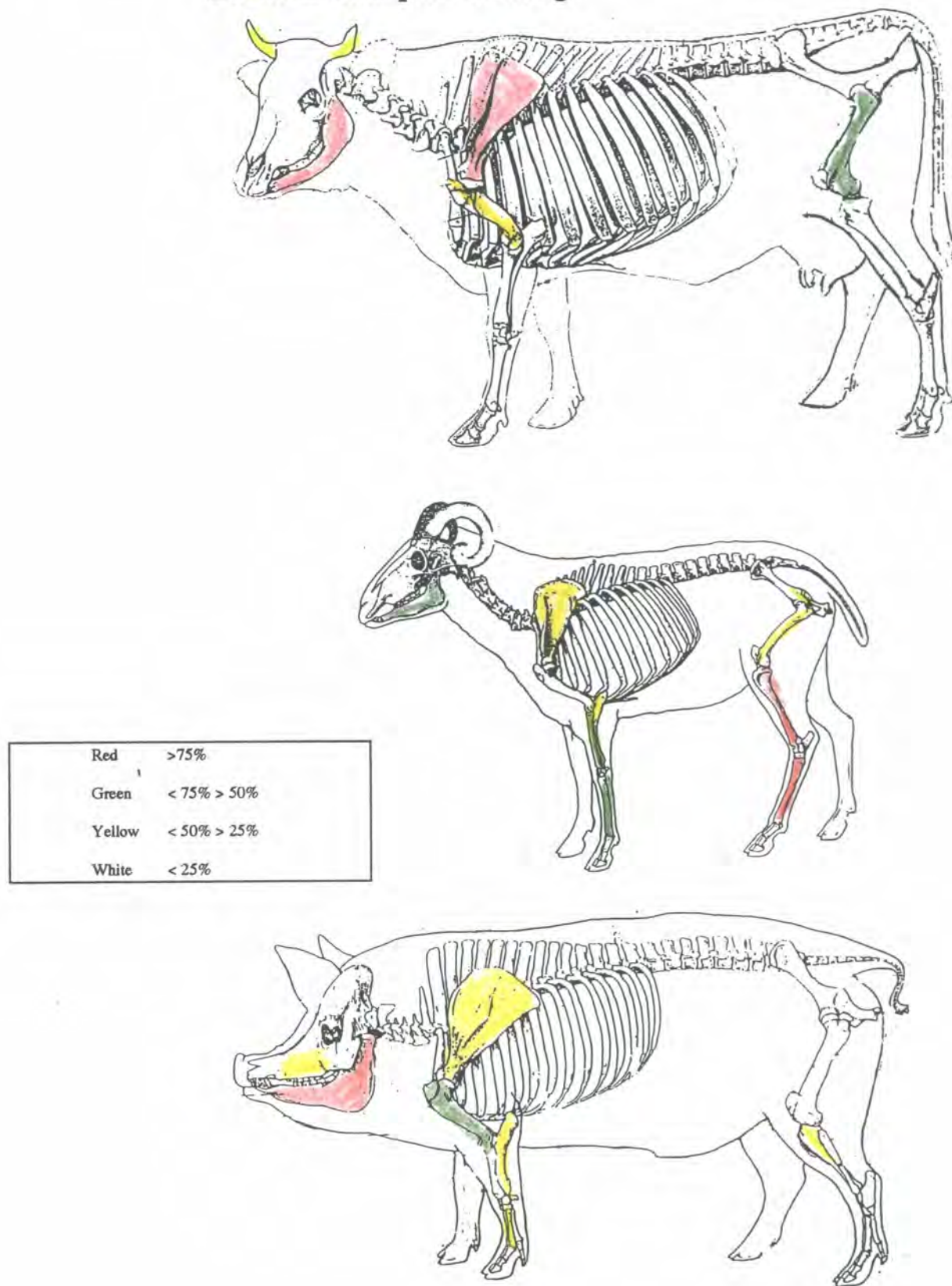


figure 91 Diagrammatic frequency for location Rampart Buiding

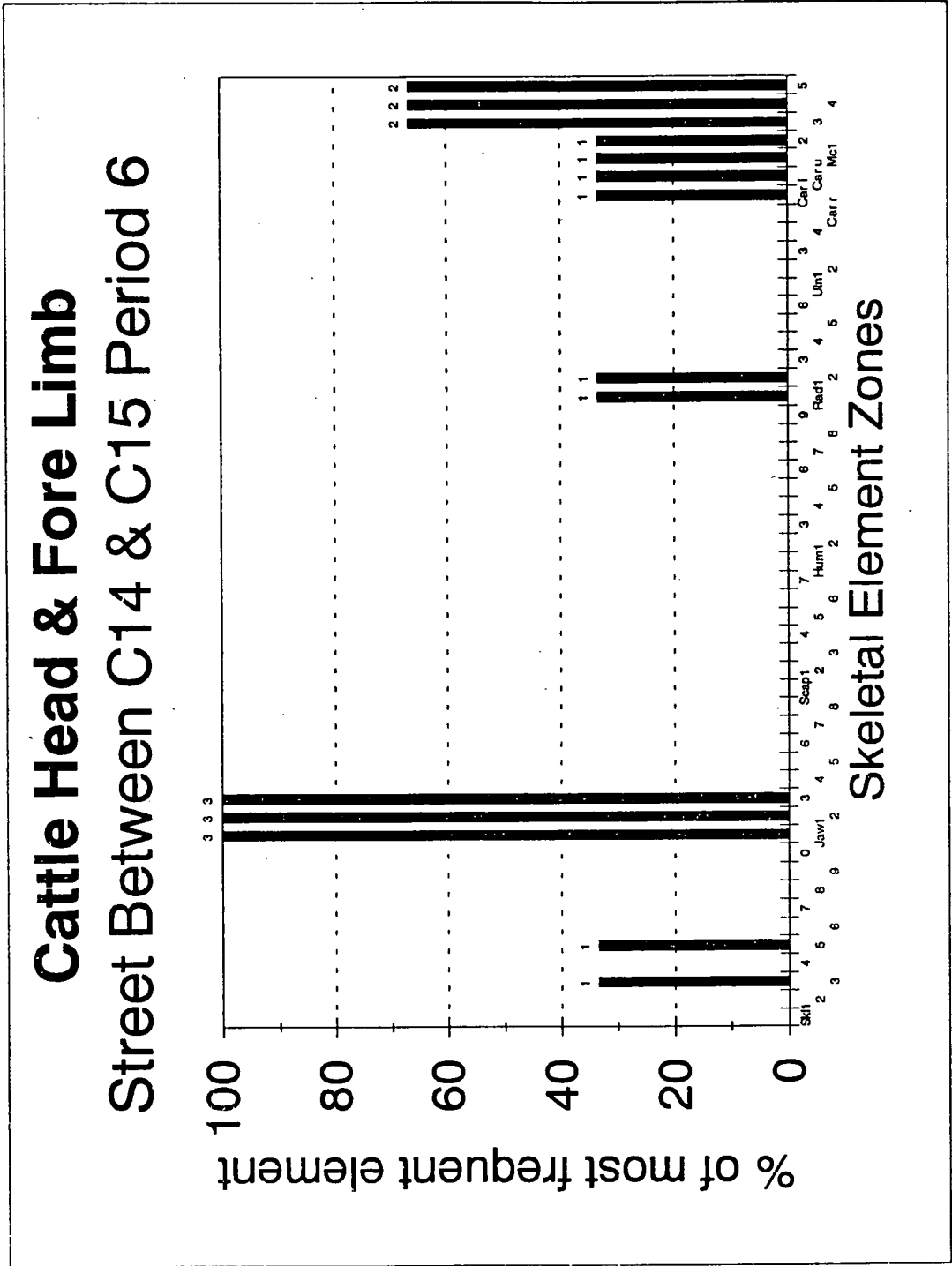
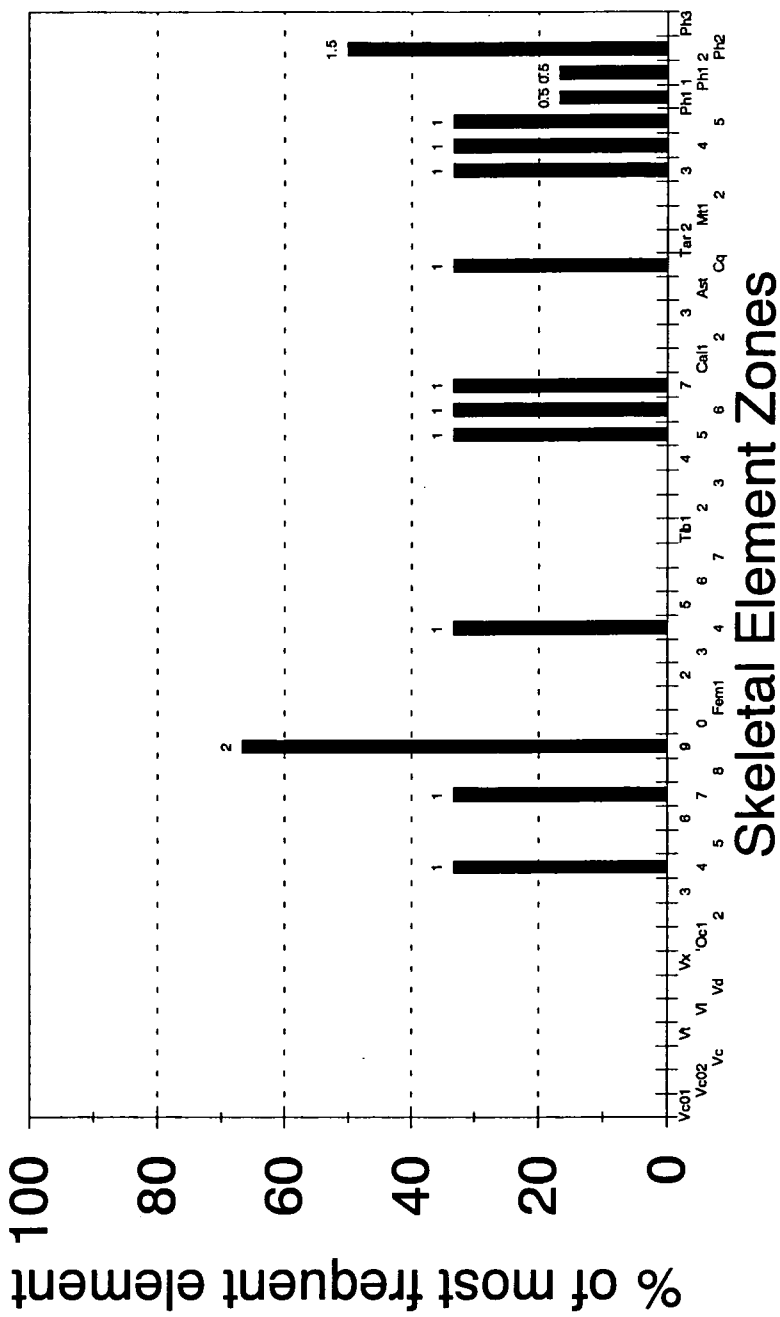


figure 92

Cattle Vertebrae & Hind Limb Street Between C14 & C15 Period 6



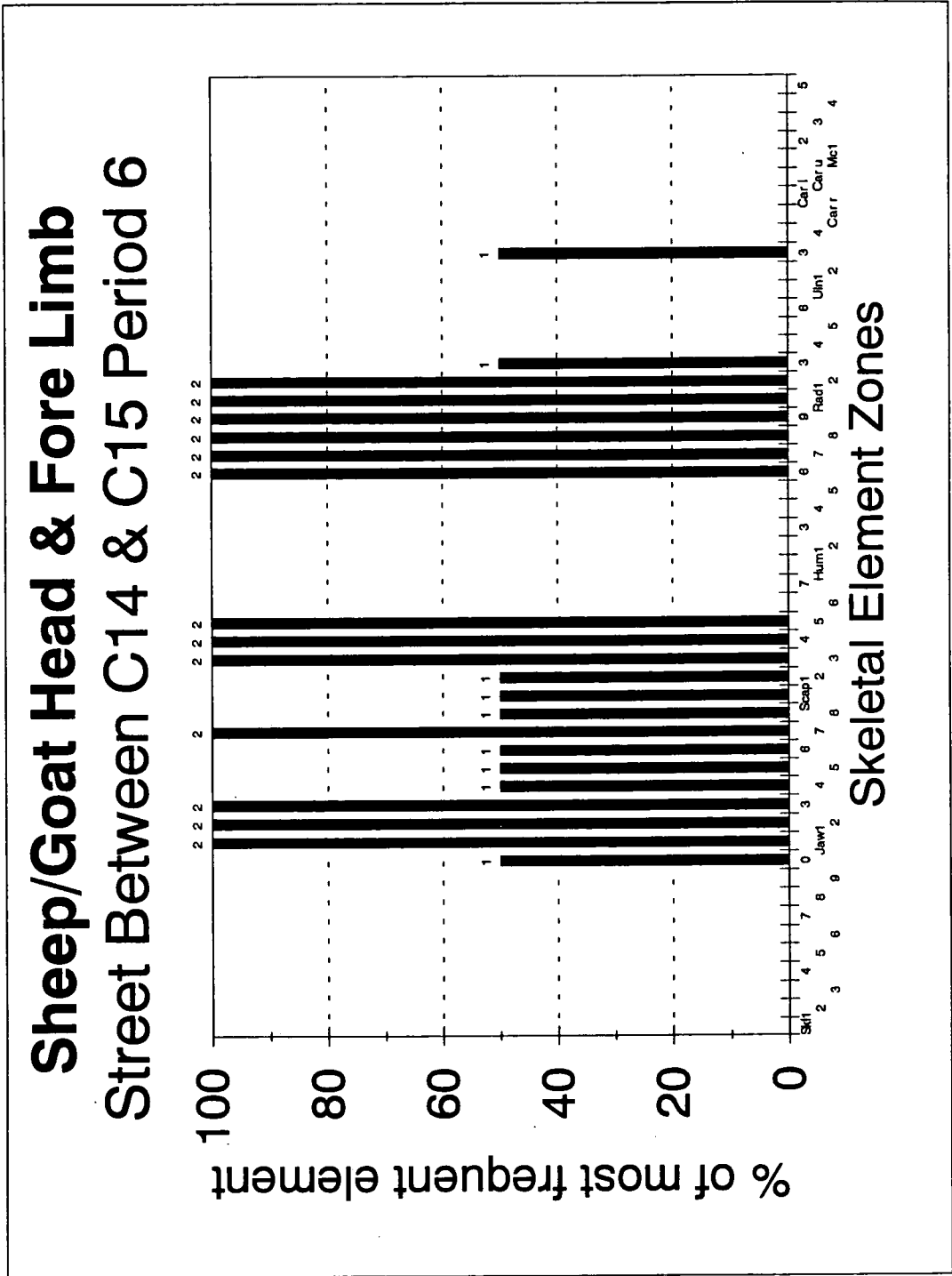


figure 94

Pig Head & Fore Limb Street Between C14 & C15 Period 6

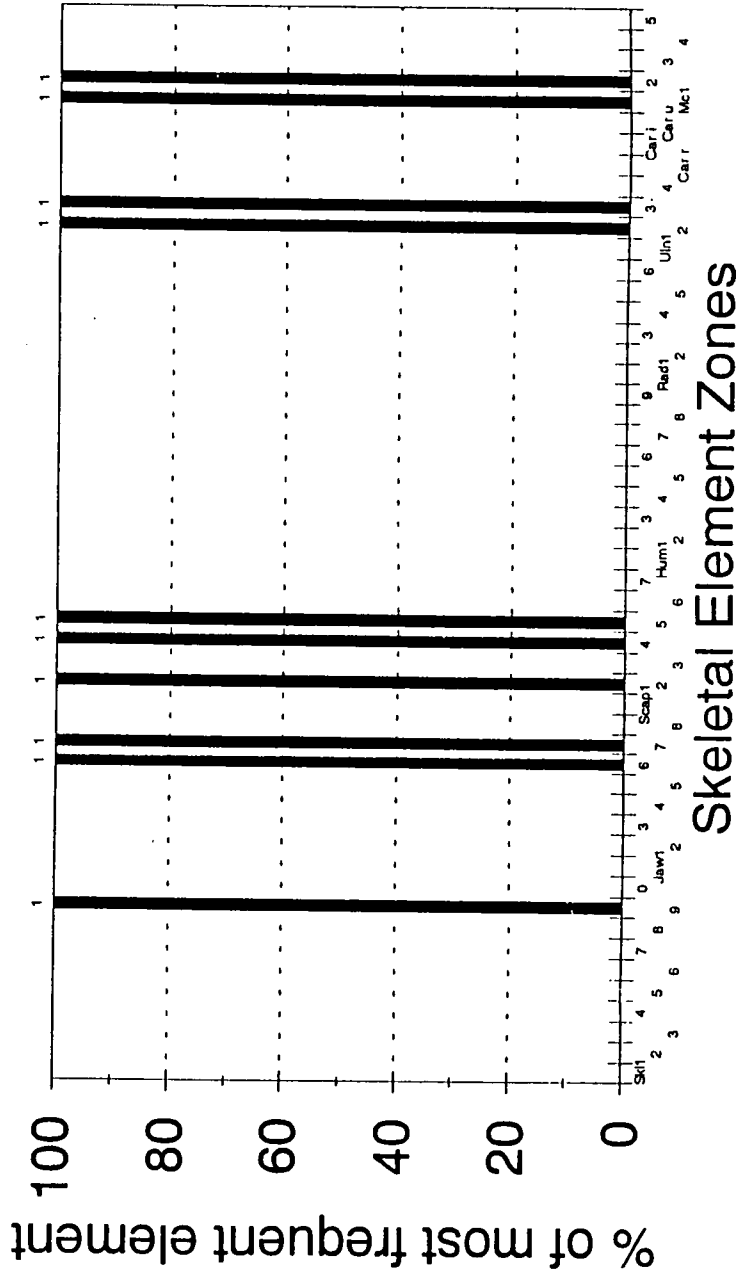


figure 96

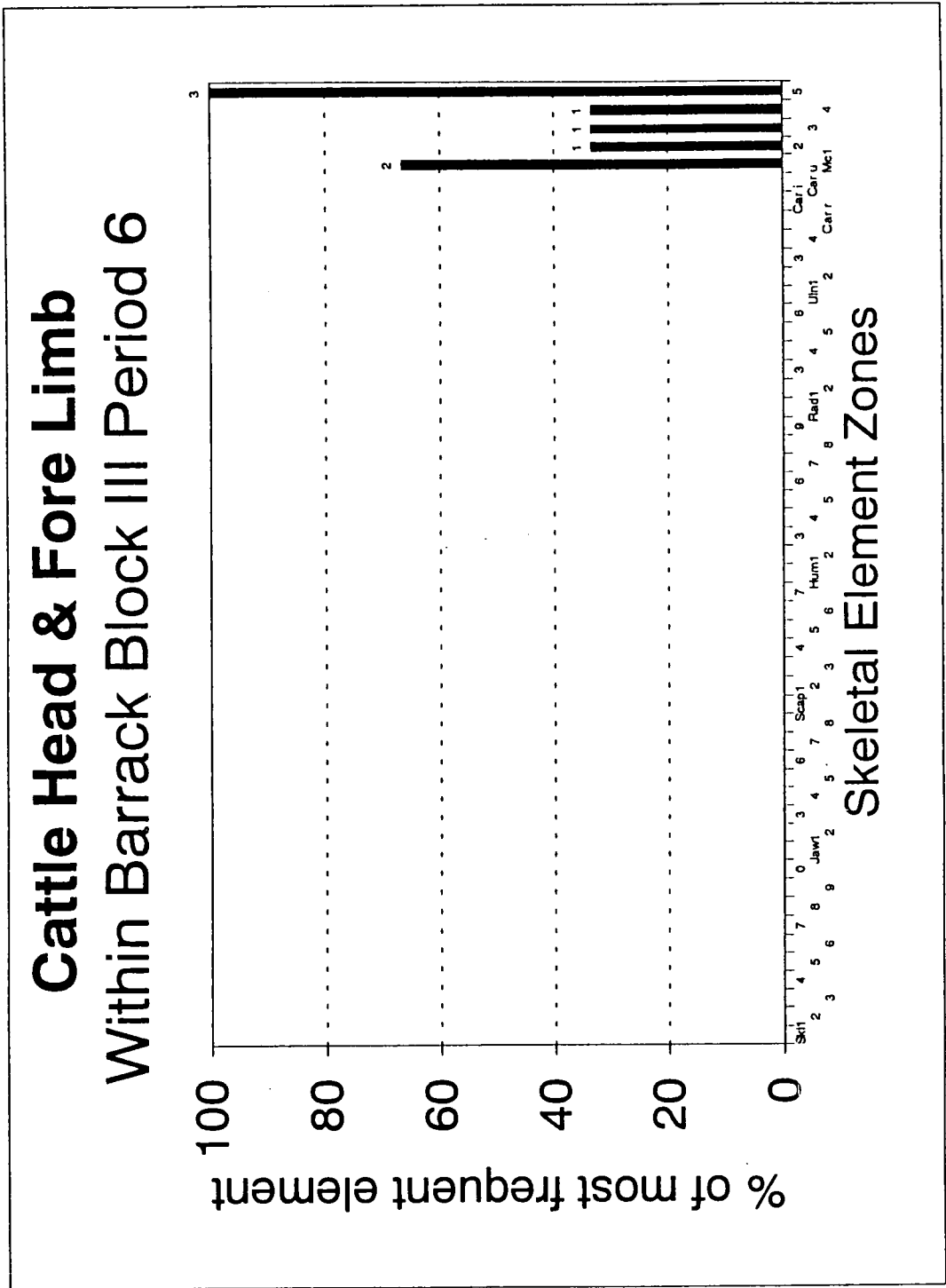


figure 98

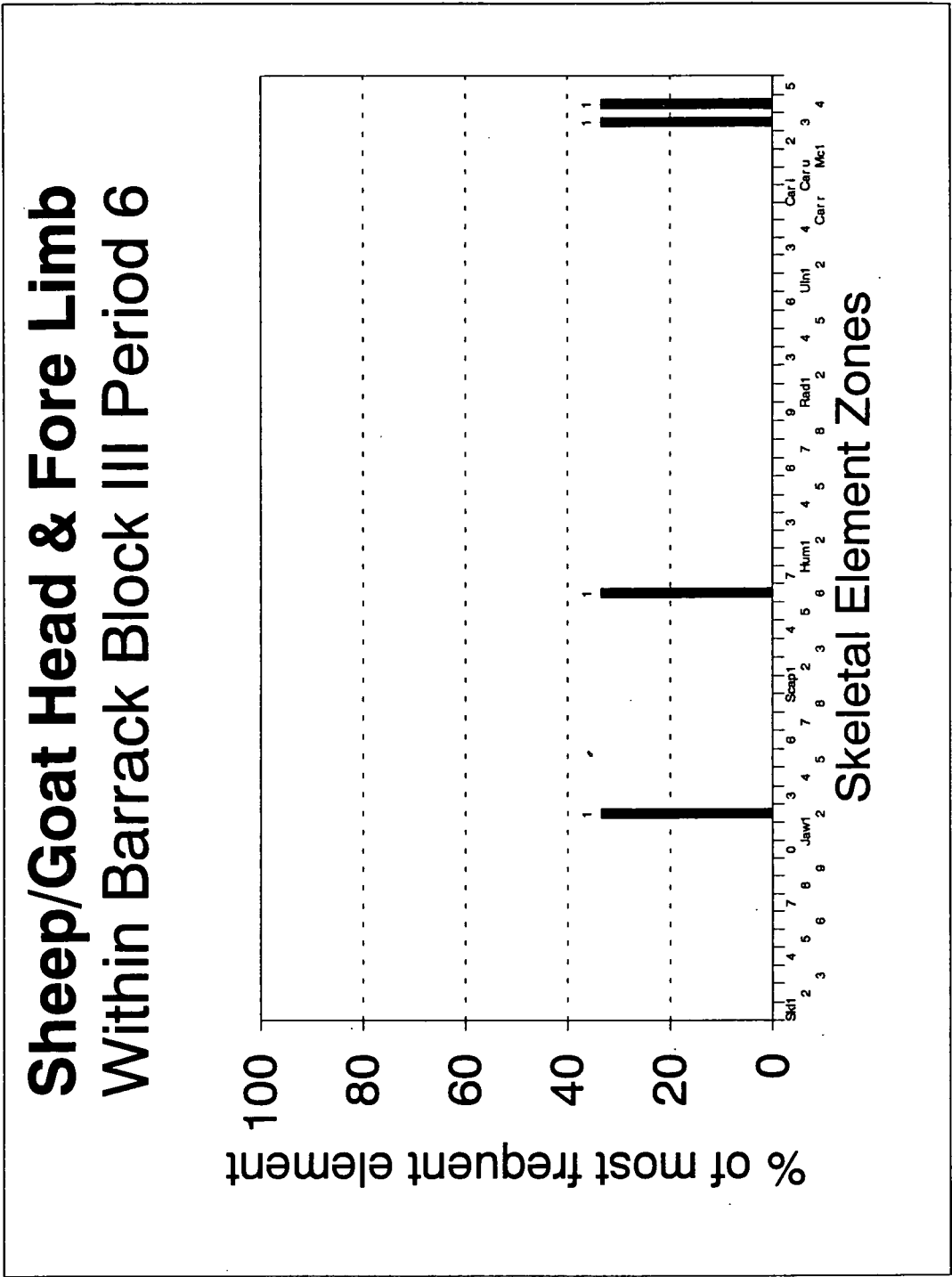


figure 100

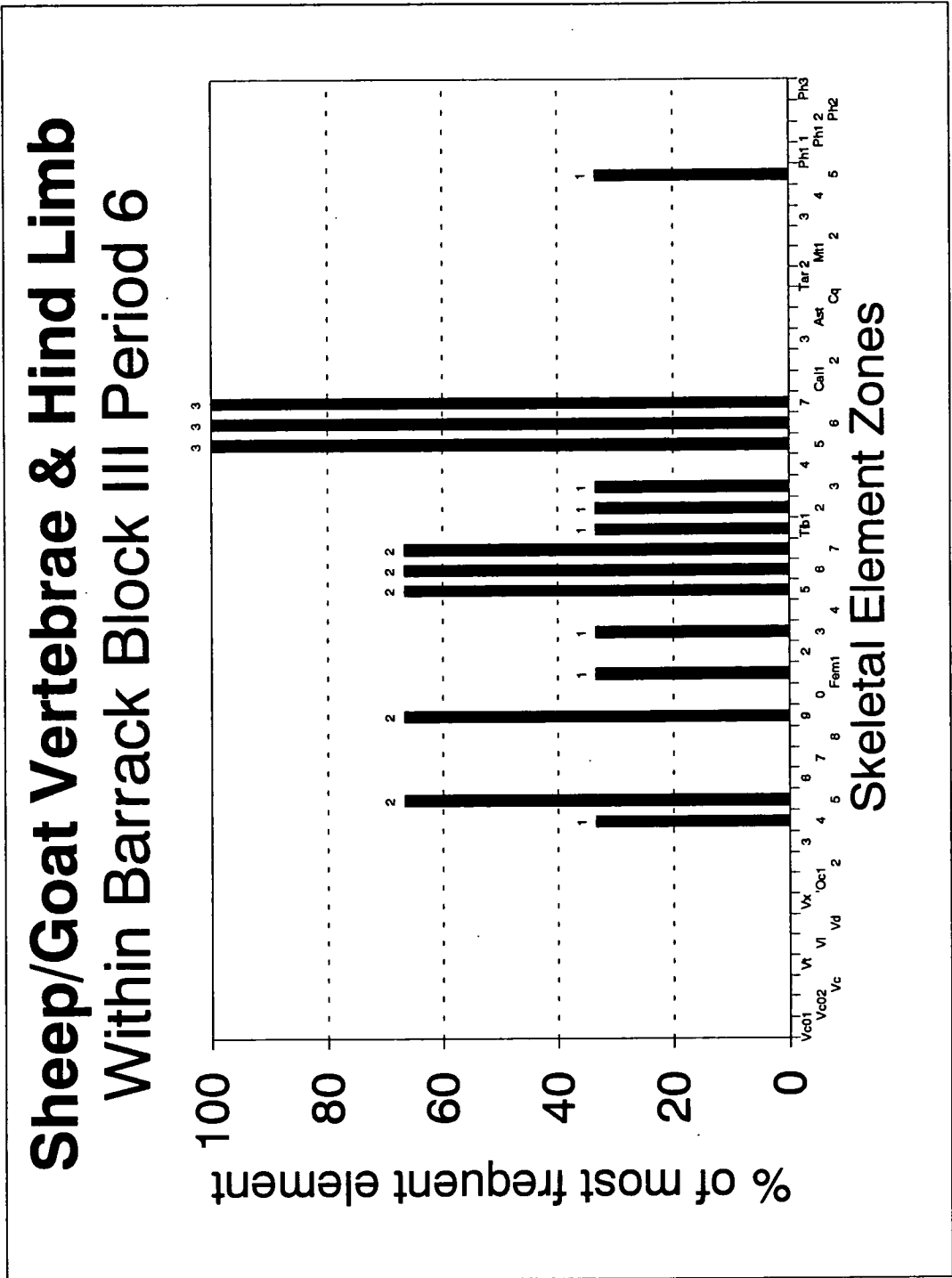


figure 101

Pig Head & Fore Limb Within Barrack Block III Period 6

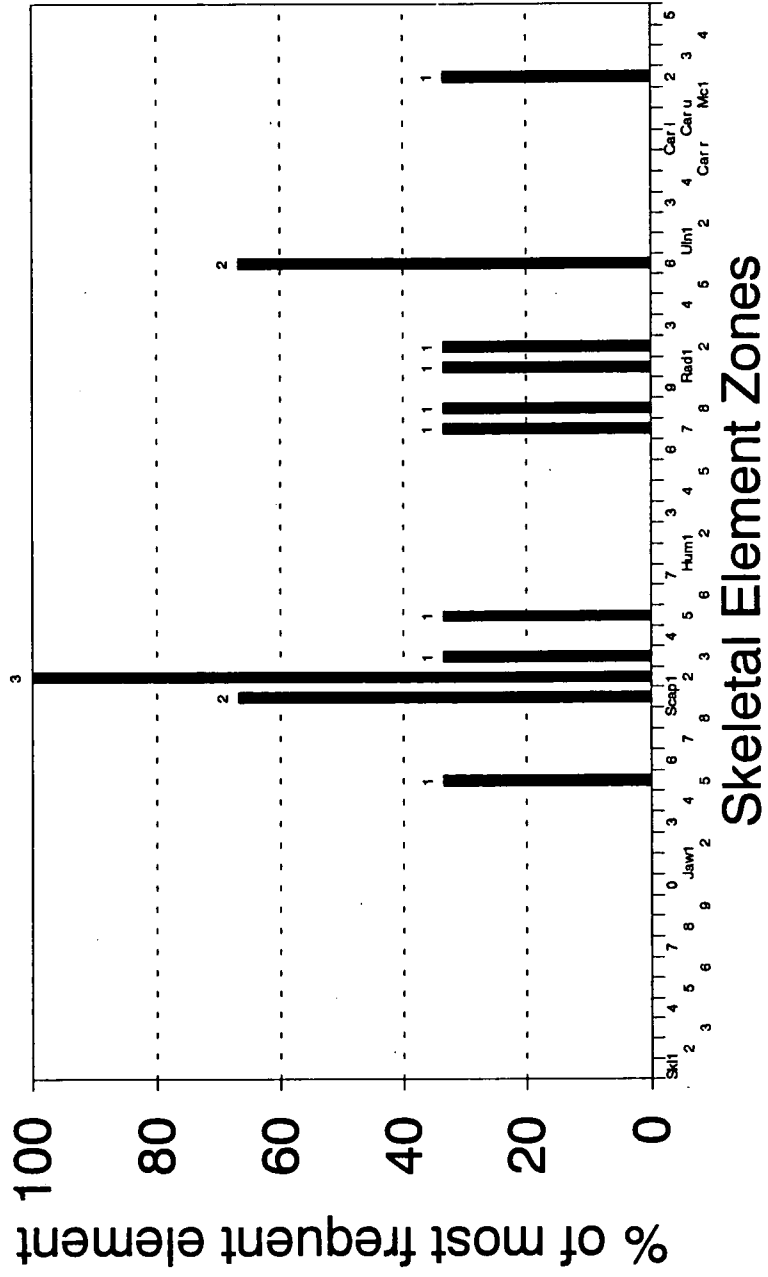


figure 102

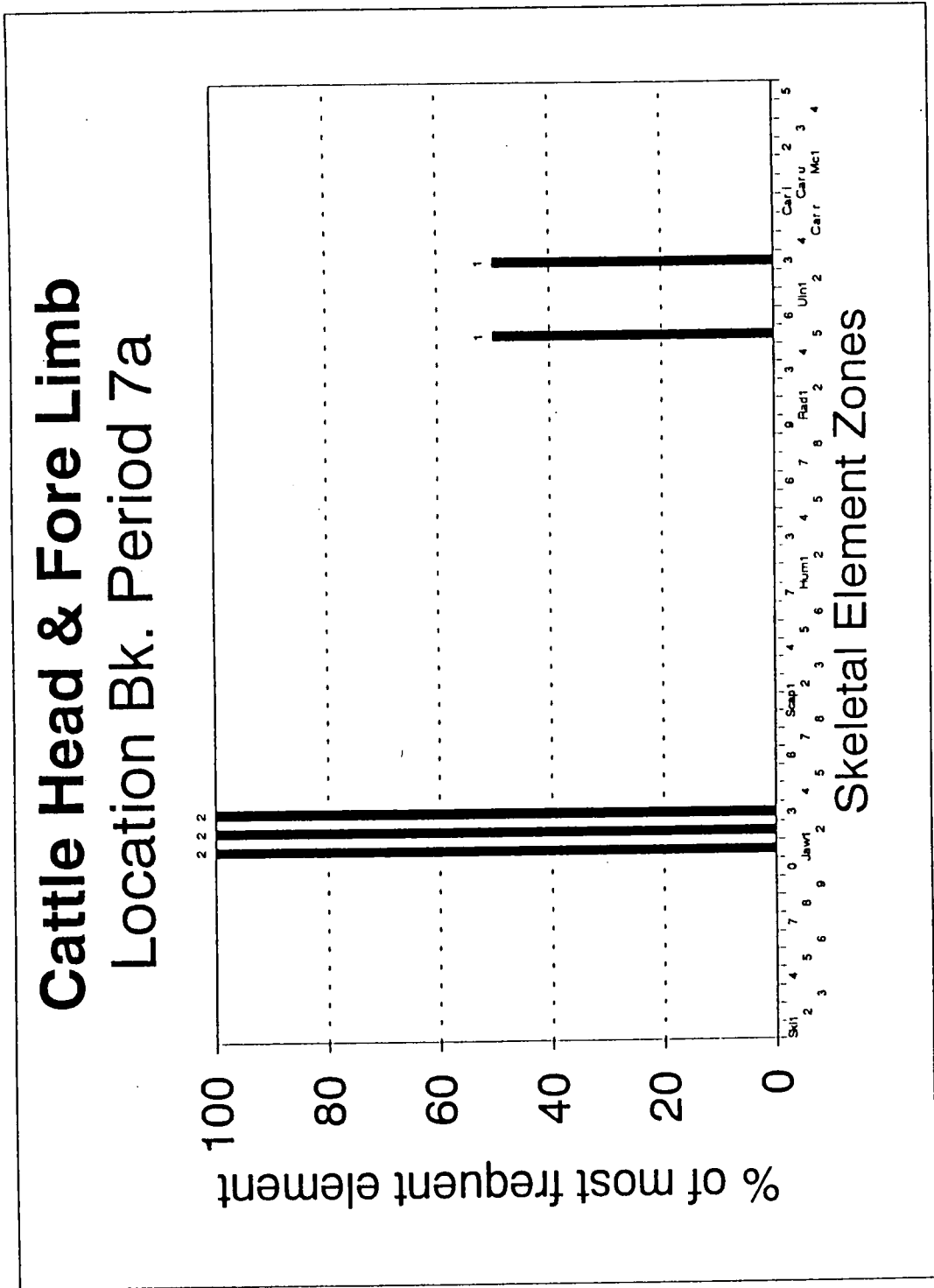


figure 104

Cattle Vertebrae & Hind Limb

Location Bk. Period 7a

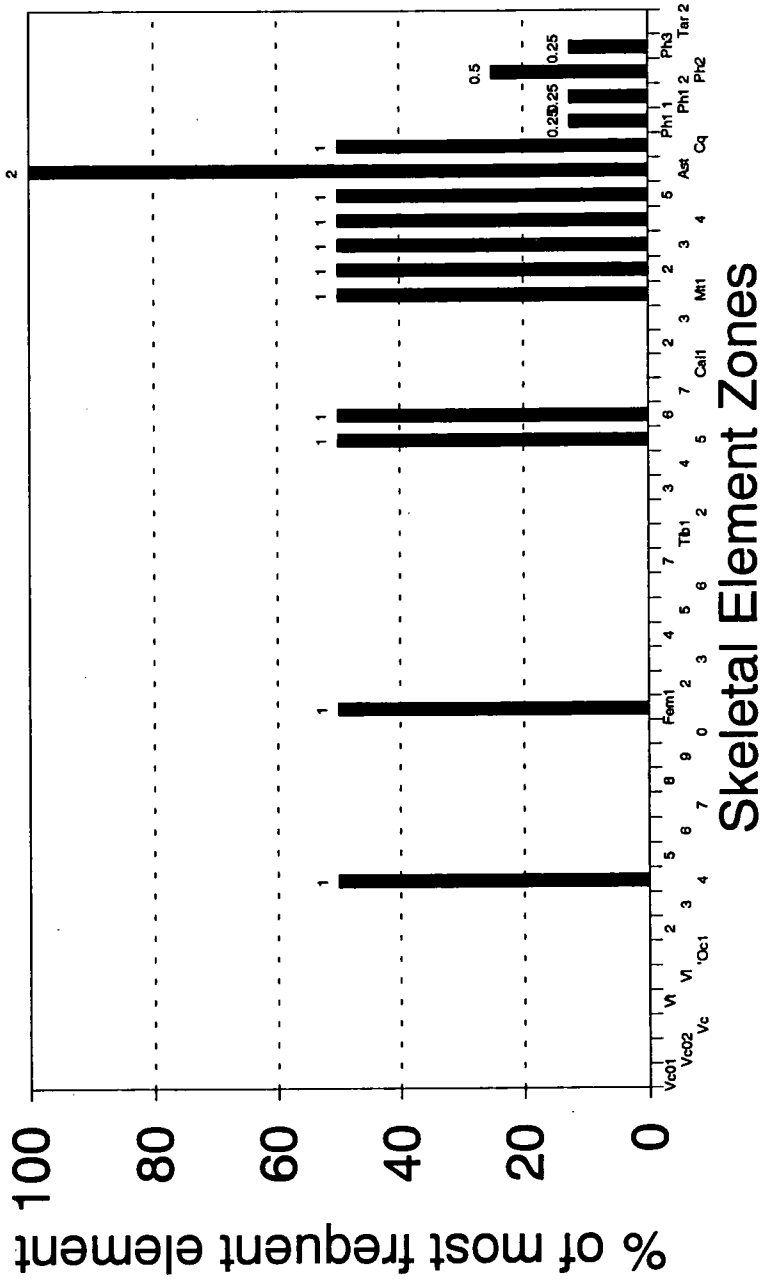


figure 105

Sheep/Goat Head & Fore Limb Location Bk. Period 7a

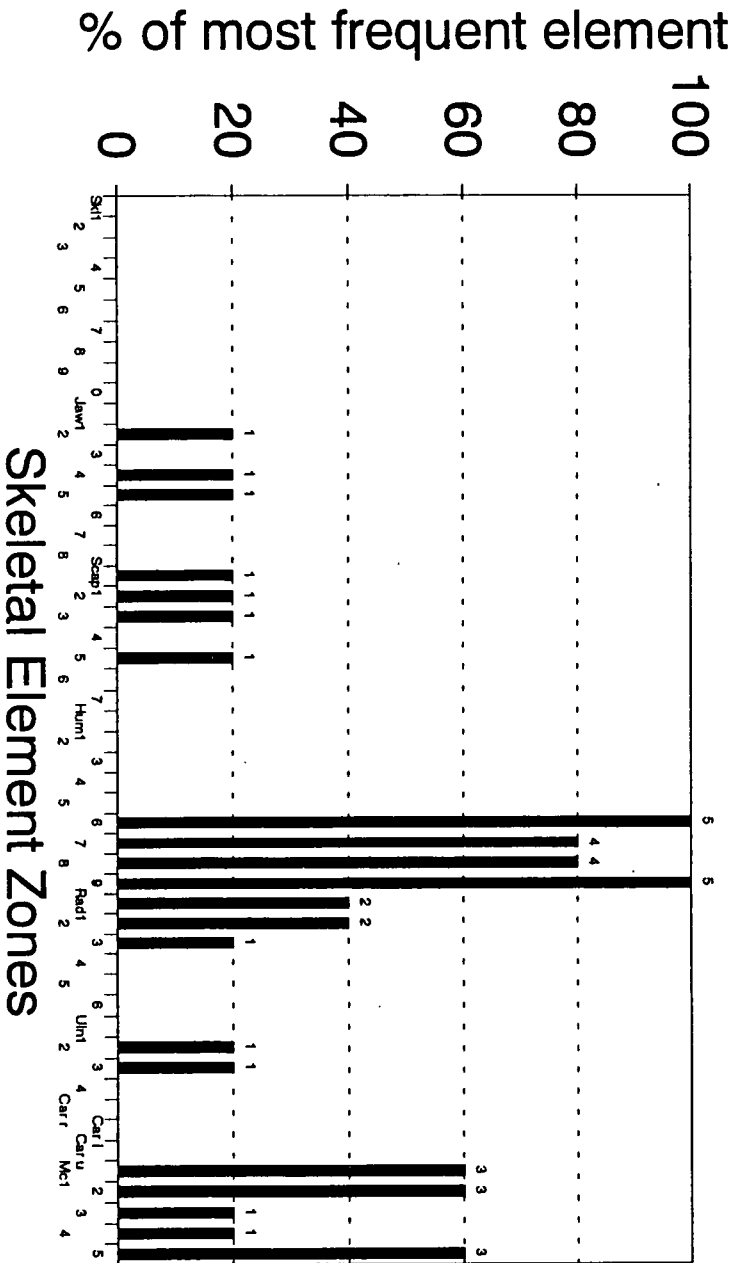


figure 106

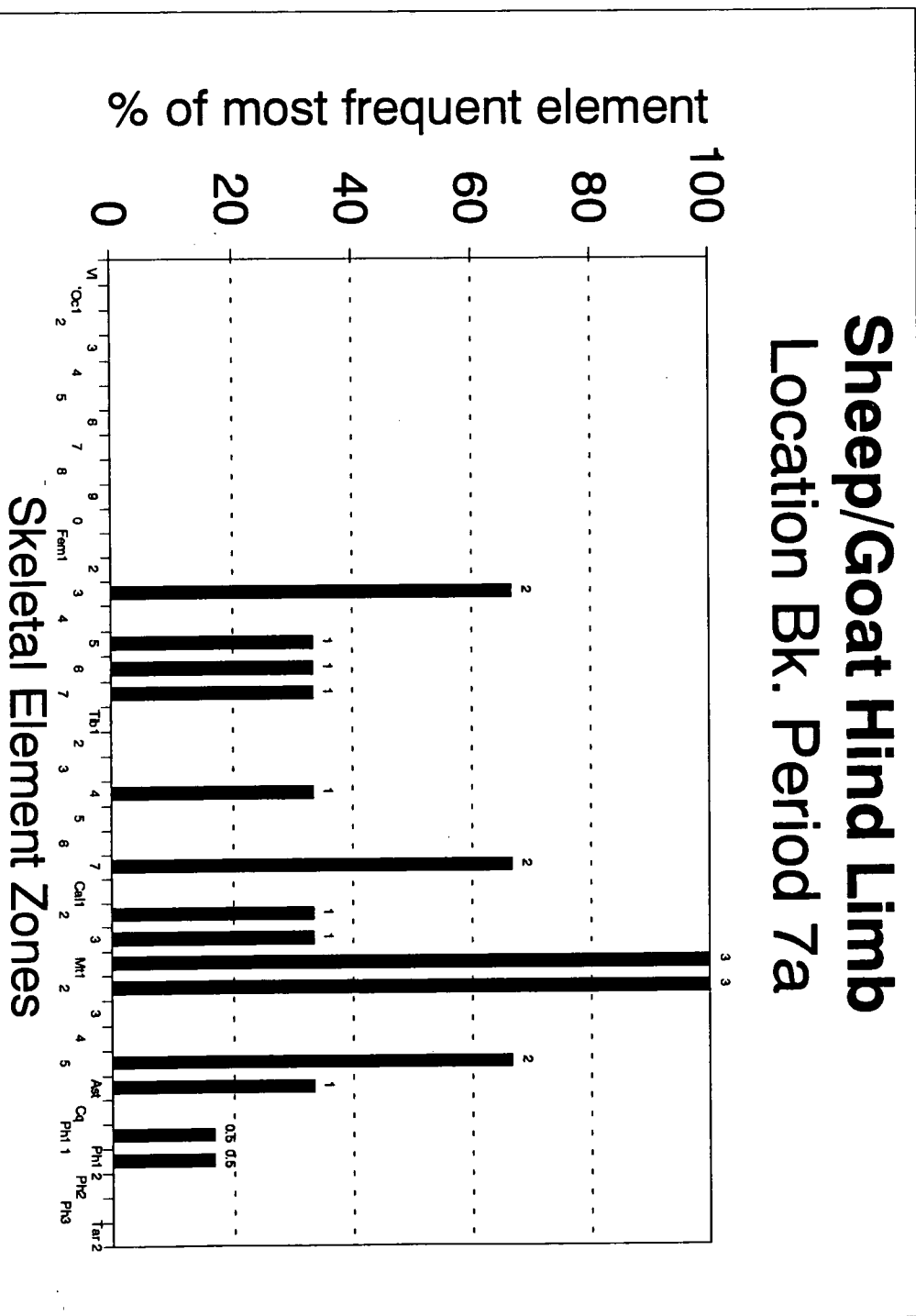


figure 107

Pig Head & Fore Limb Location Bk. Period 7a

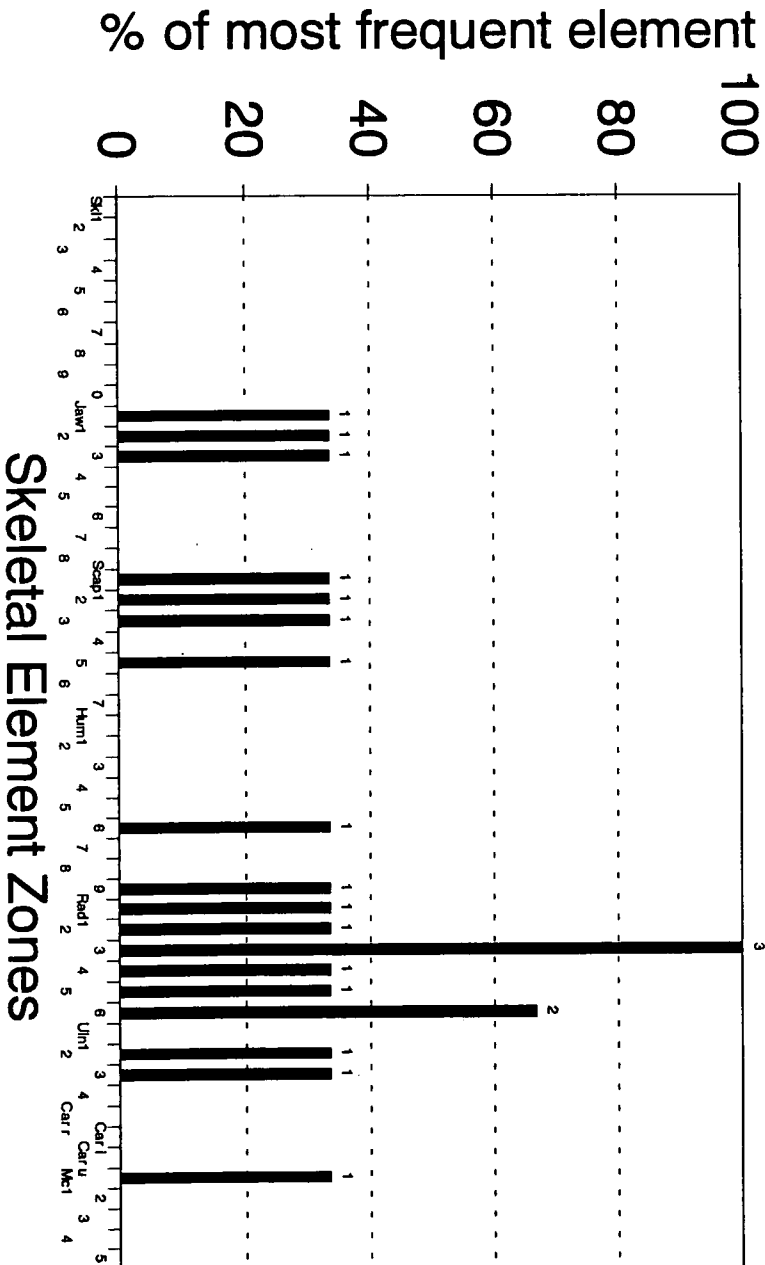


figure 108

Pig Vertebrae & Hind Limb Location Bk. Period 7a

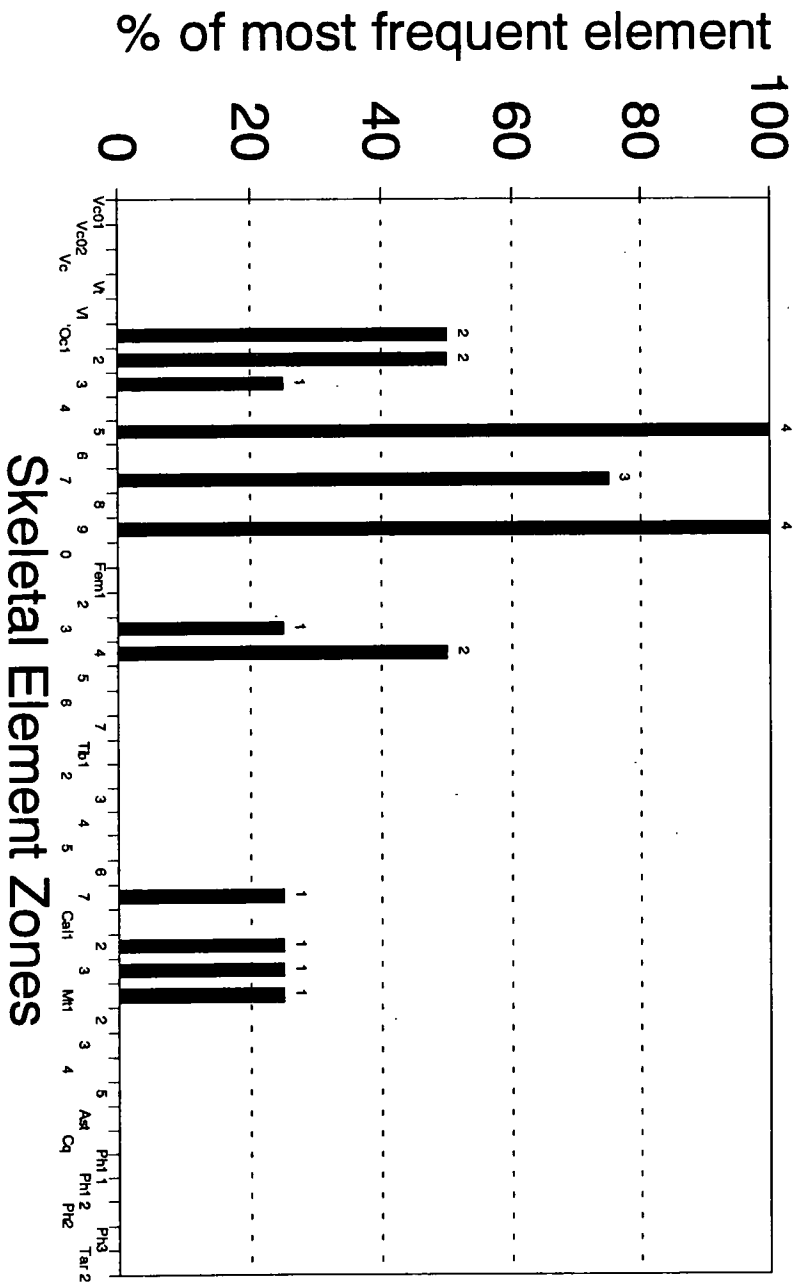


figure 109

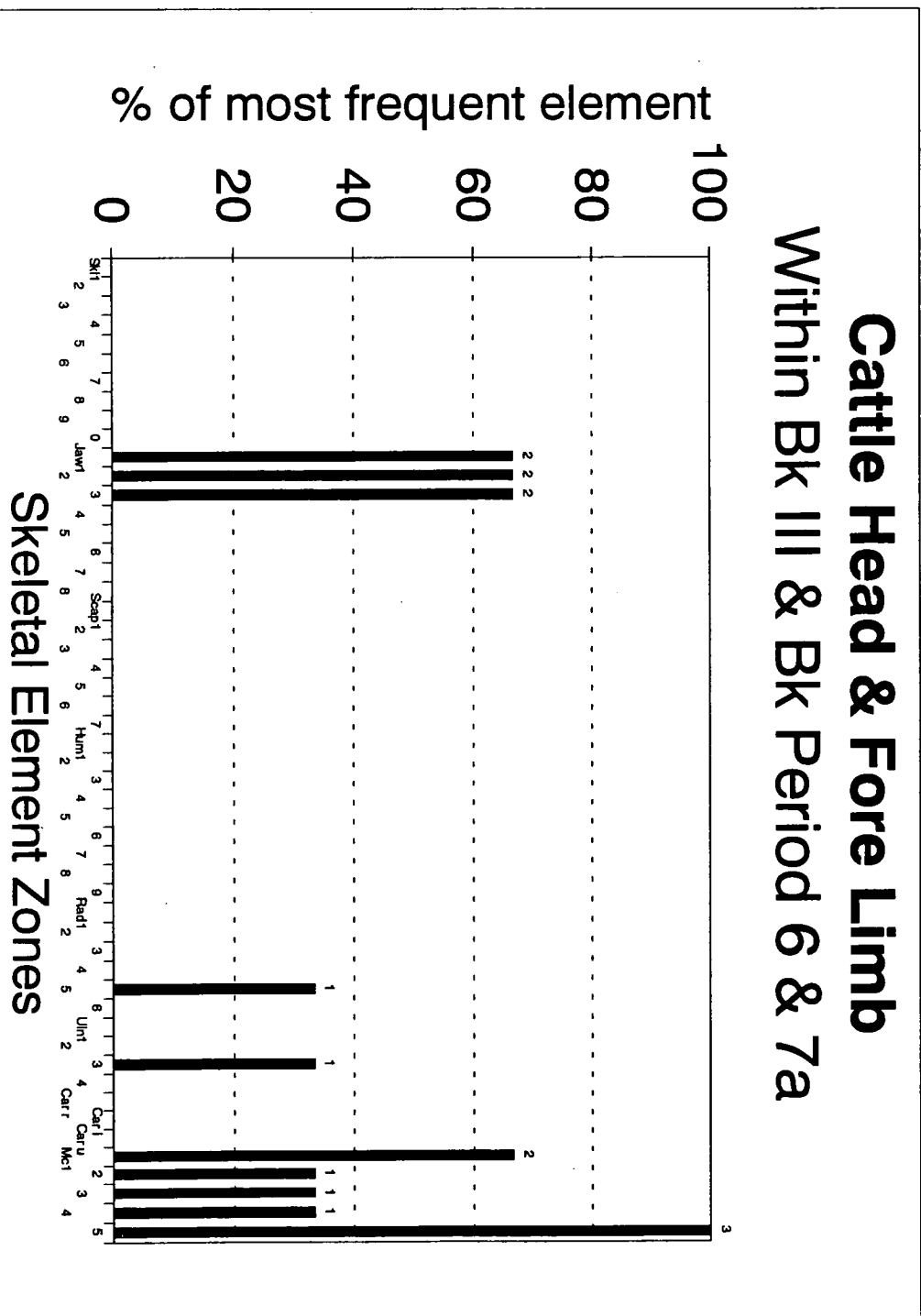


figure 110

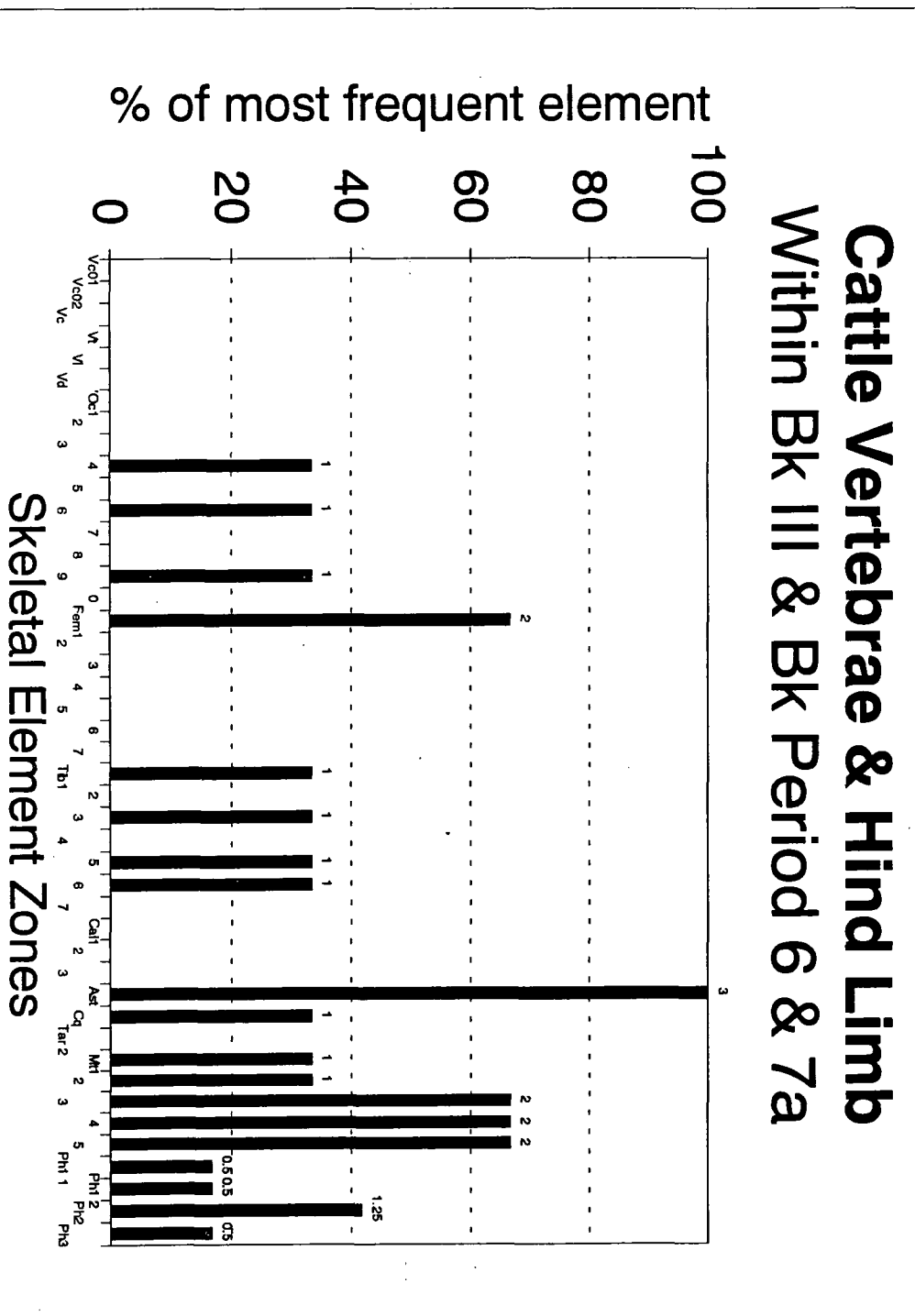


figure 111

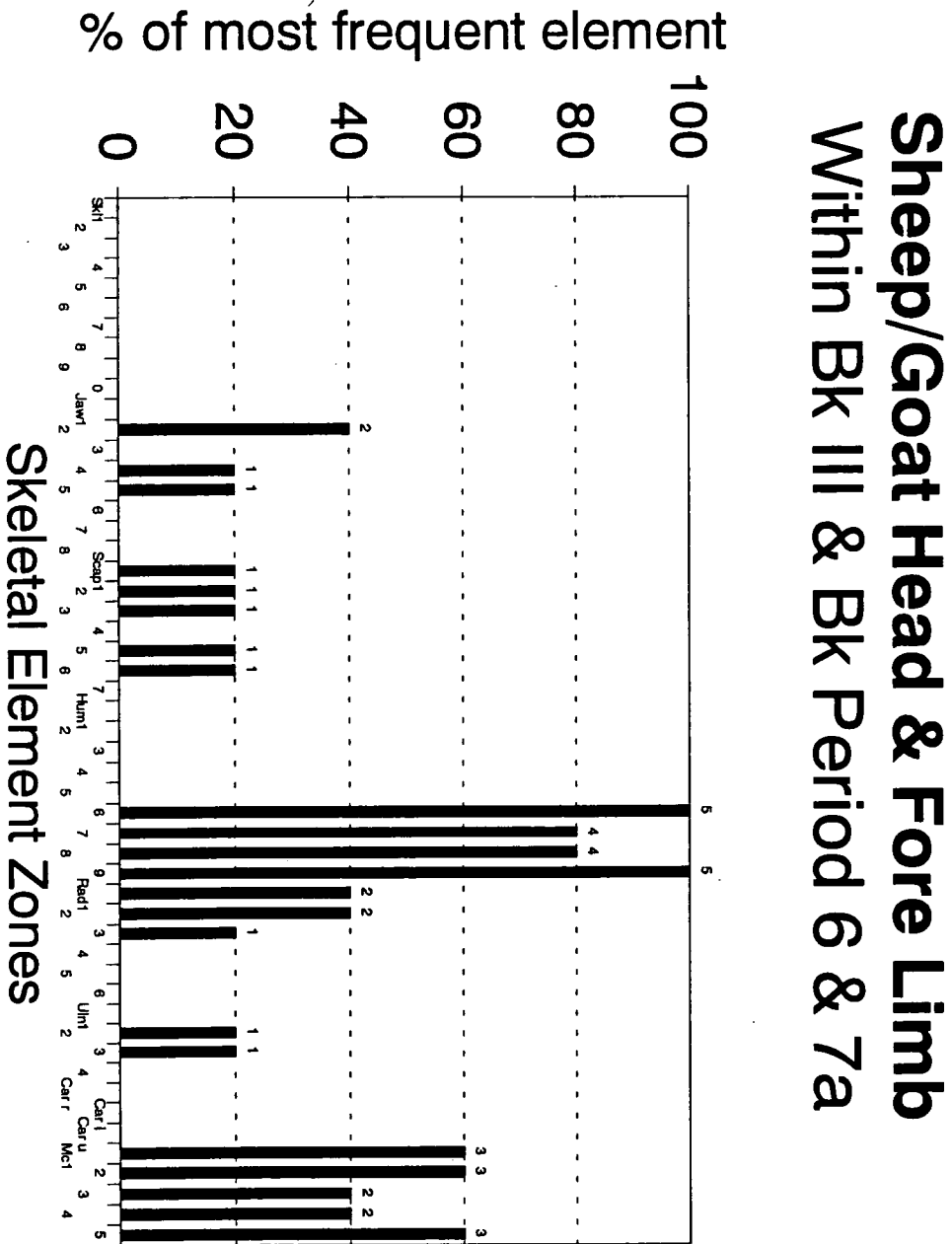


figure 112

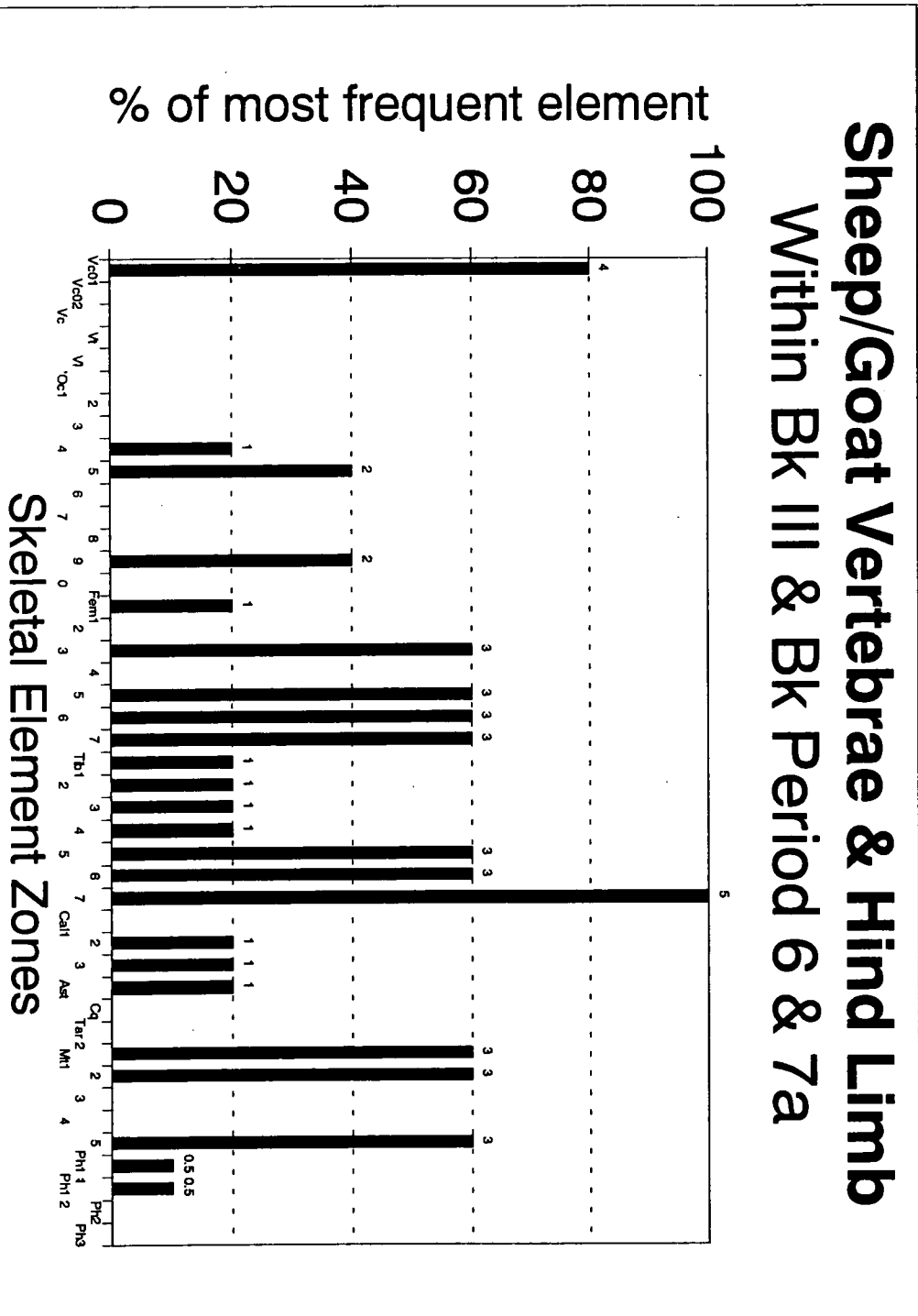


figure 113

Pig Head & Fore Limb Within Bk III & Bk Period 6 & 7a

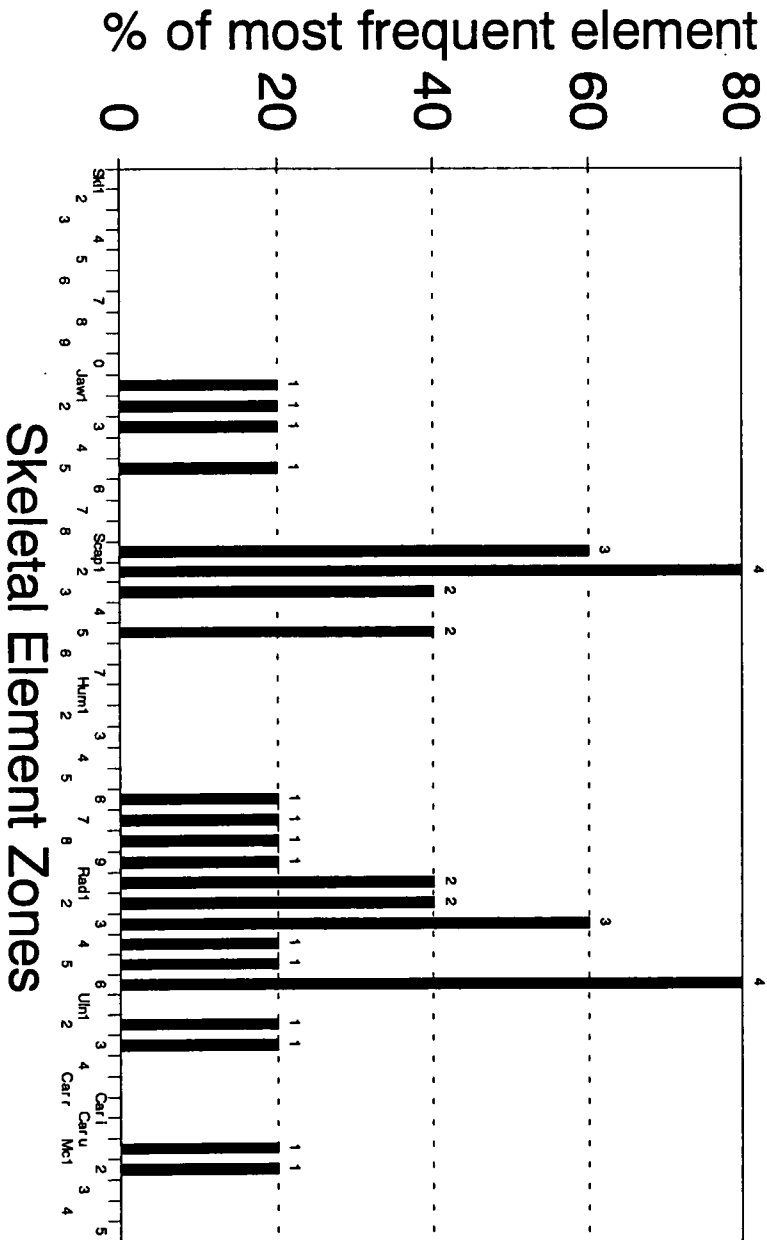


figure 114

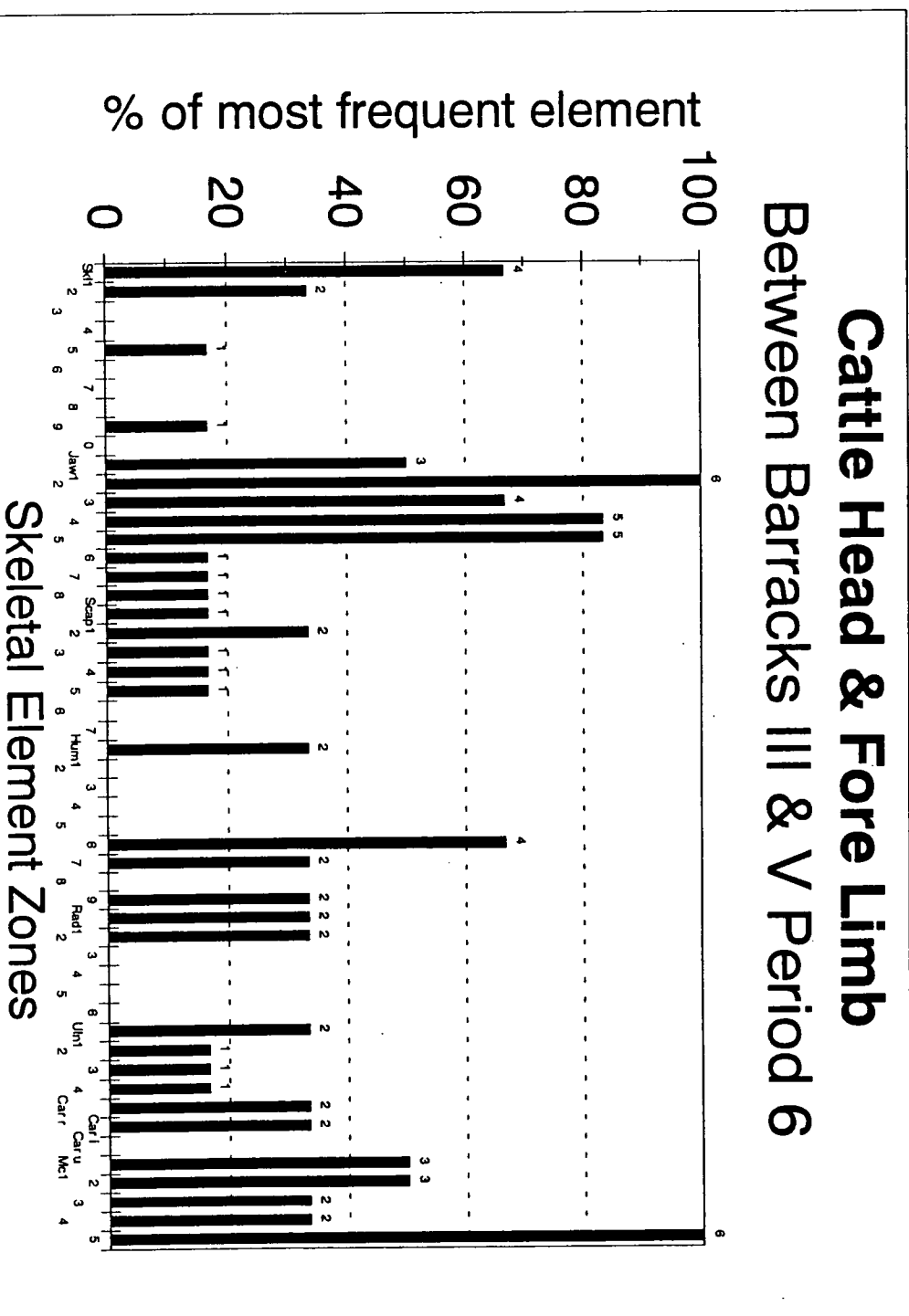


figure 116

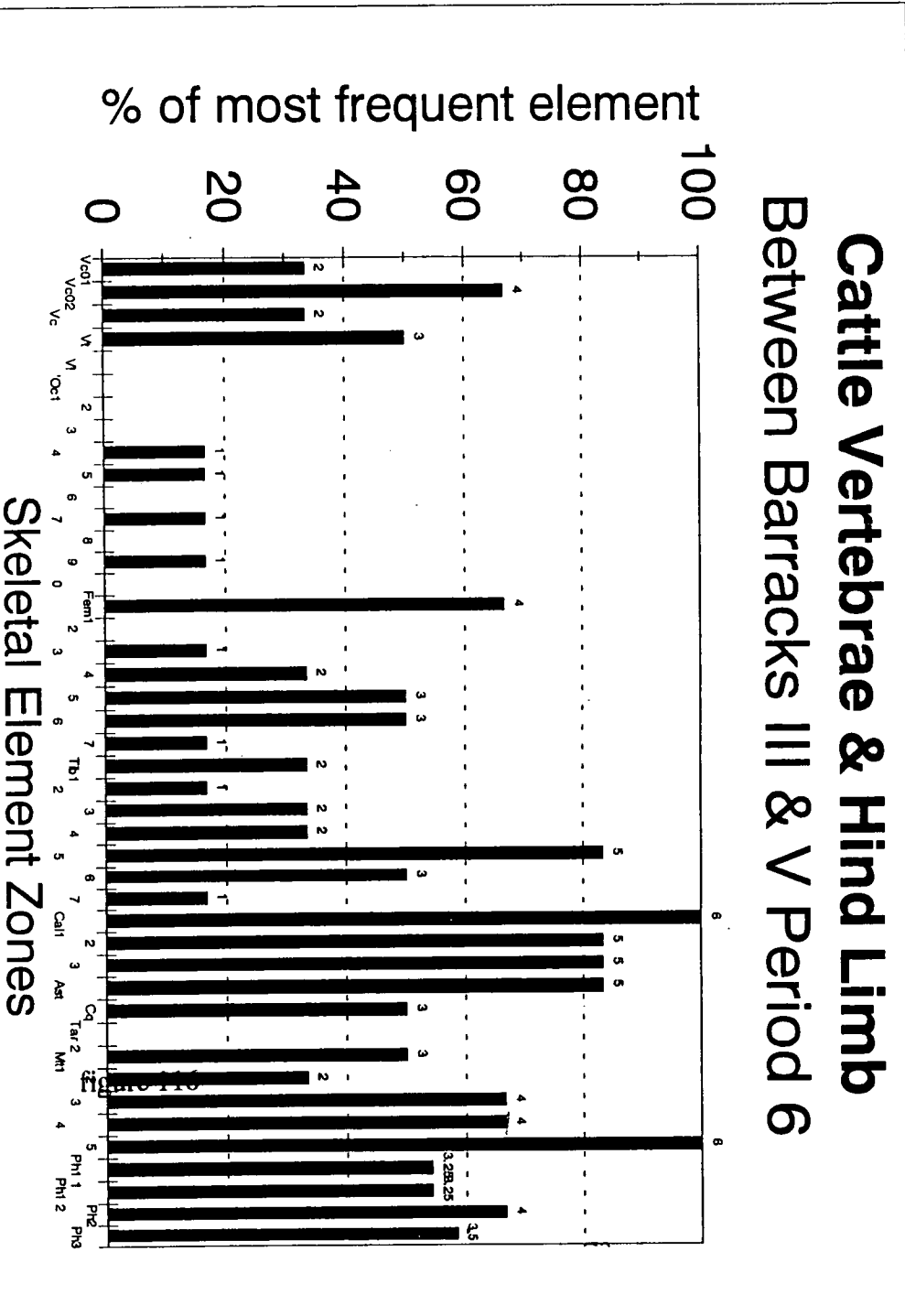


figure 117

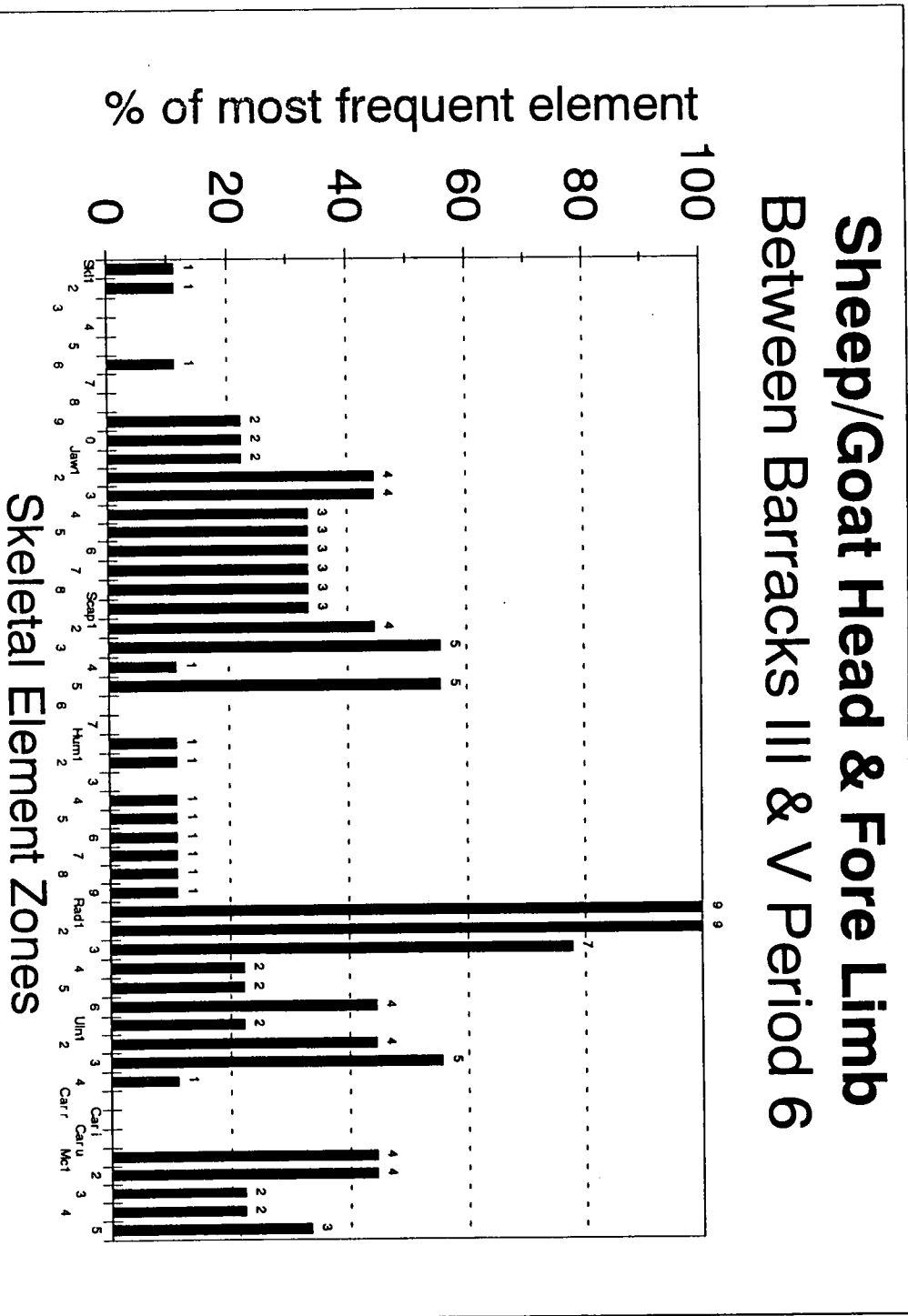


figure 118

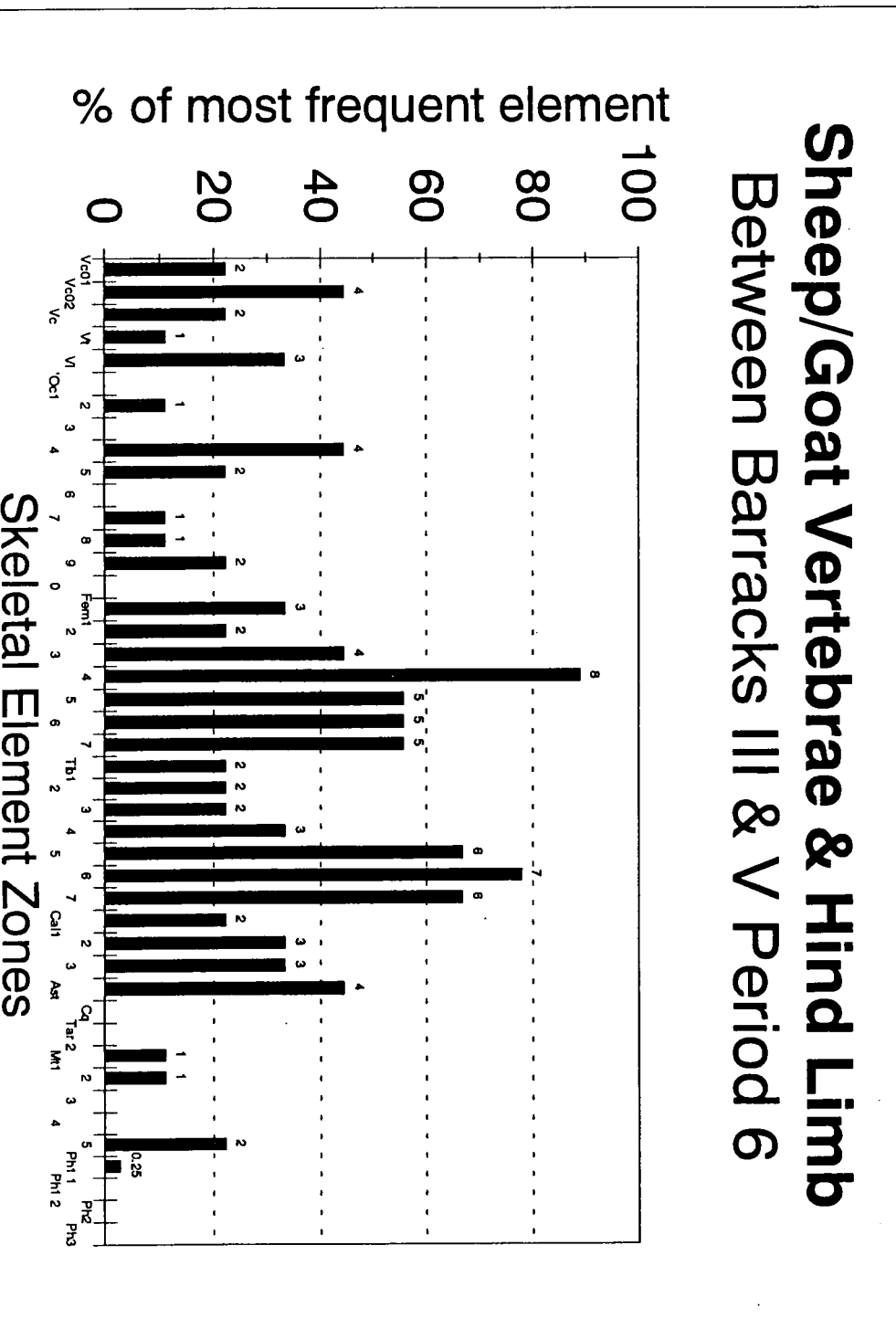


figure 119

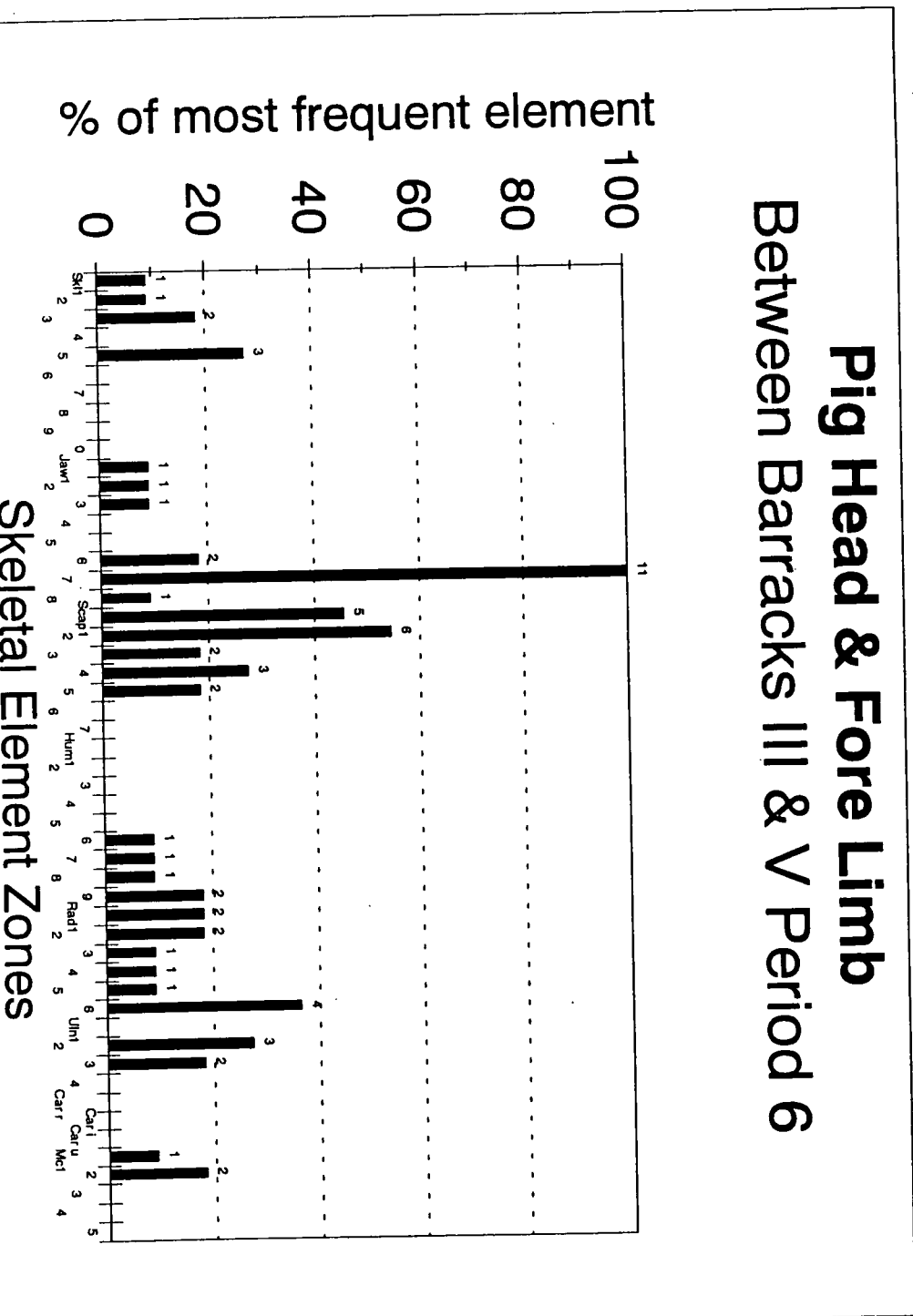


figure 120

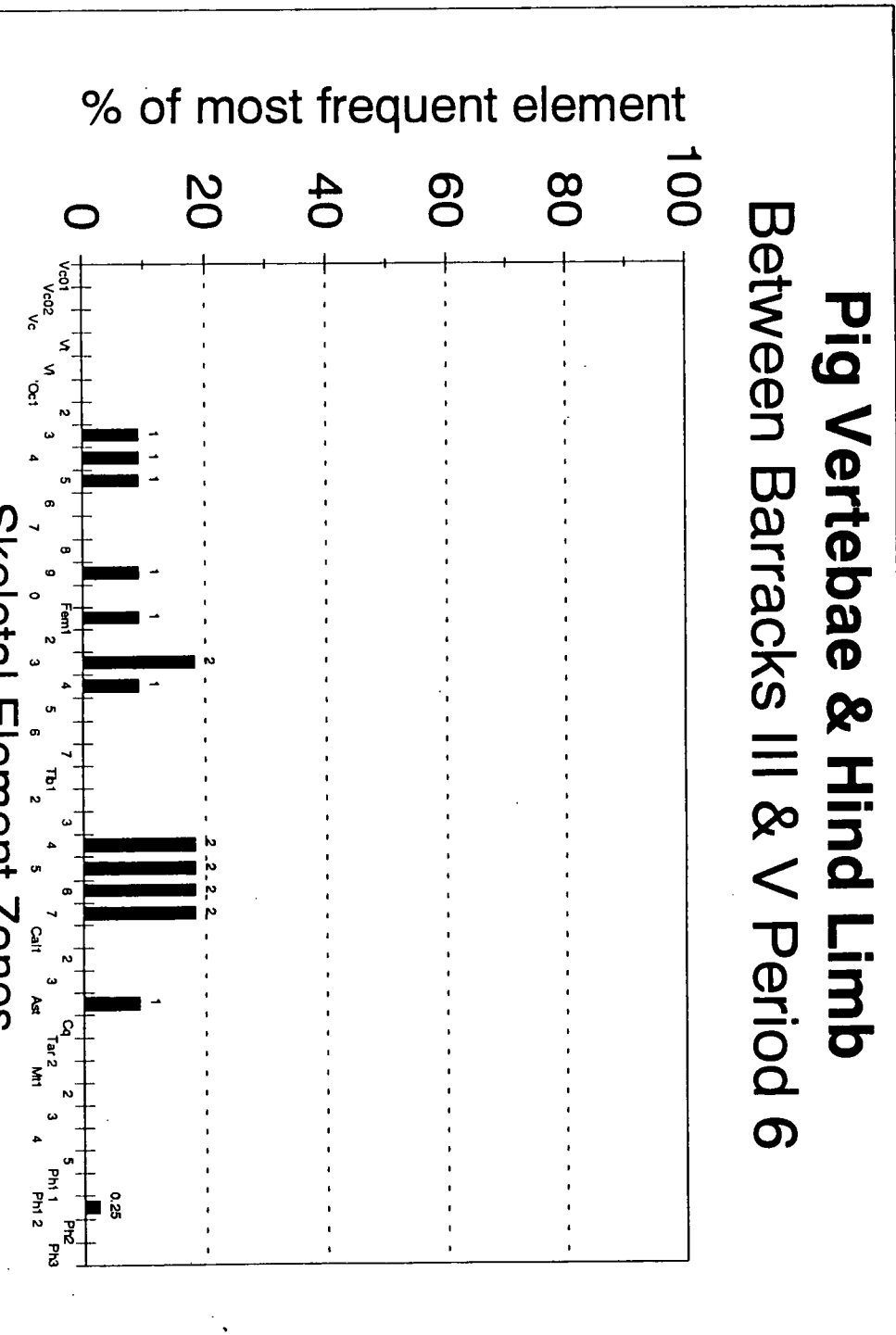


figure 121

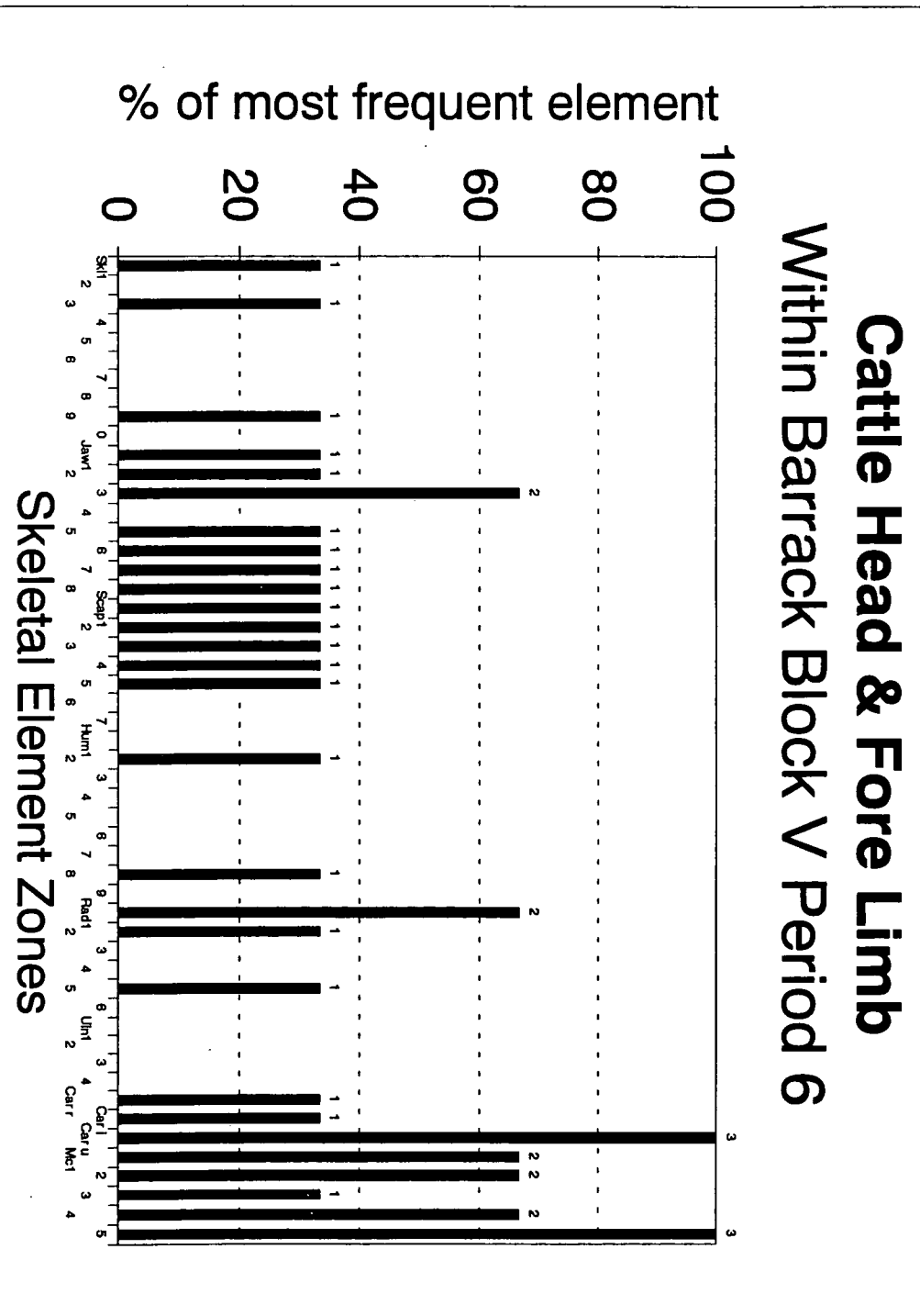


figure 122

Cattle Vertebrae & Hind Limb Within Barrack Block V Period 6

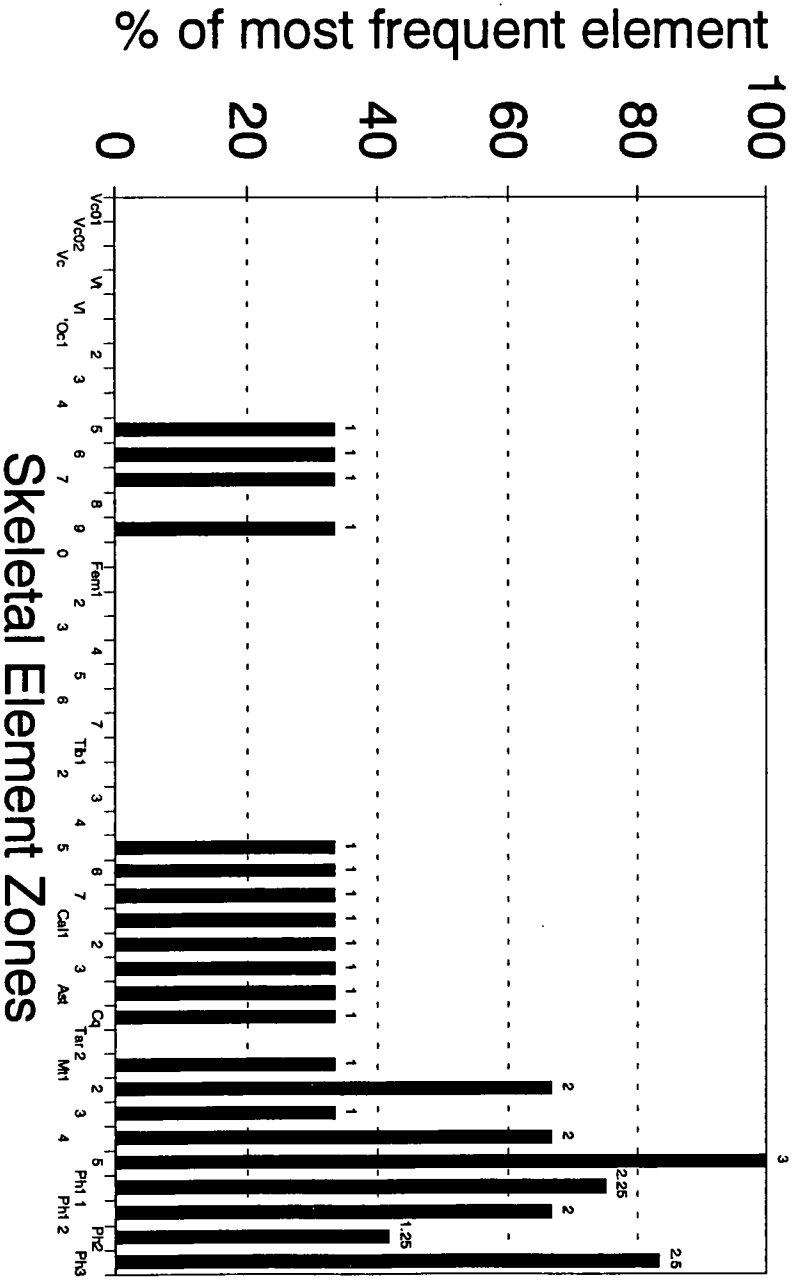


figure 123

Sheep/Goat Head & Fore Limb Within Barrack Block V Period 6

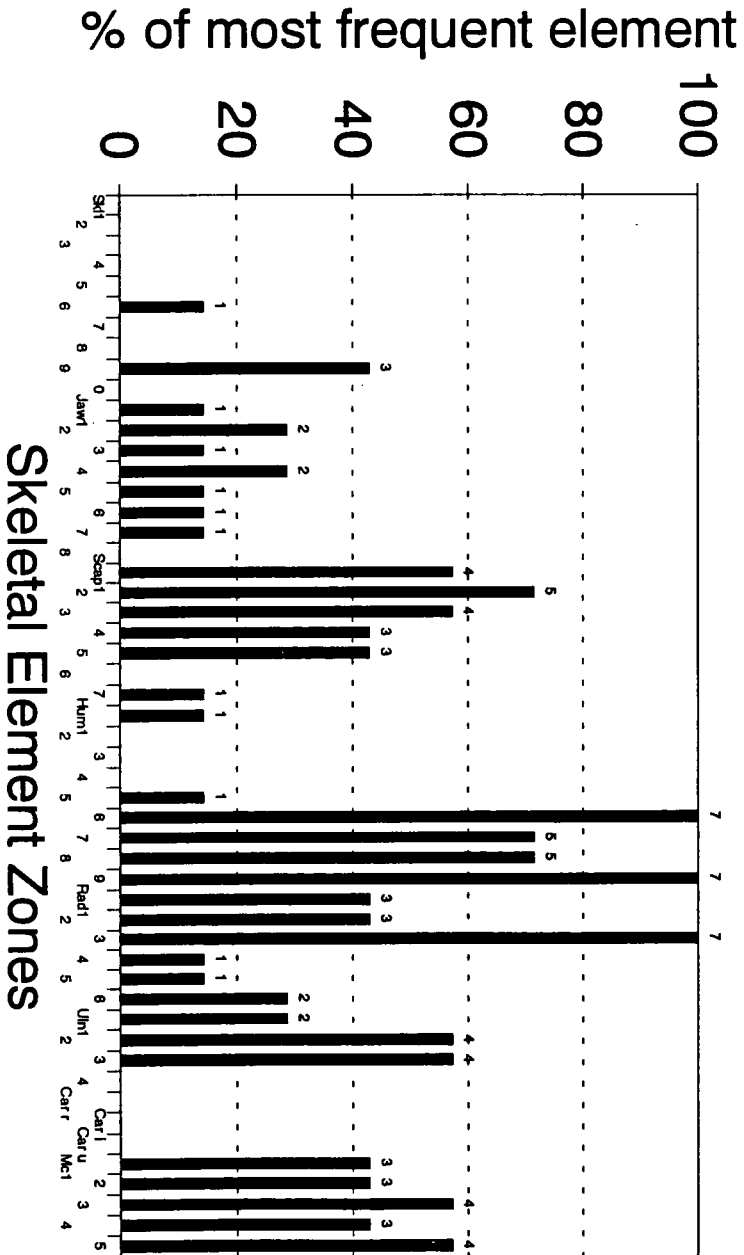


figure 124

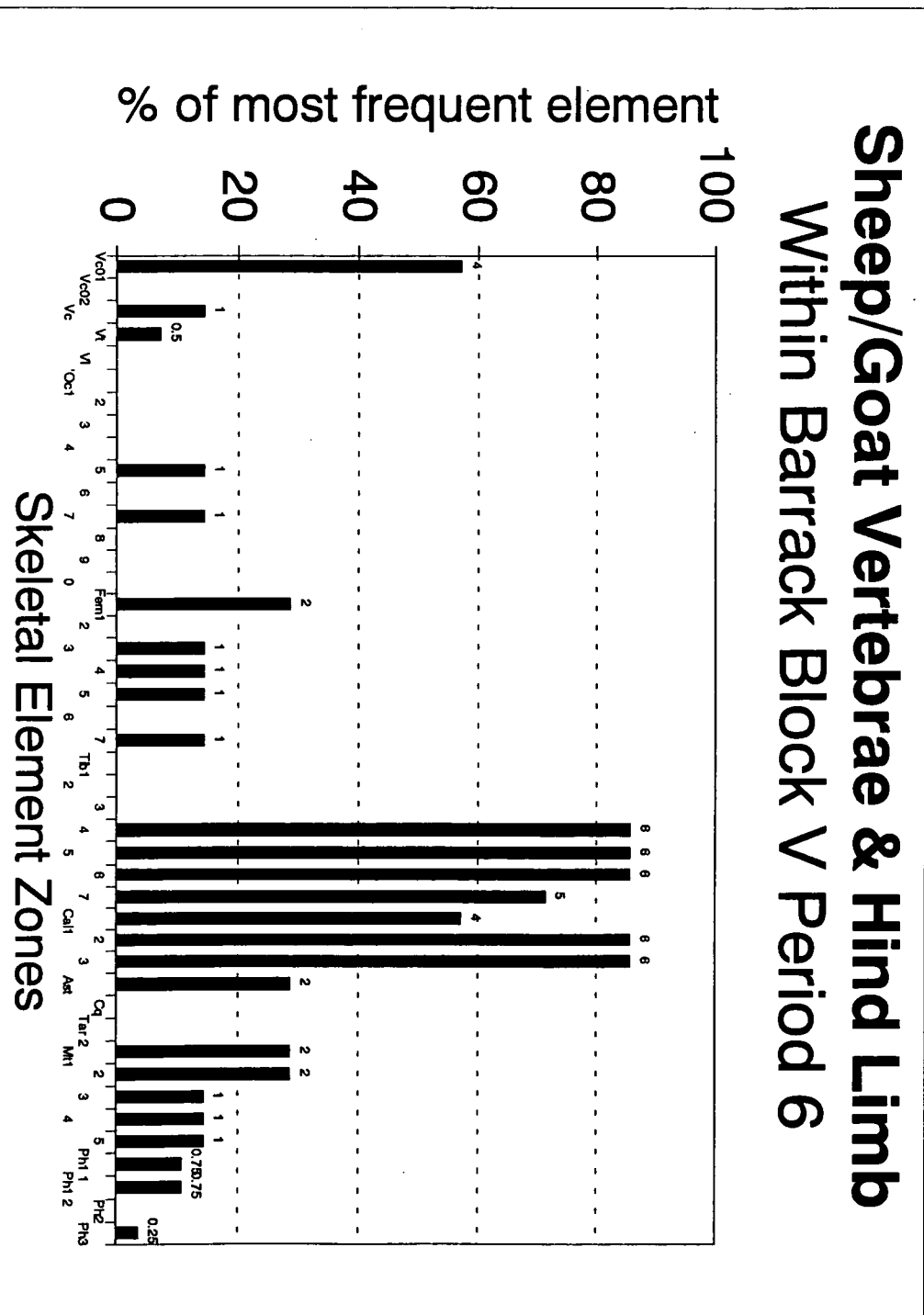


figure 125

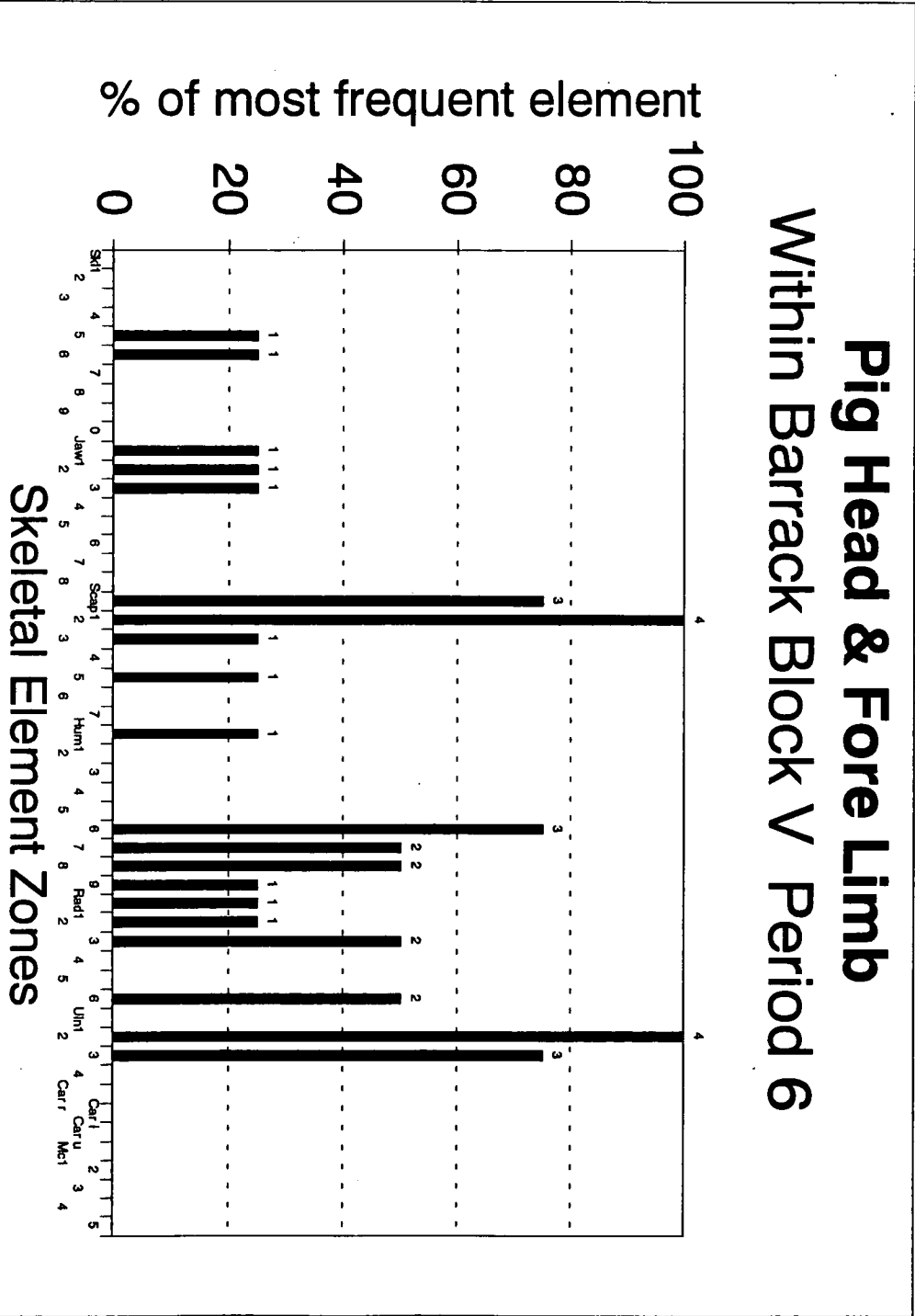


figure 126

Pig Vertebrae & Hind Limb Within Barrack Block V Period 6

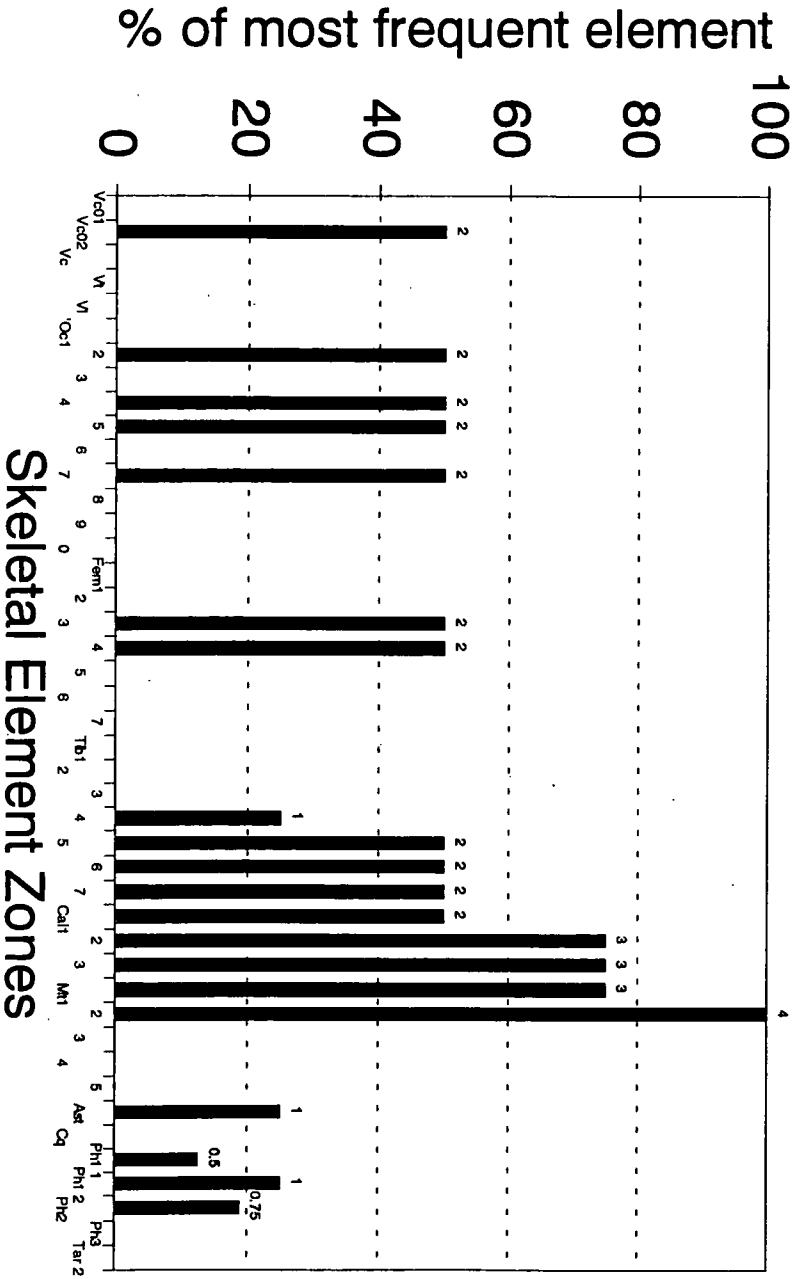


figure 127

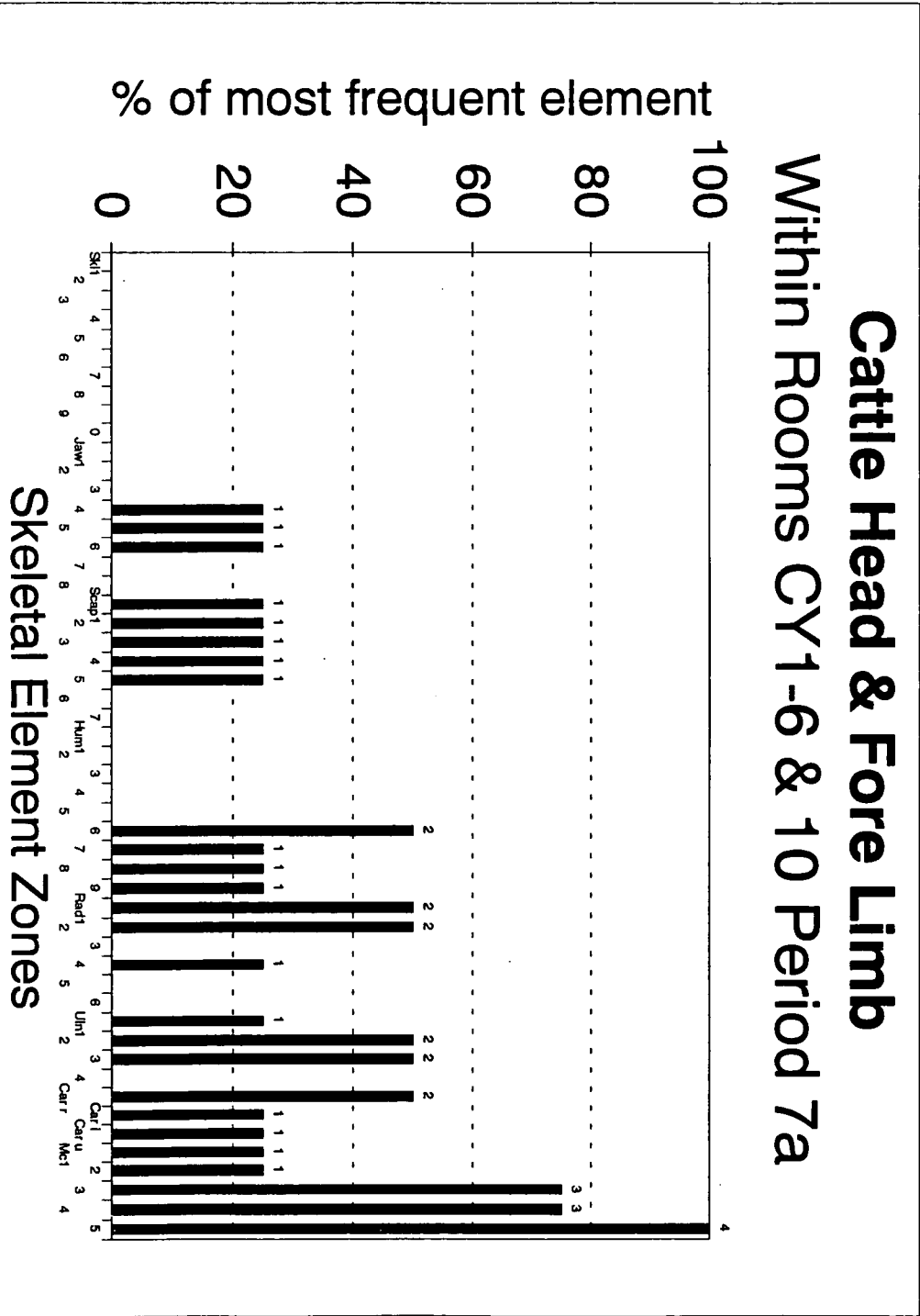


figure 128

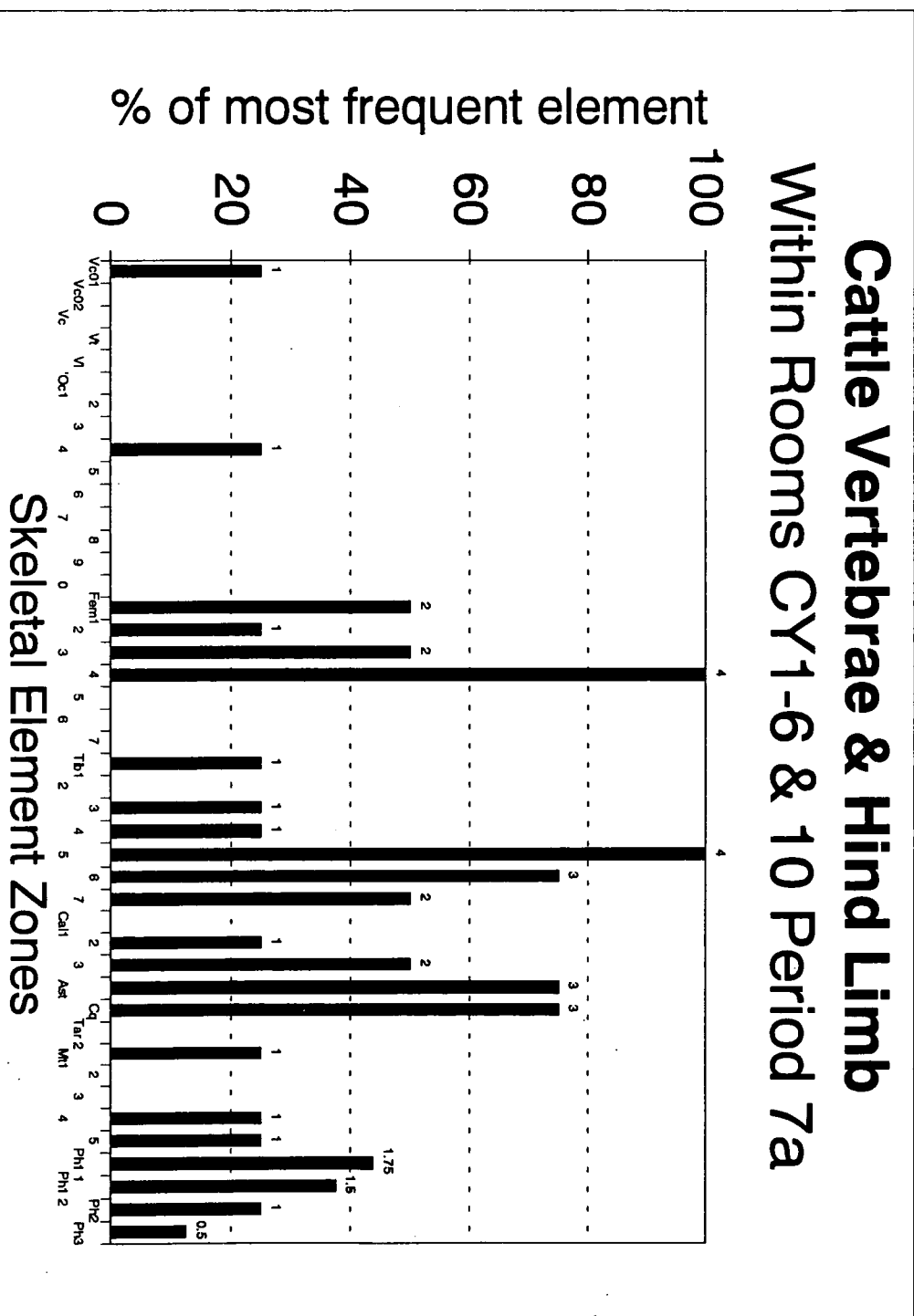


figure 129

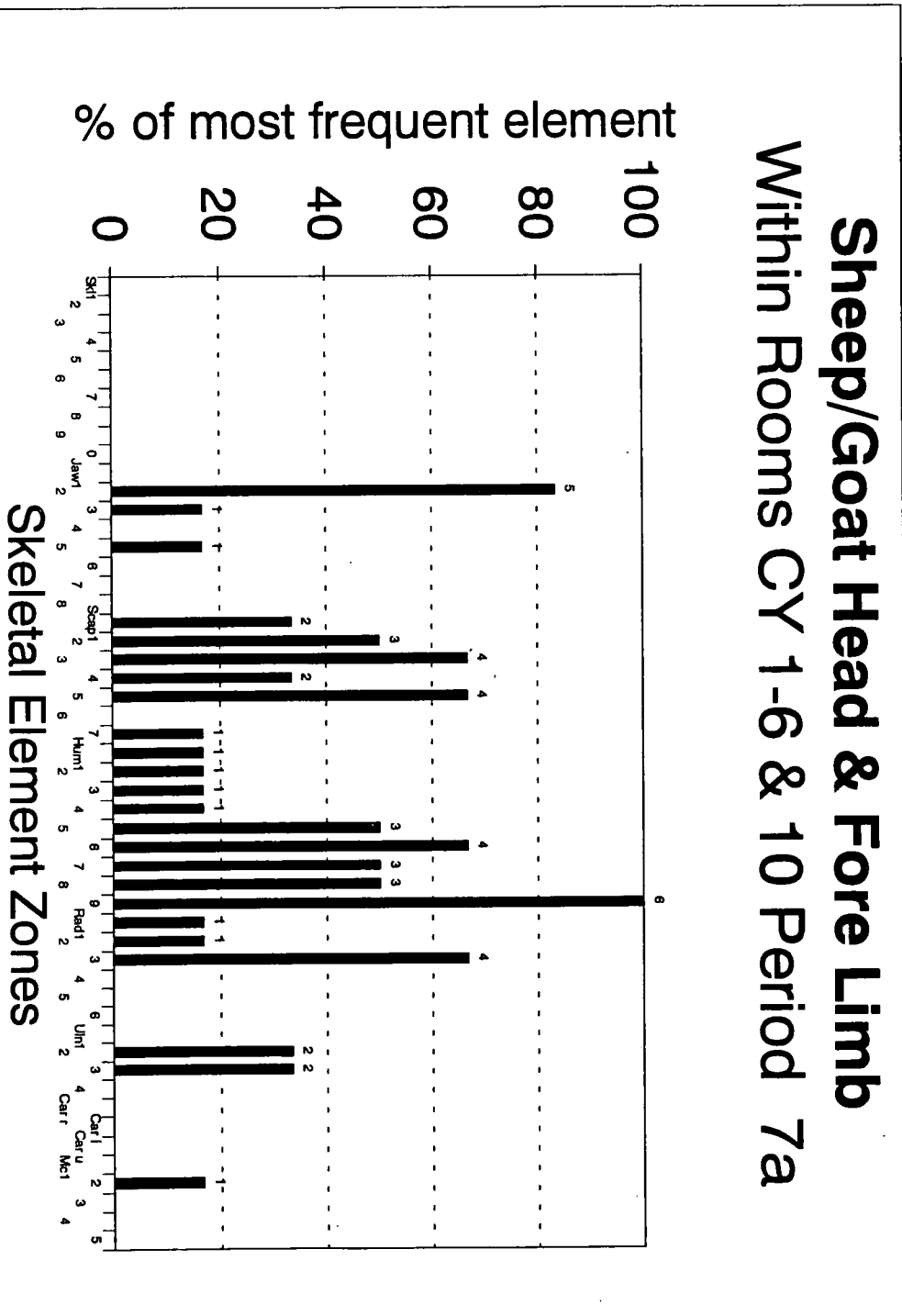


figure 130

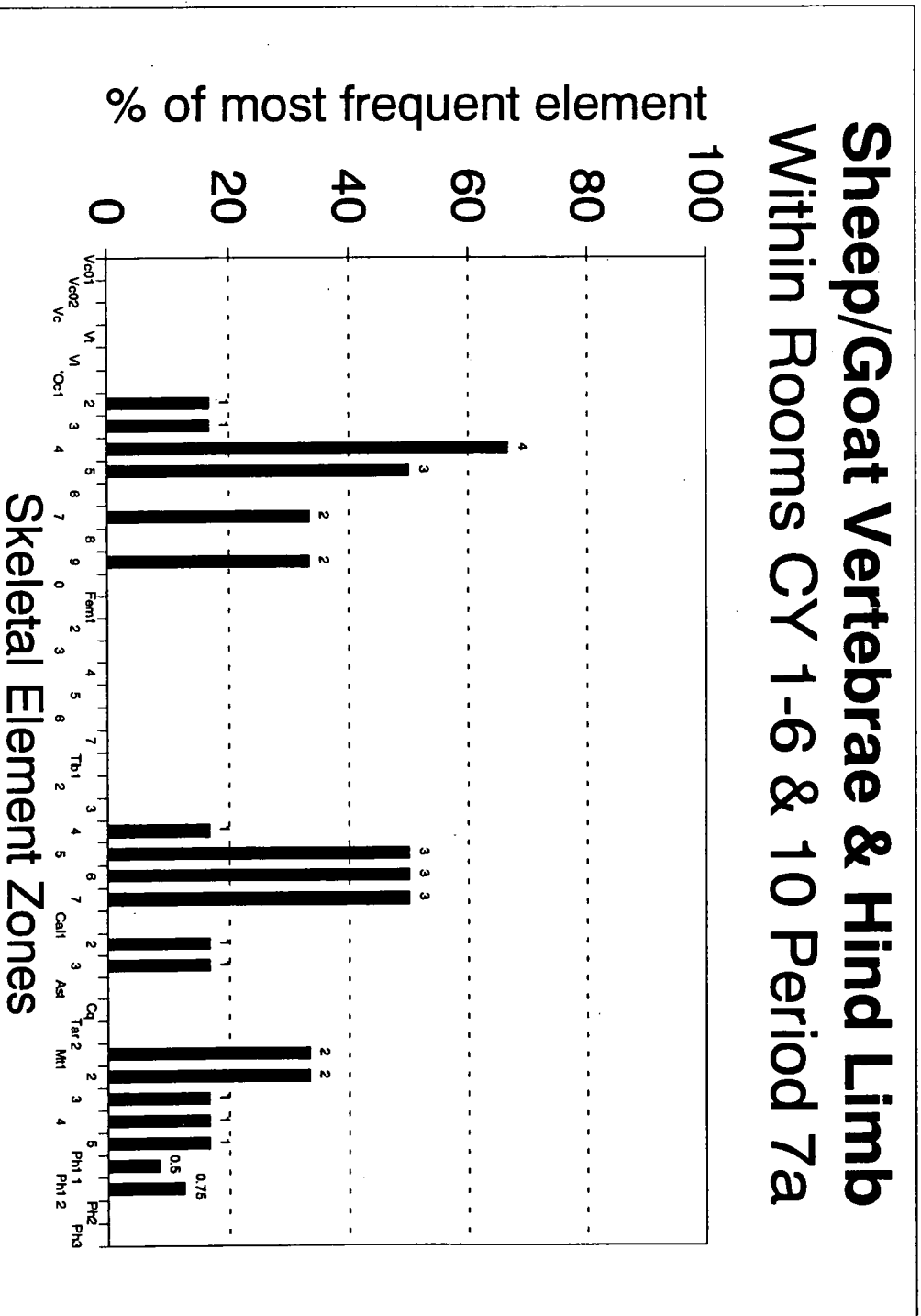


figure 131

Pig Head & Fore Limb Within RoomSCY 1-6 & 10 Period 7a

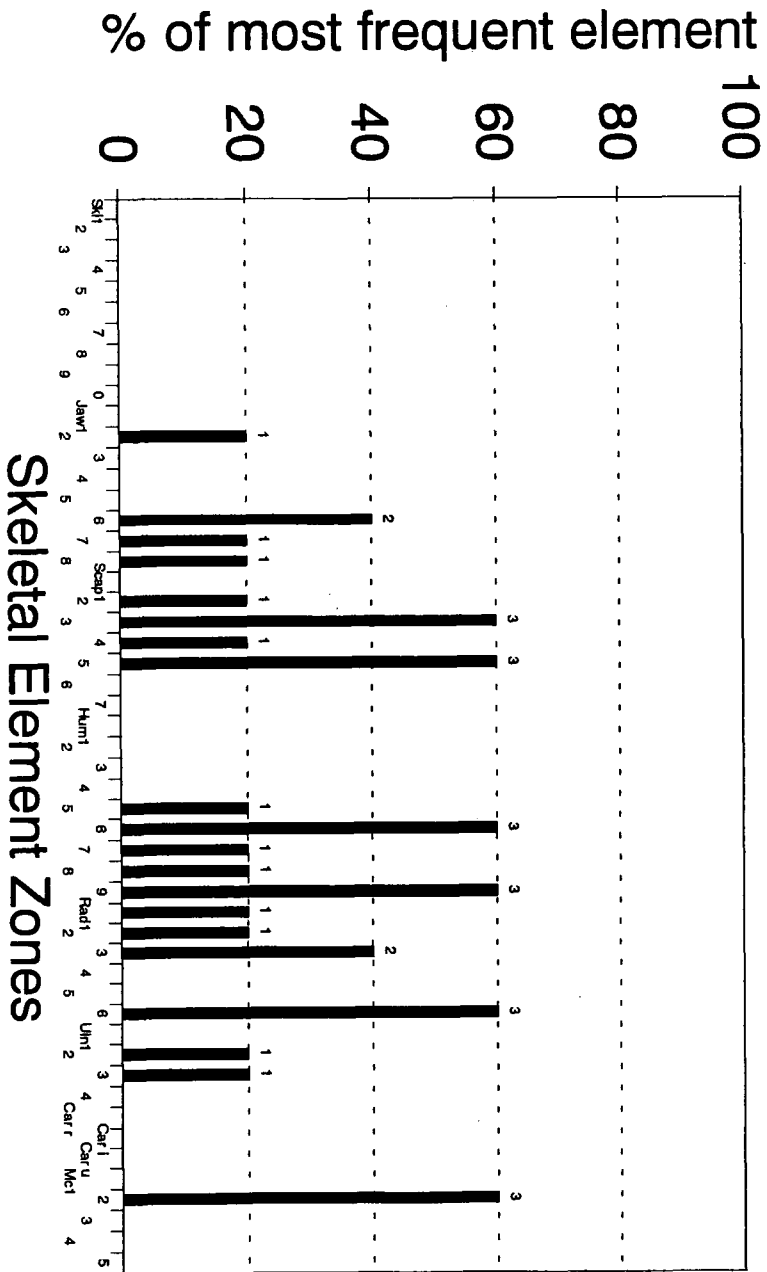


figure 132

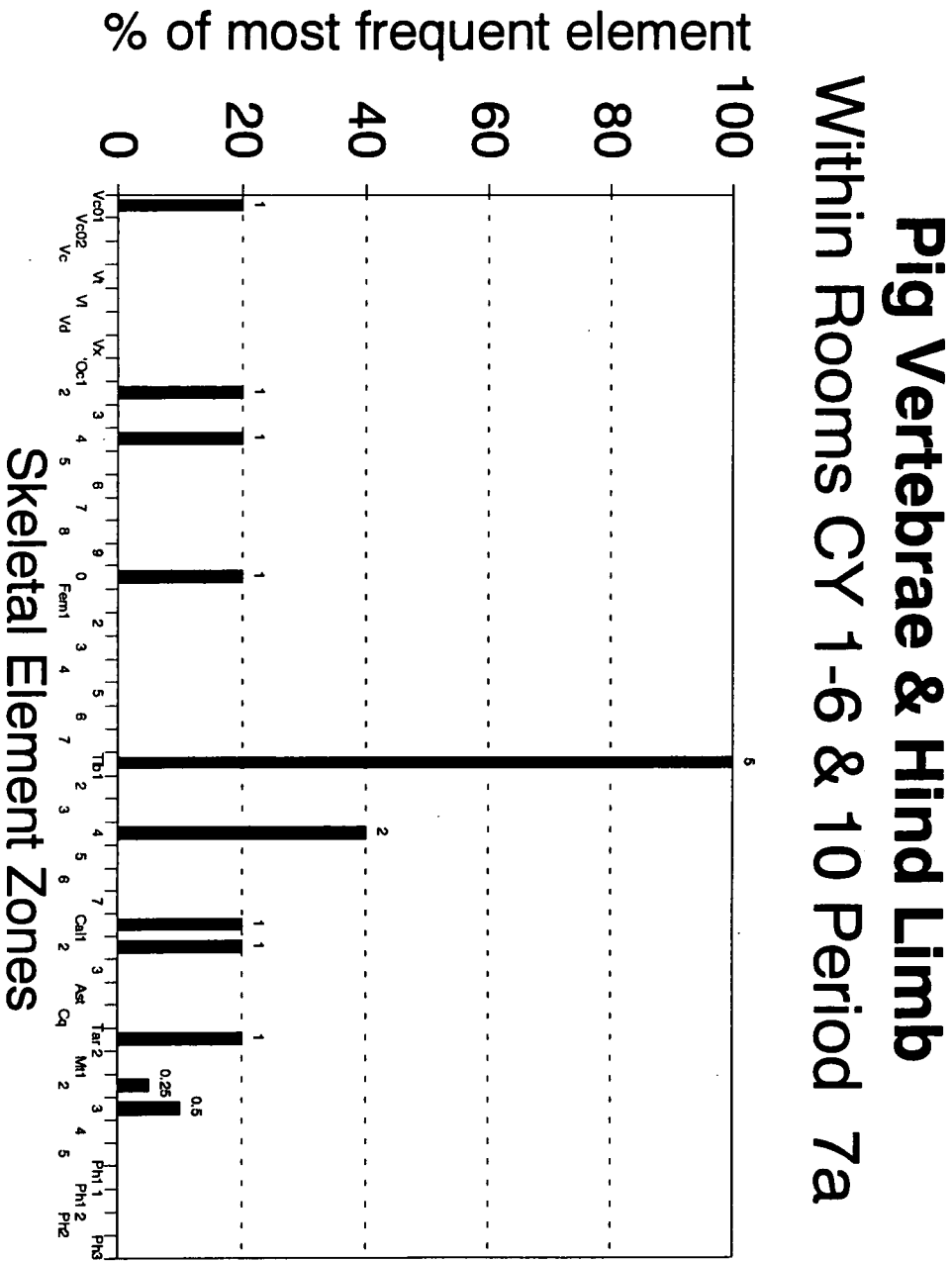


figure 133

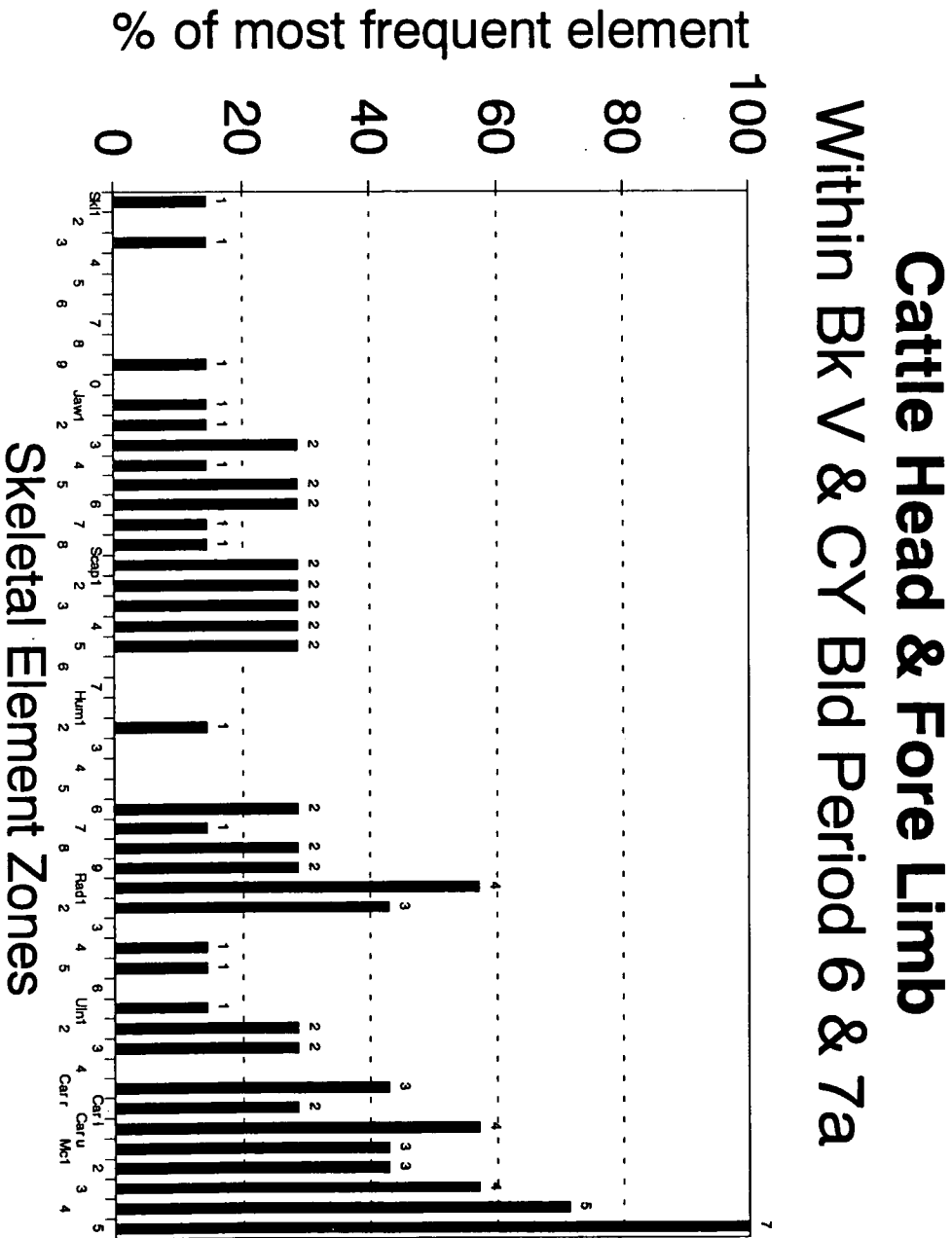


figure 134

Sheep/Goat Head & Fore Limb
 Within Bk V & CY Bid Period 6 & 7a

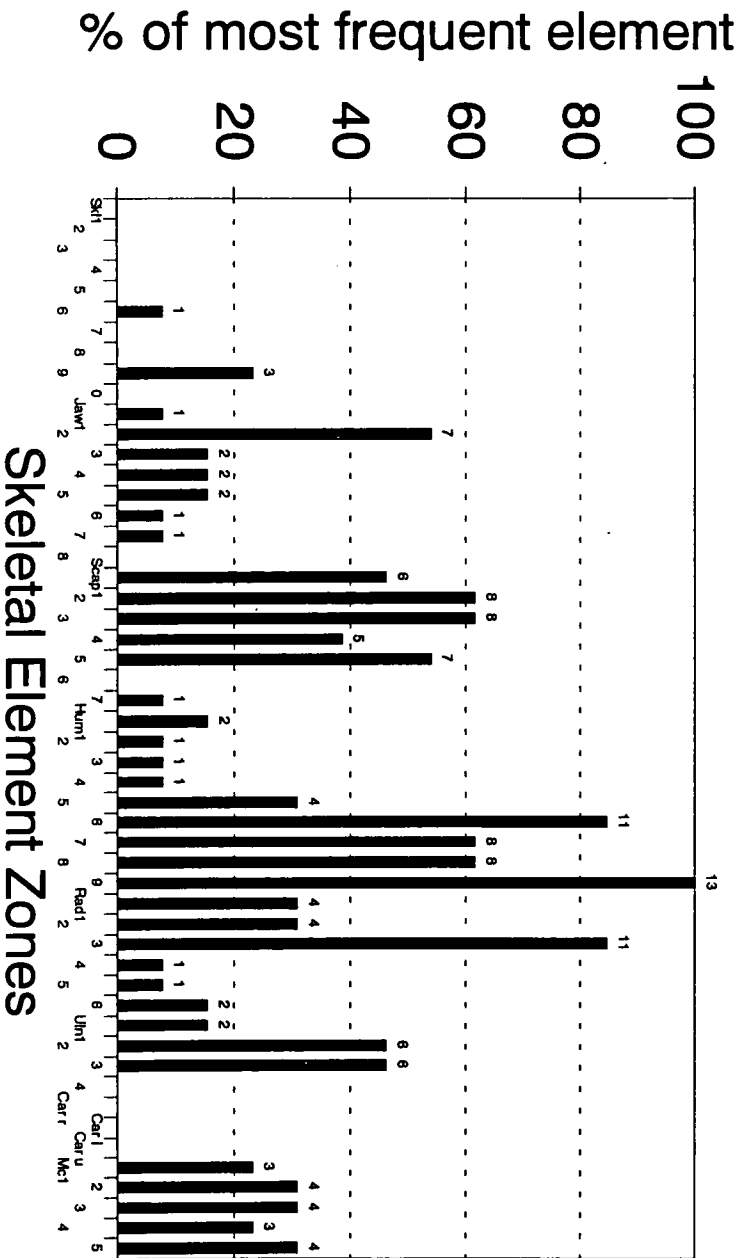


figure 136

Sheep/Goat Vertebrae & Hind Limb Within Bk V & CY Bld Period 6 & 7a

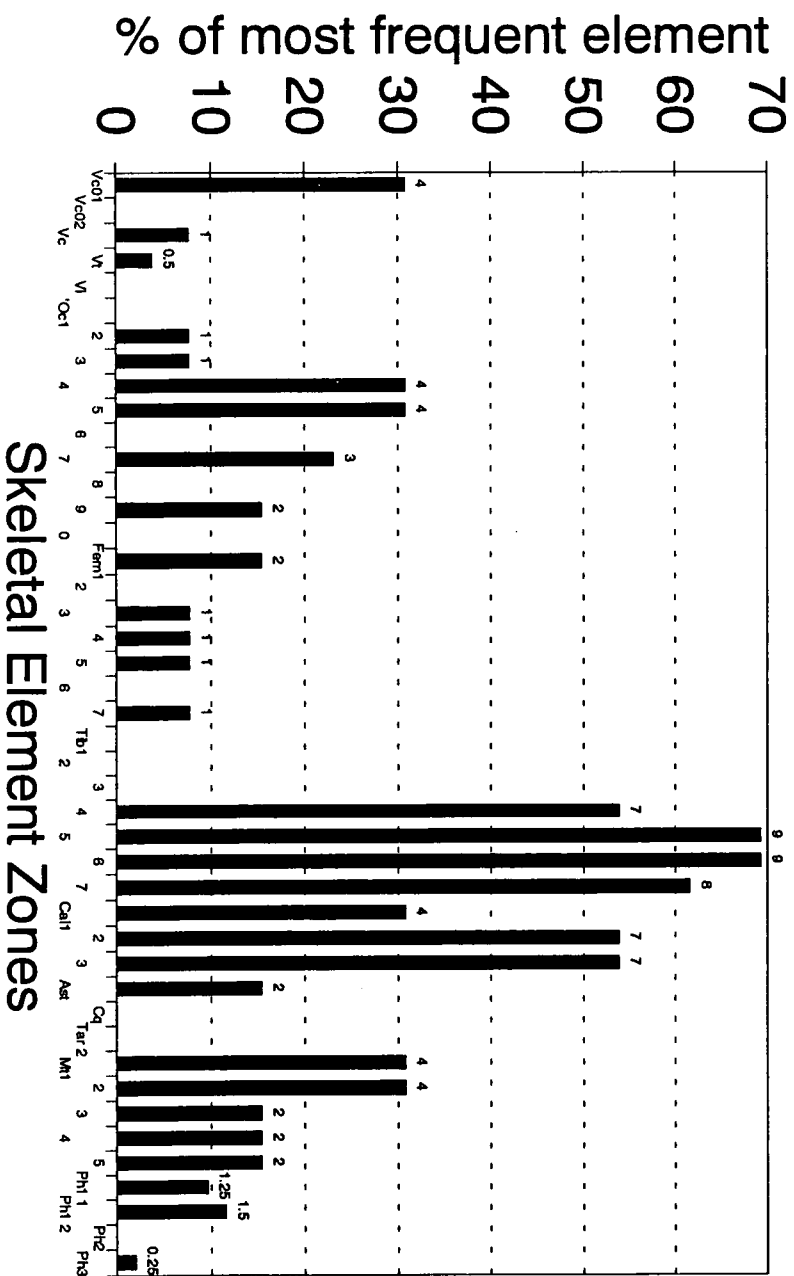


figure 137

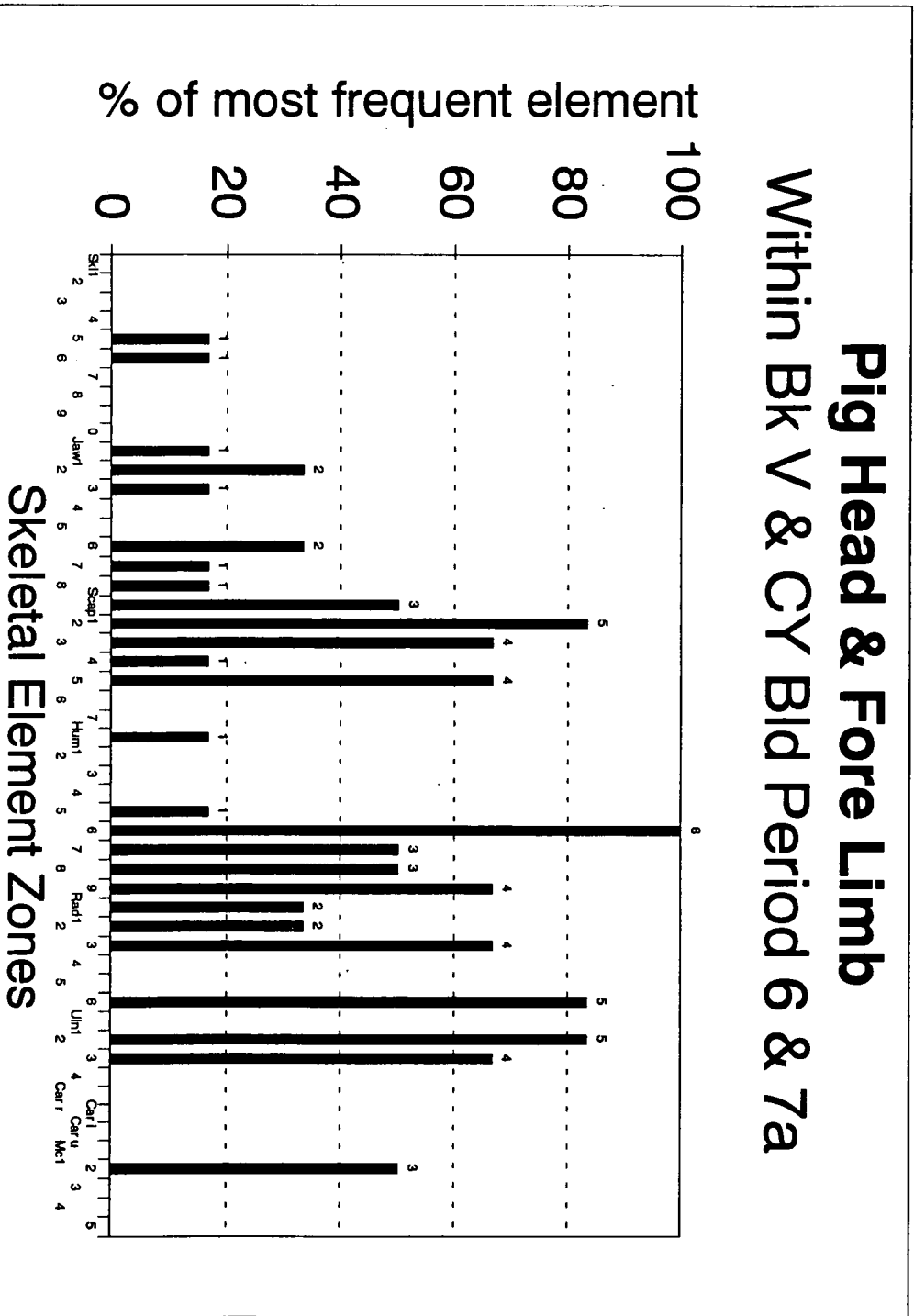


figure 138

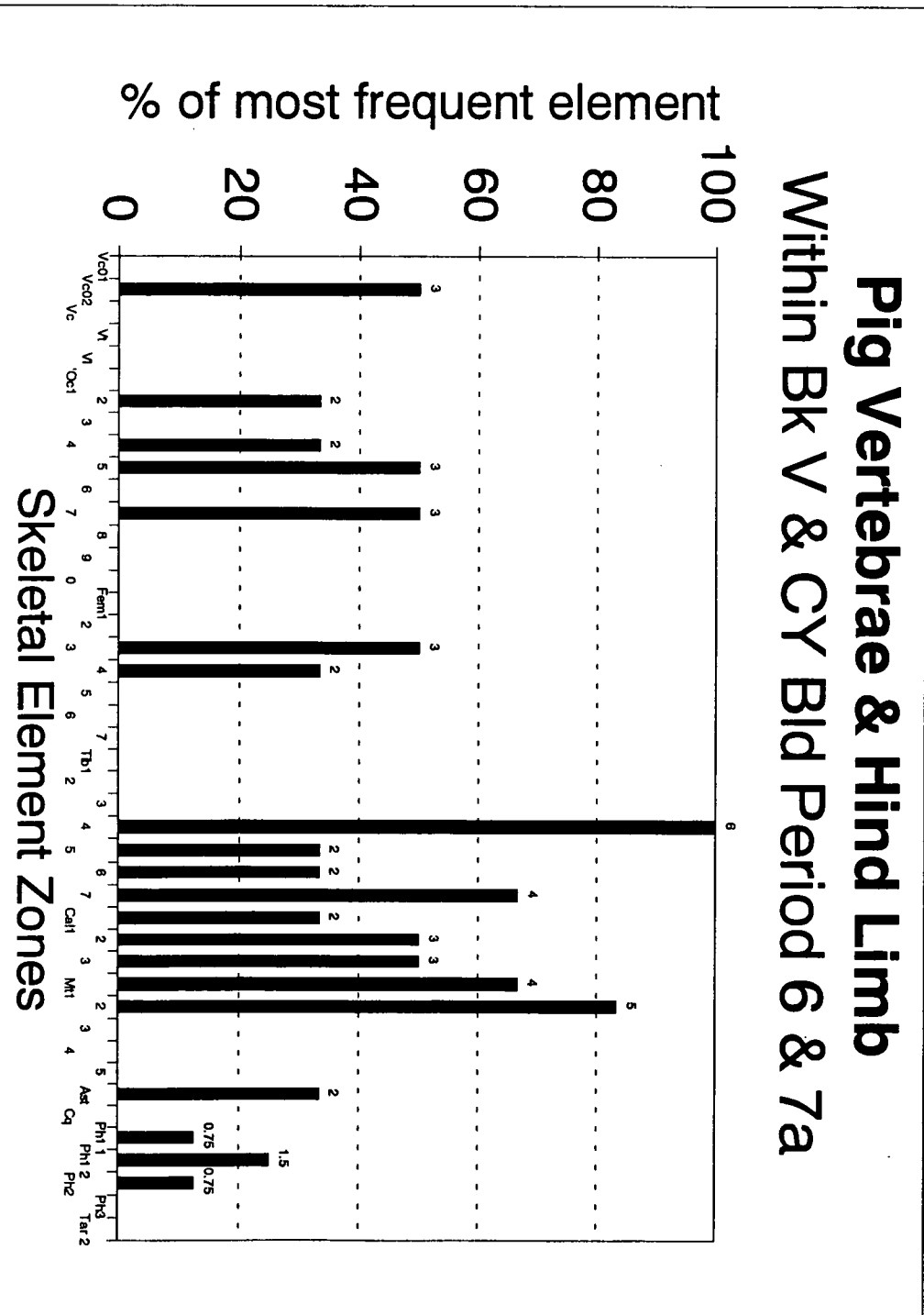


figure 139

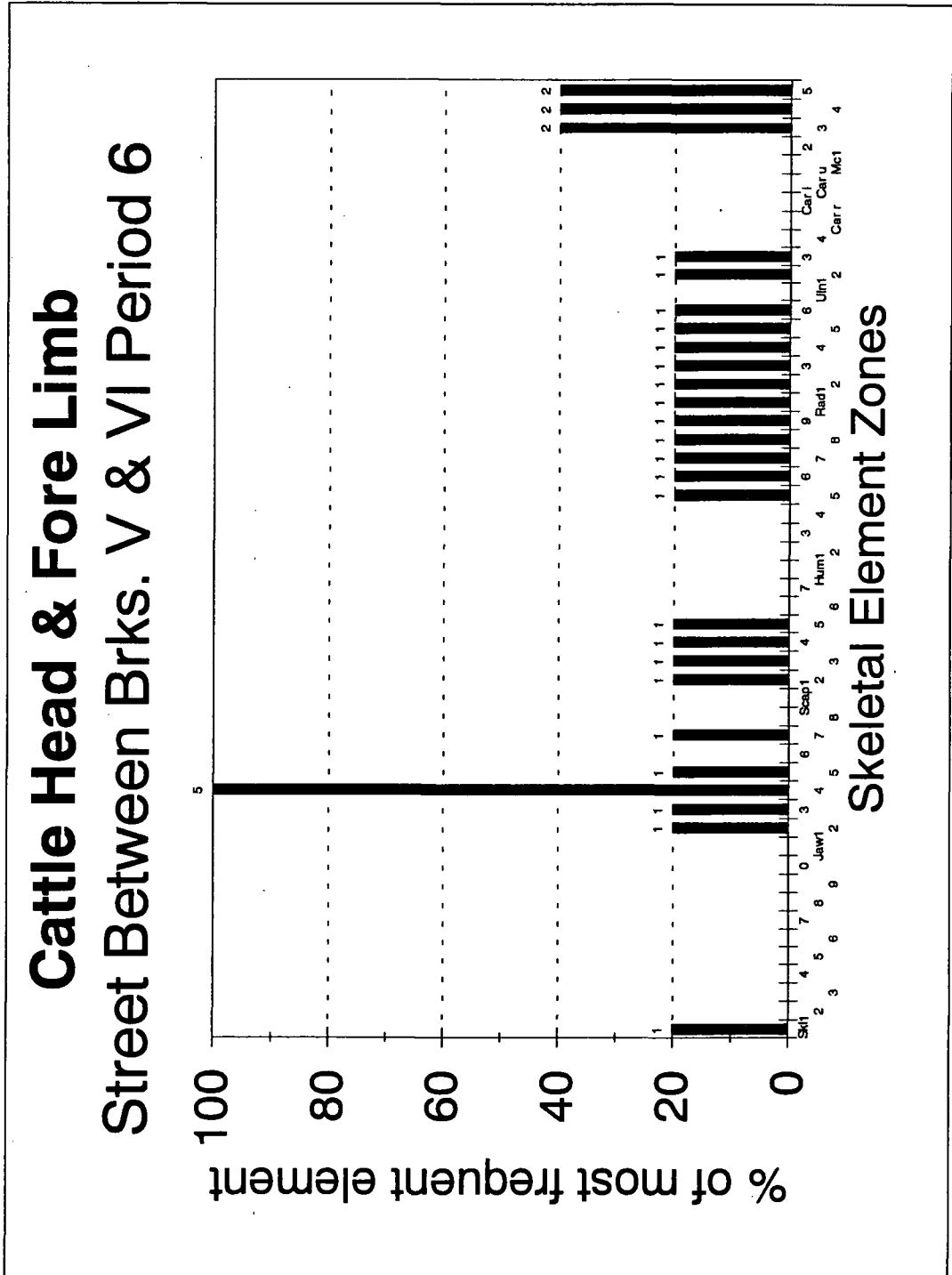


figure 140

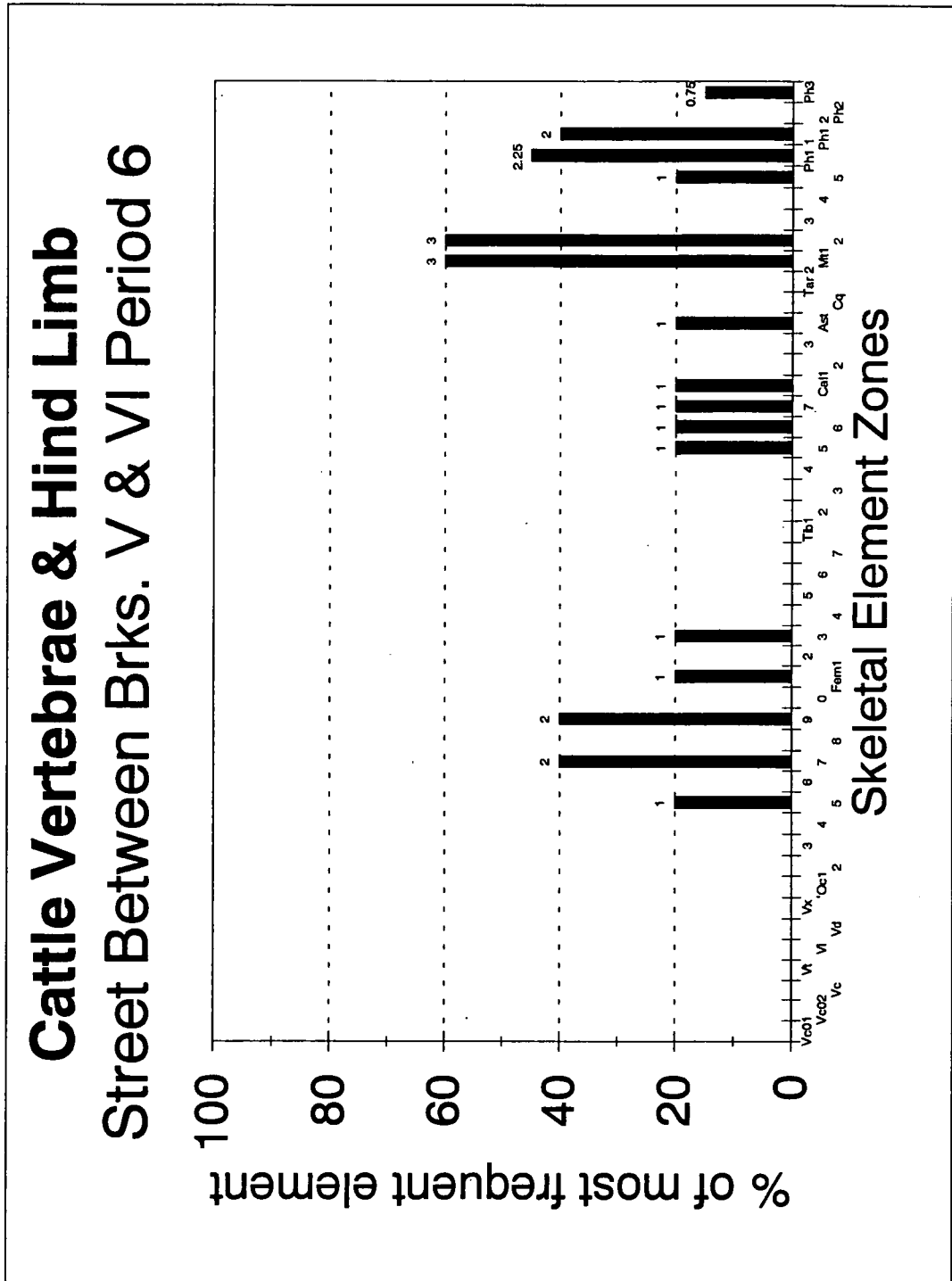


figure 141

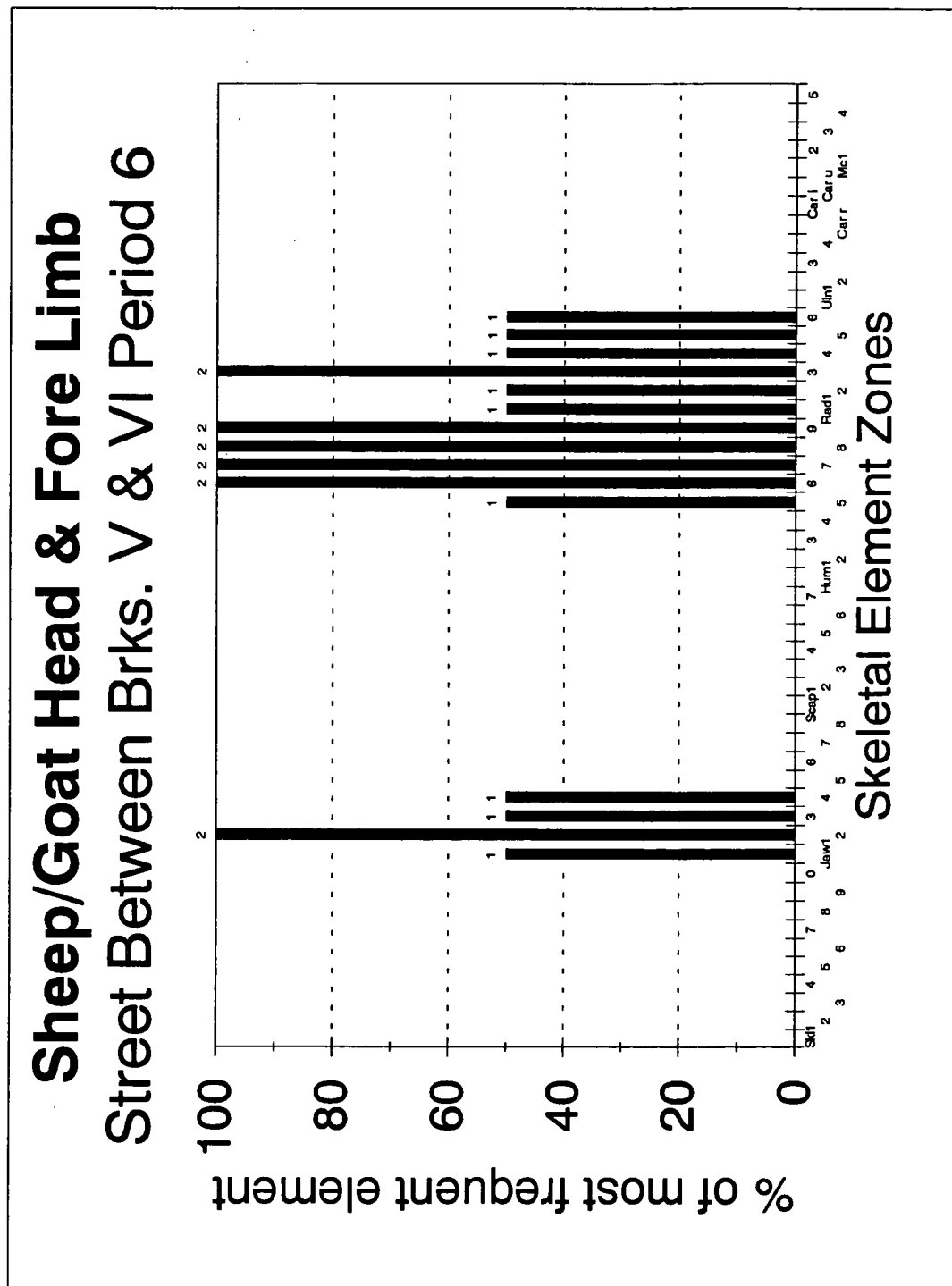


figure 142

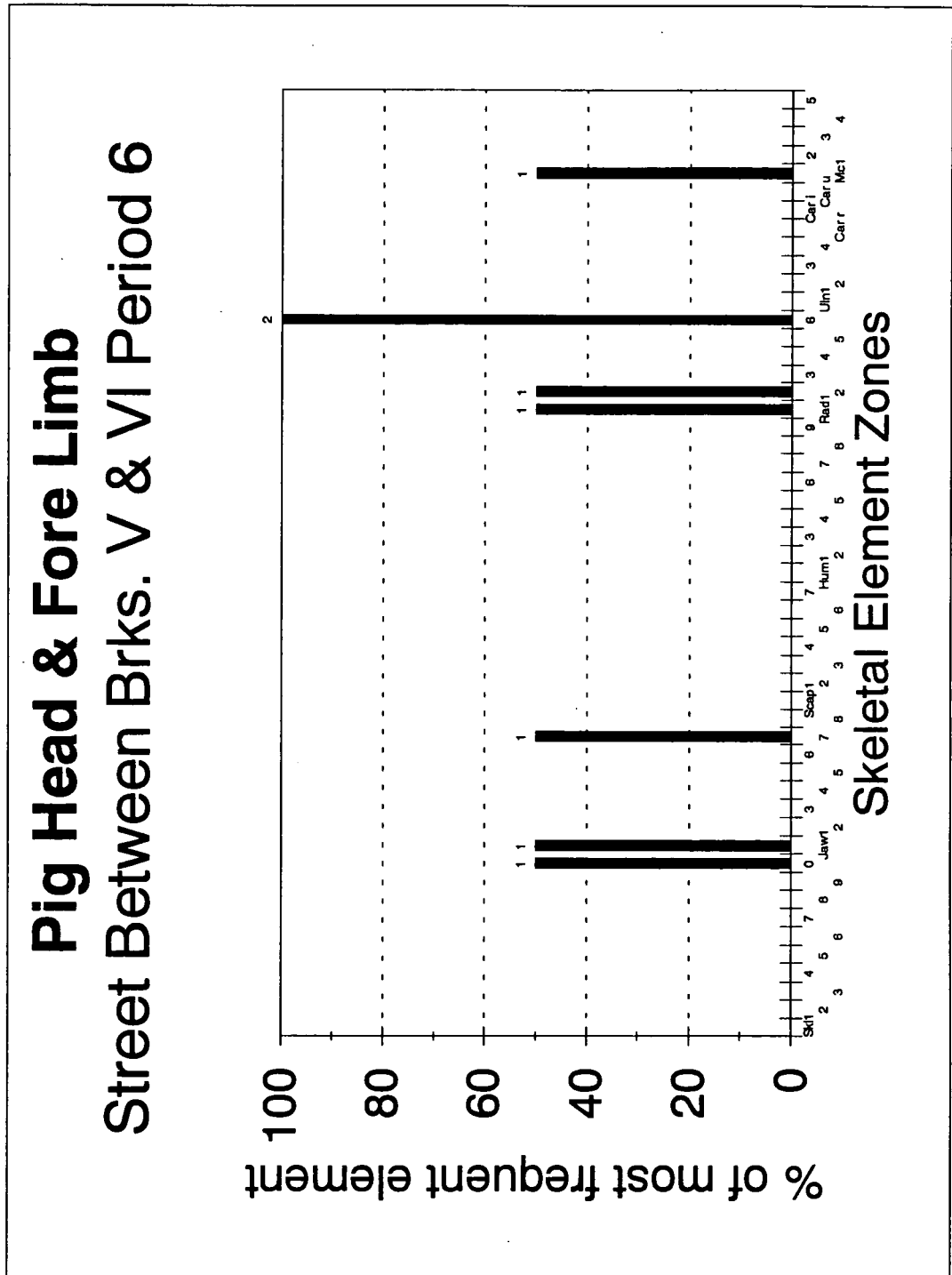


figure 144

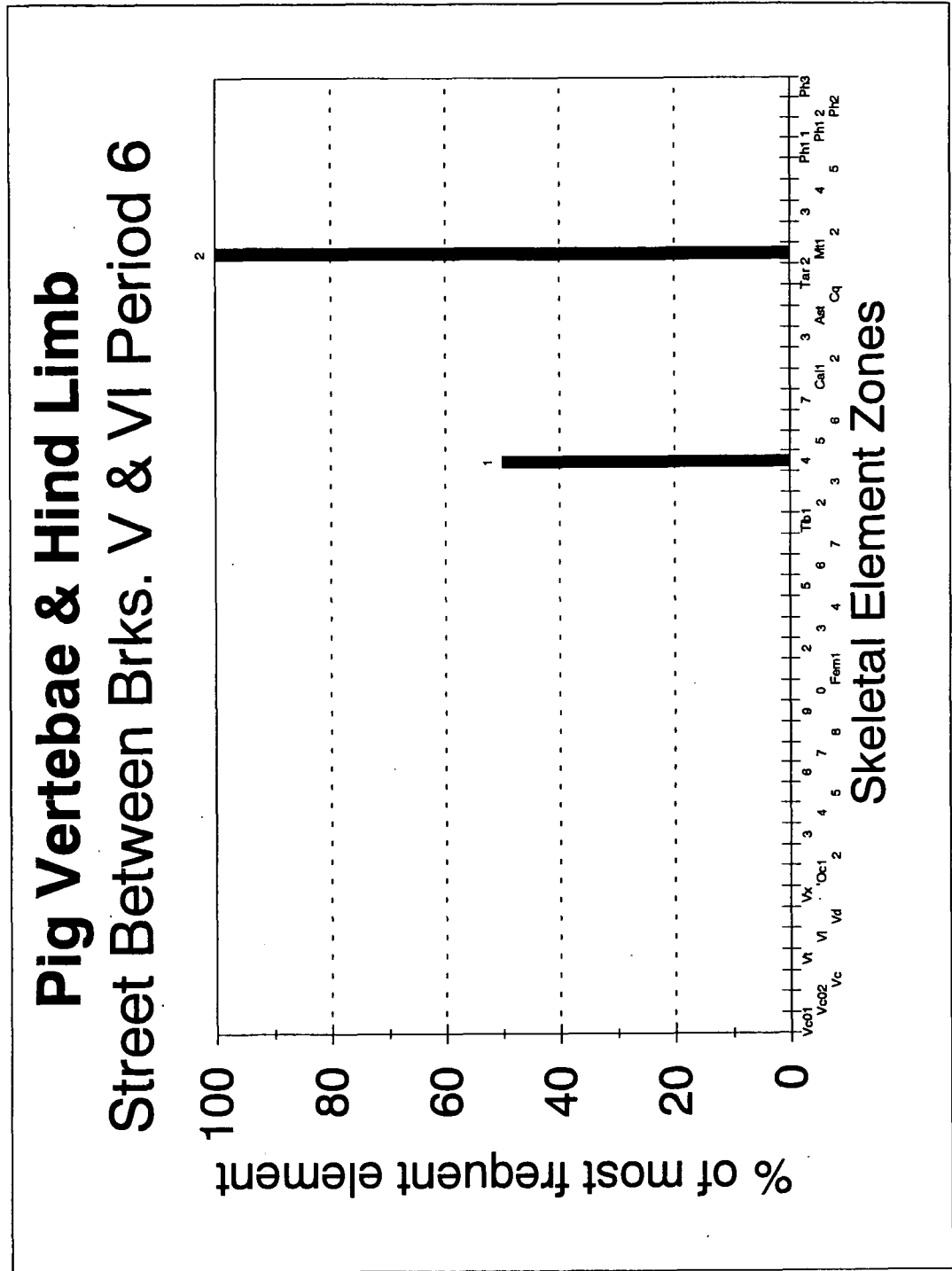


figure 145

Cattle Head & Fore Limb Within Barrack Block VI Period 6

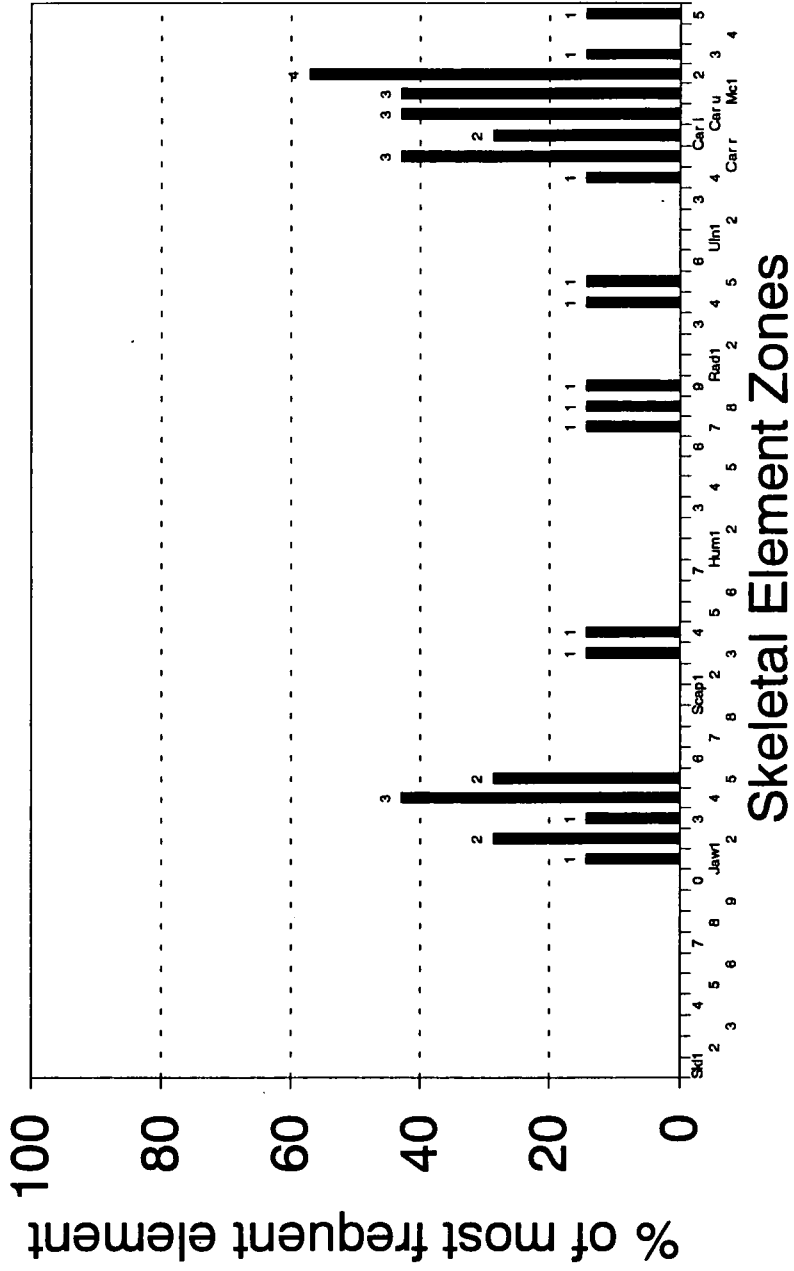


figure 146

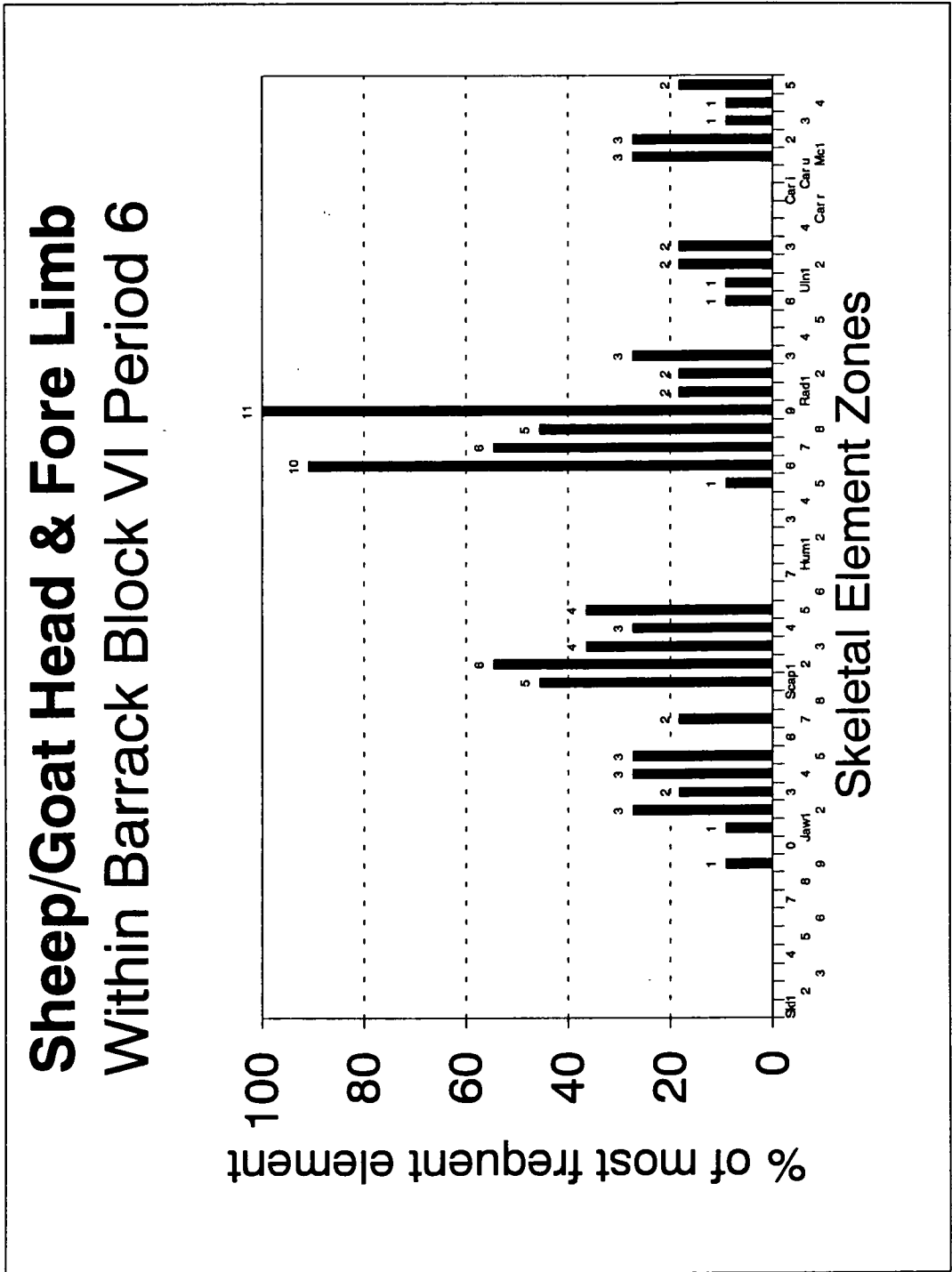
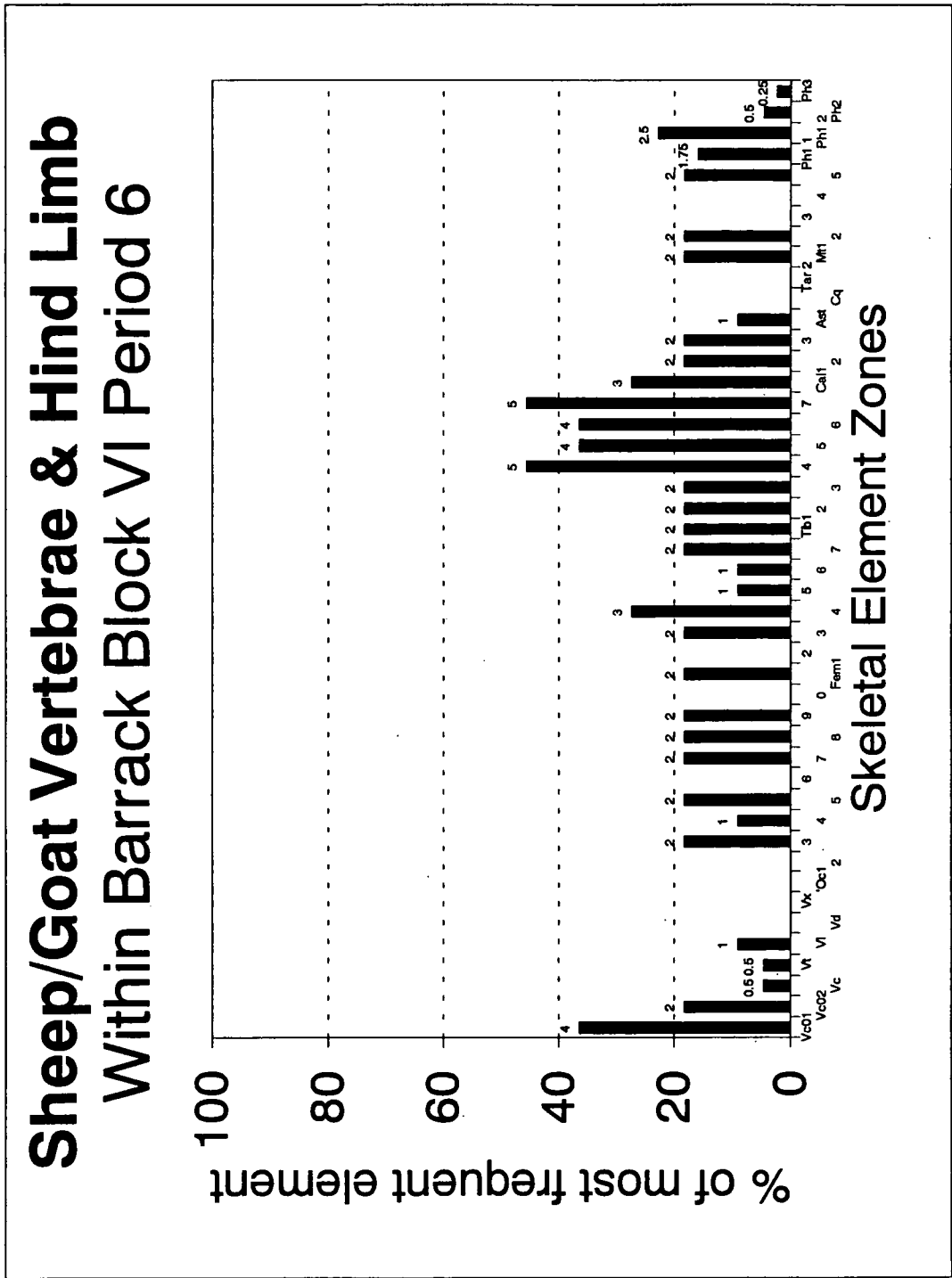


figure 148



Pig Head & Fore Limb Within Barrack Block VI Period 6

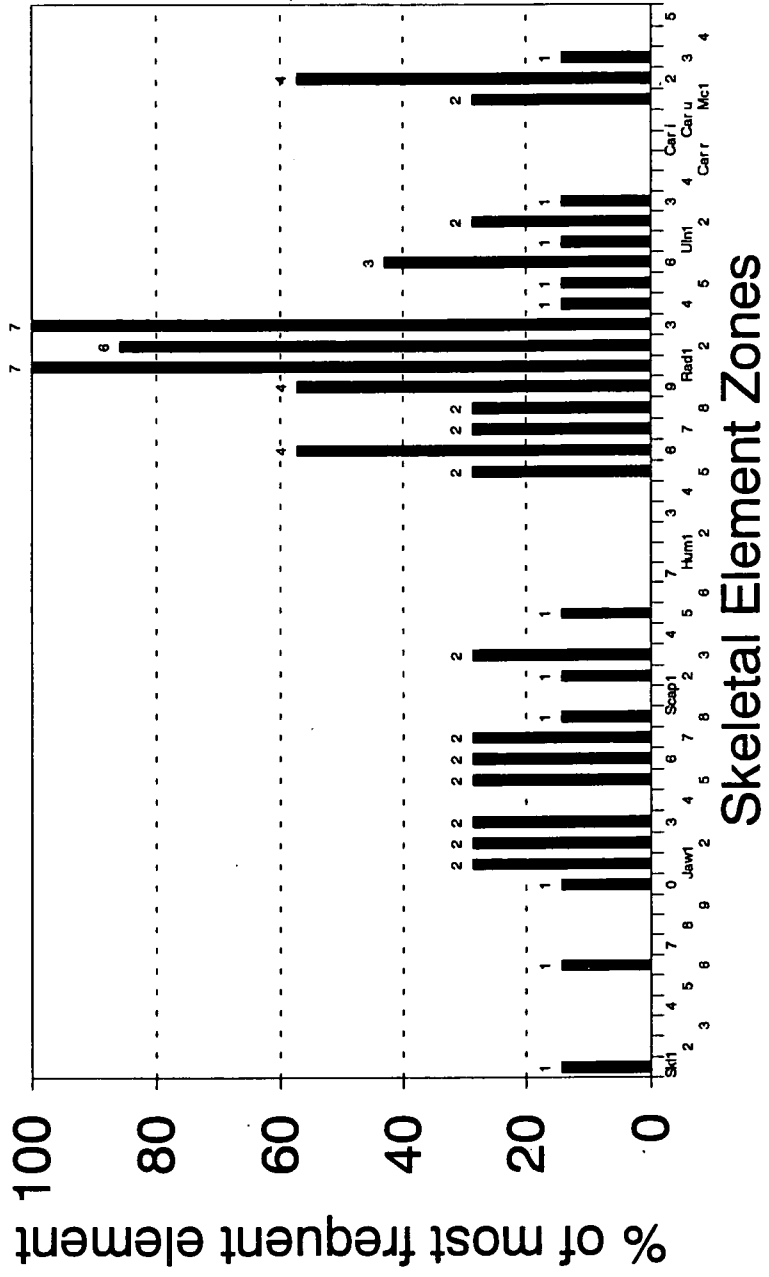
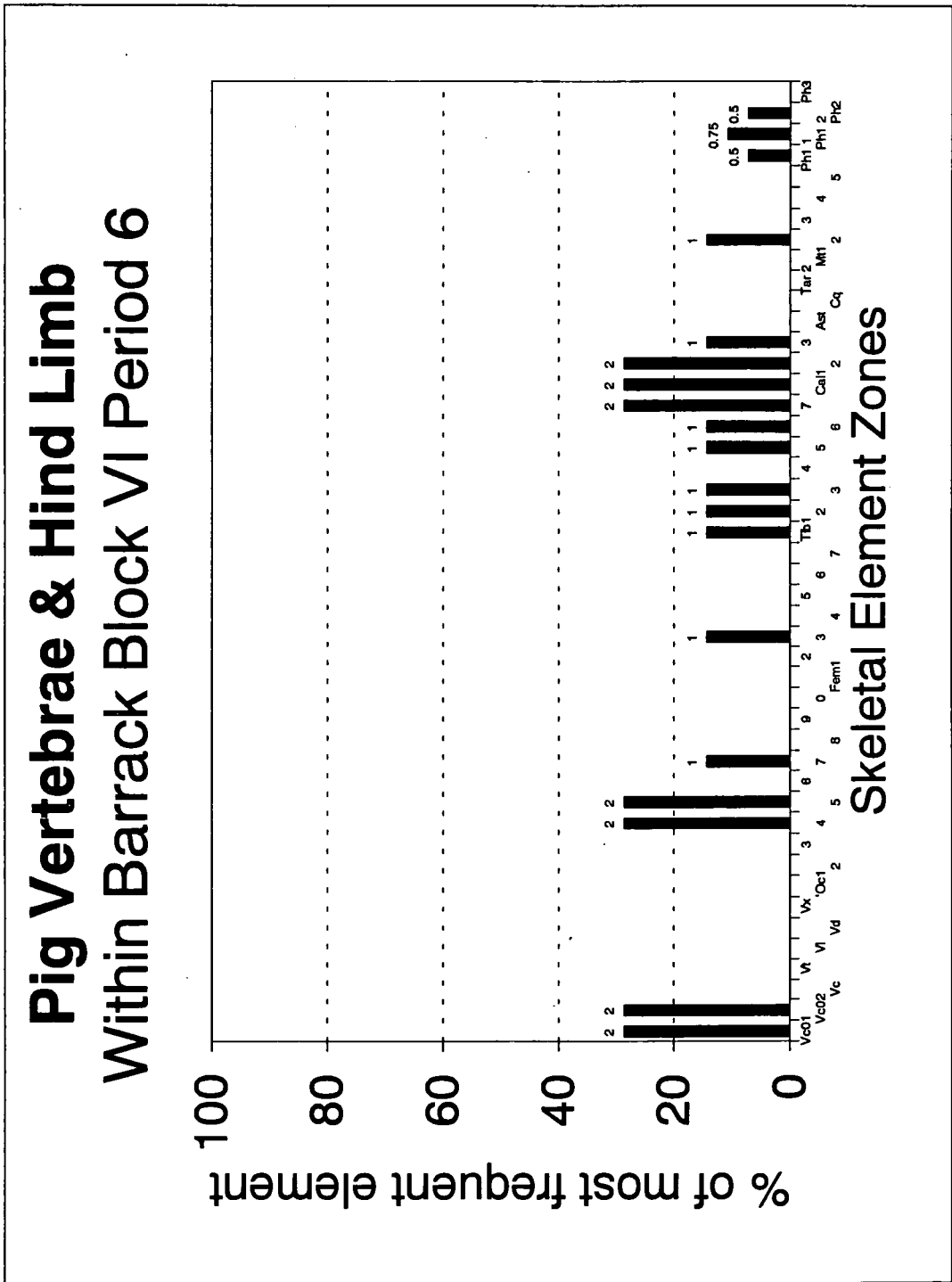


figure 150



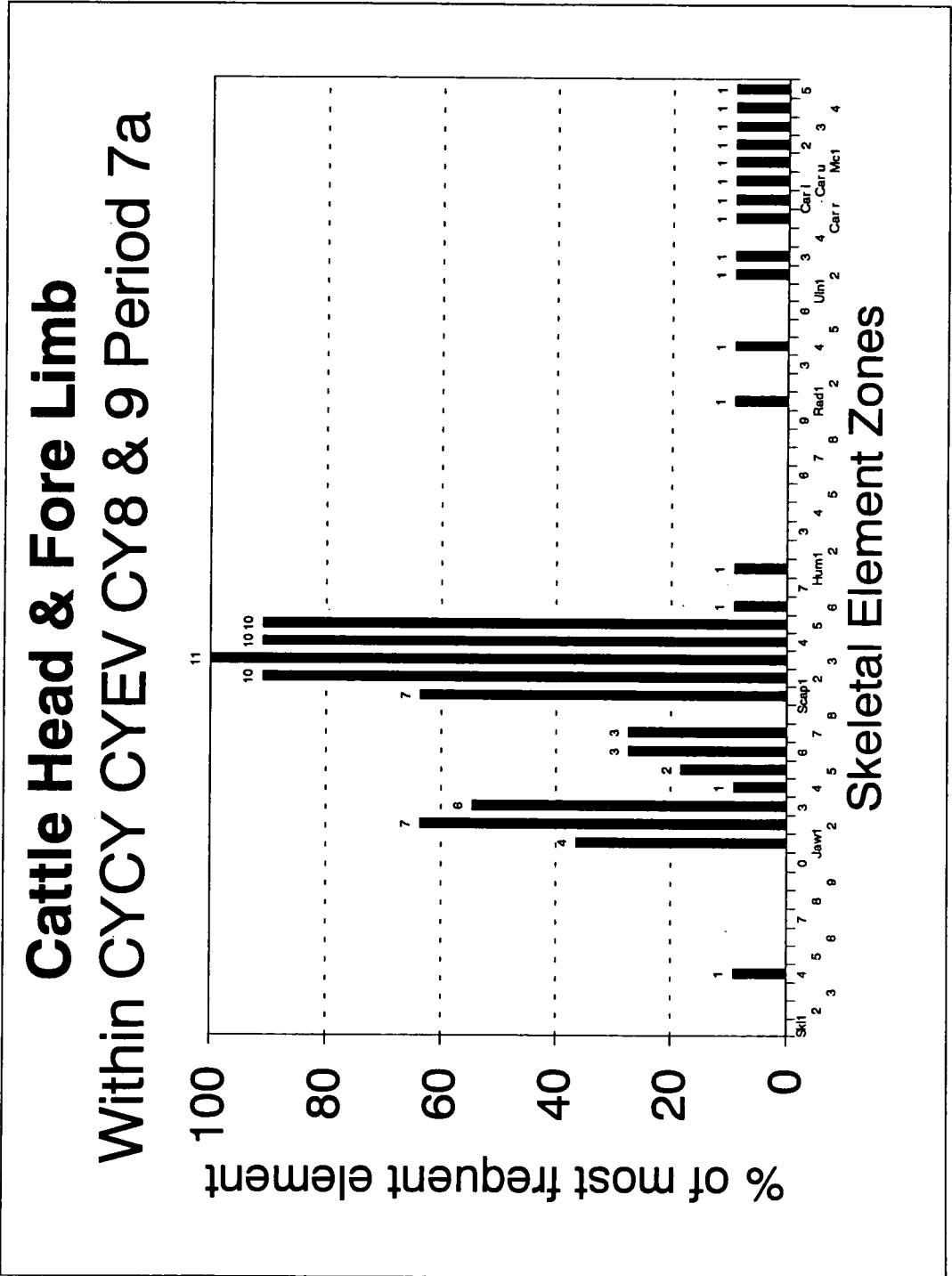


figure 152

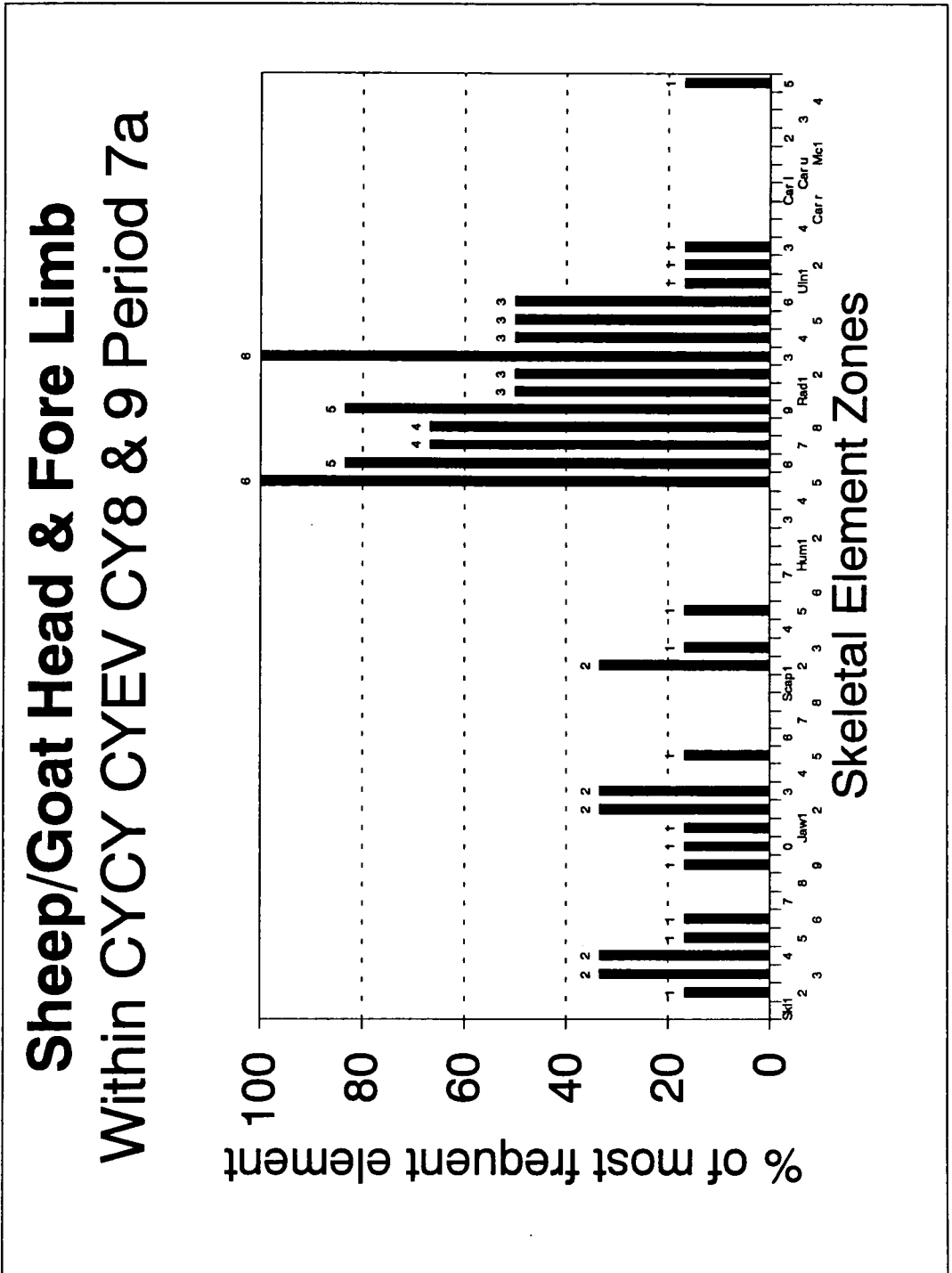


figure 154

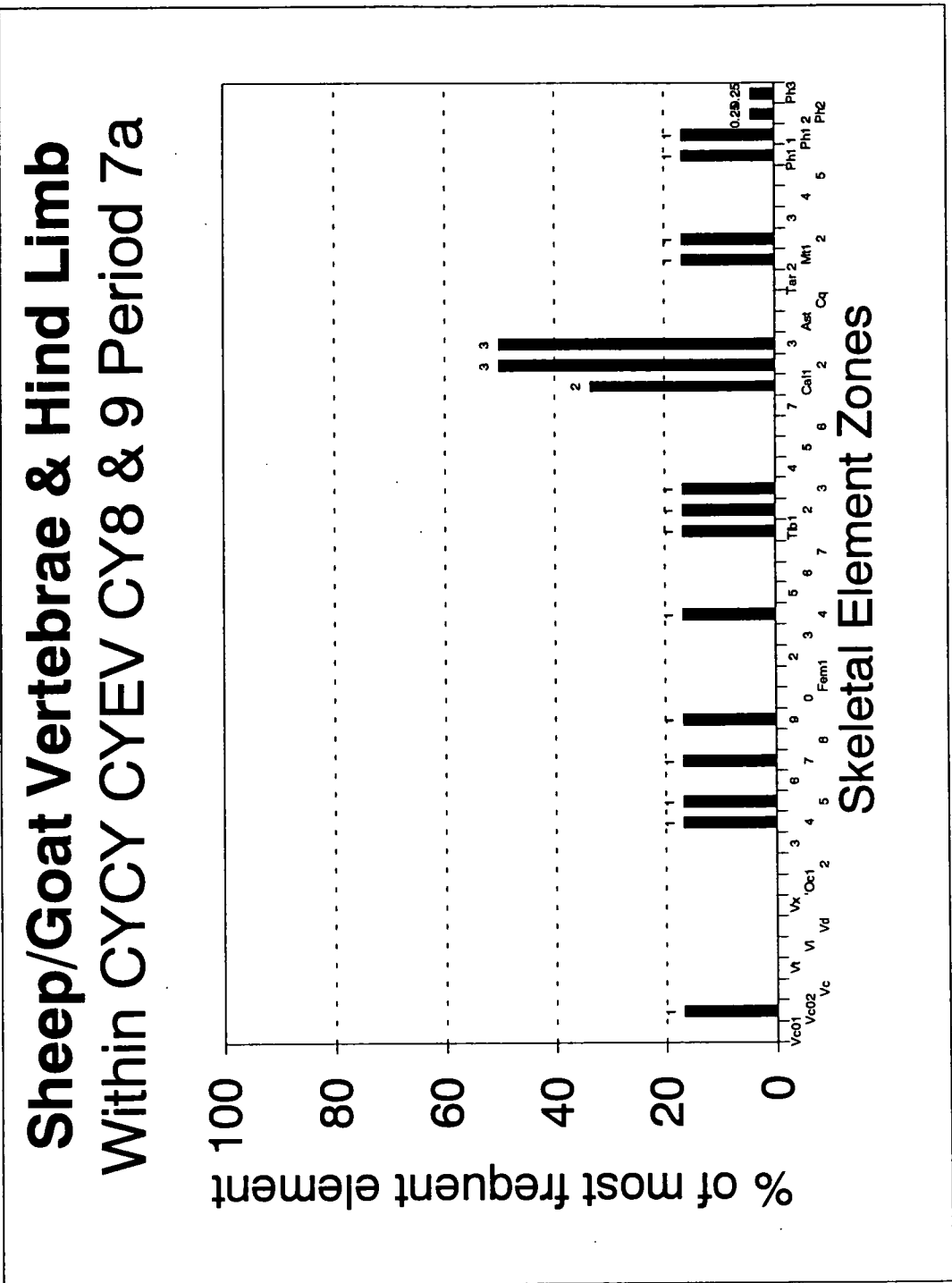


figure 155

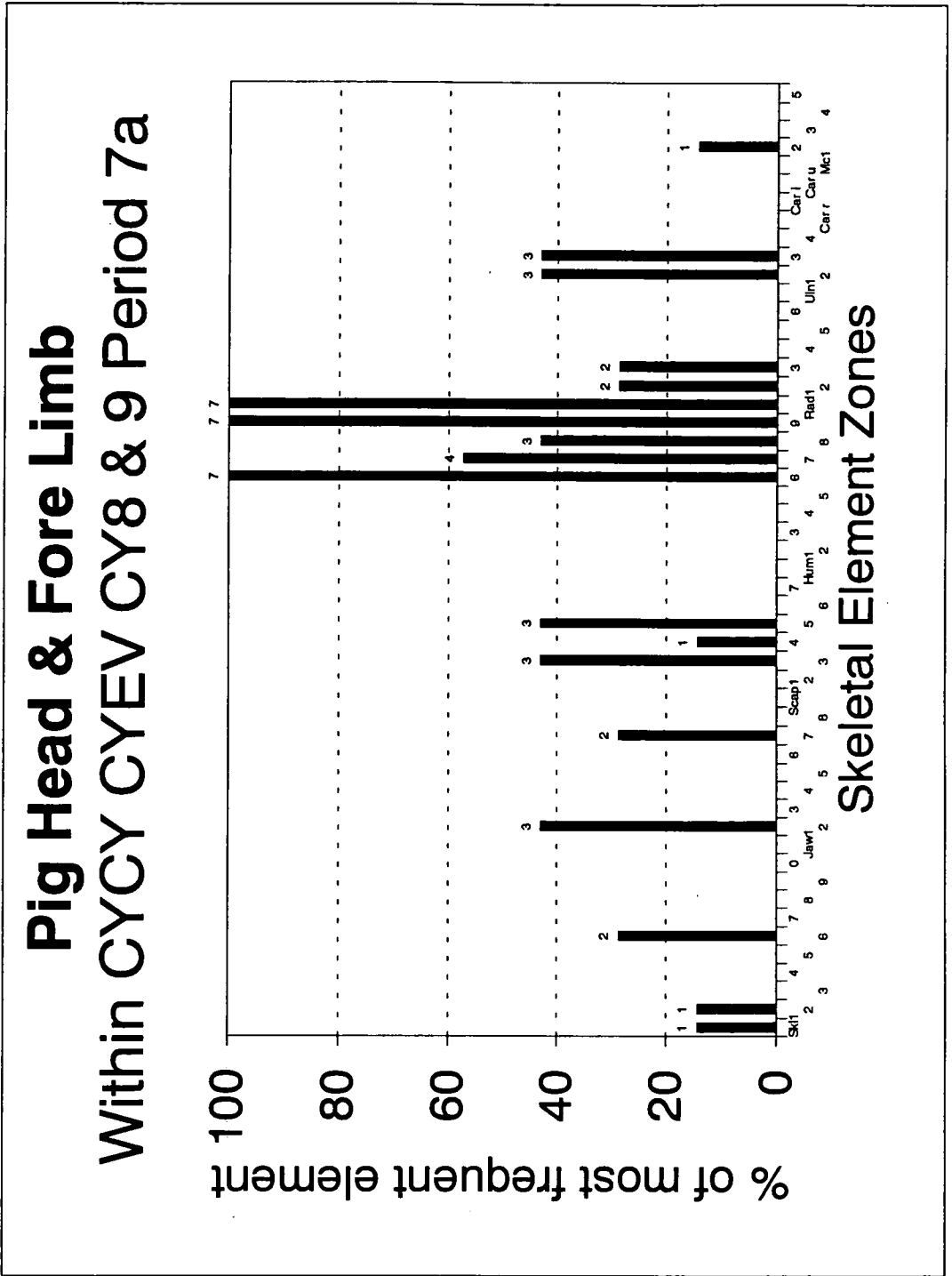


figure 156

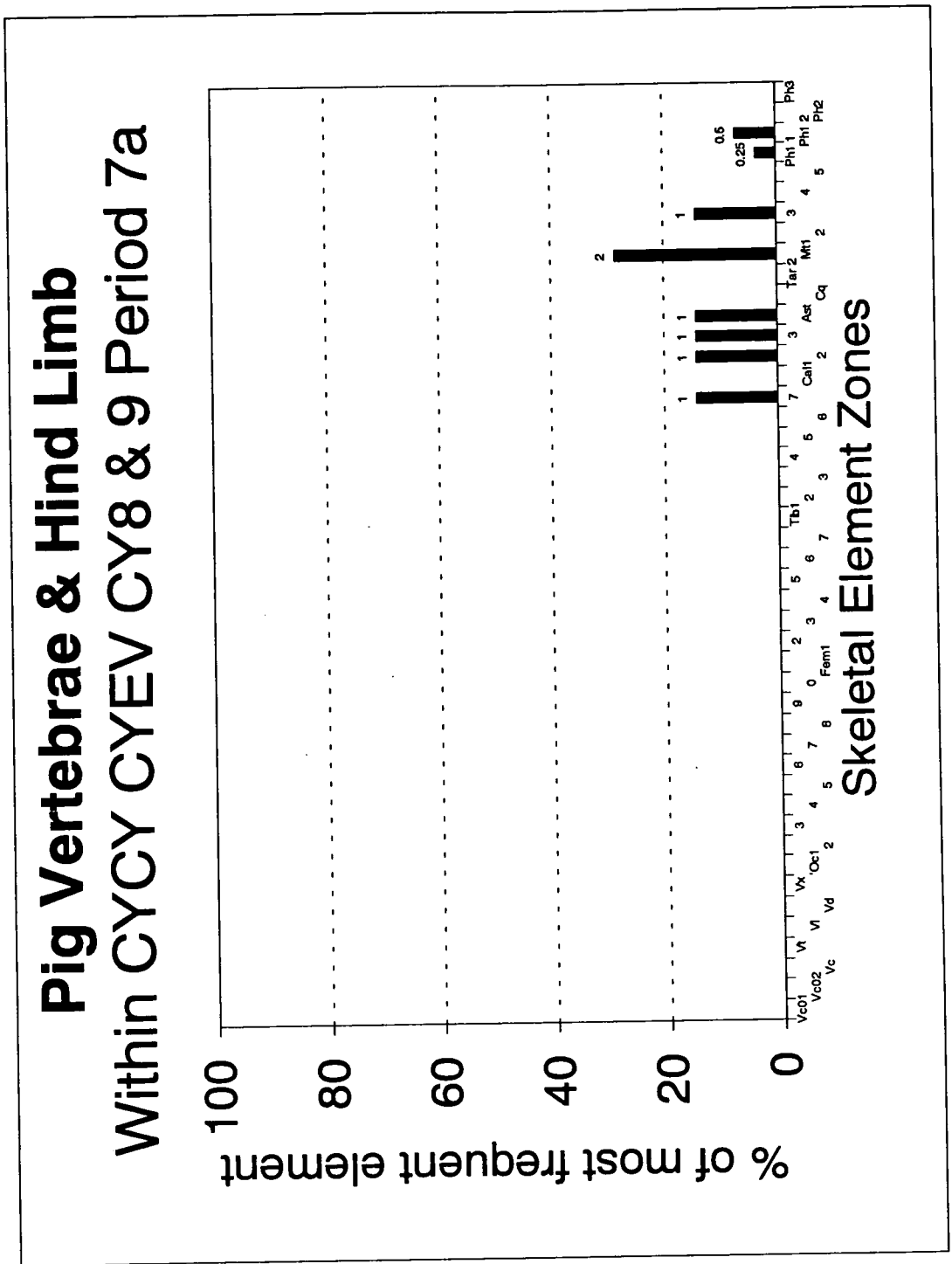


figure 157

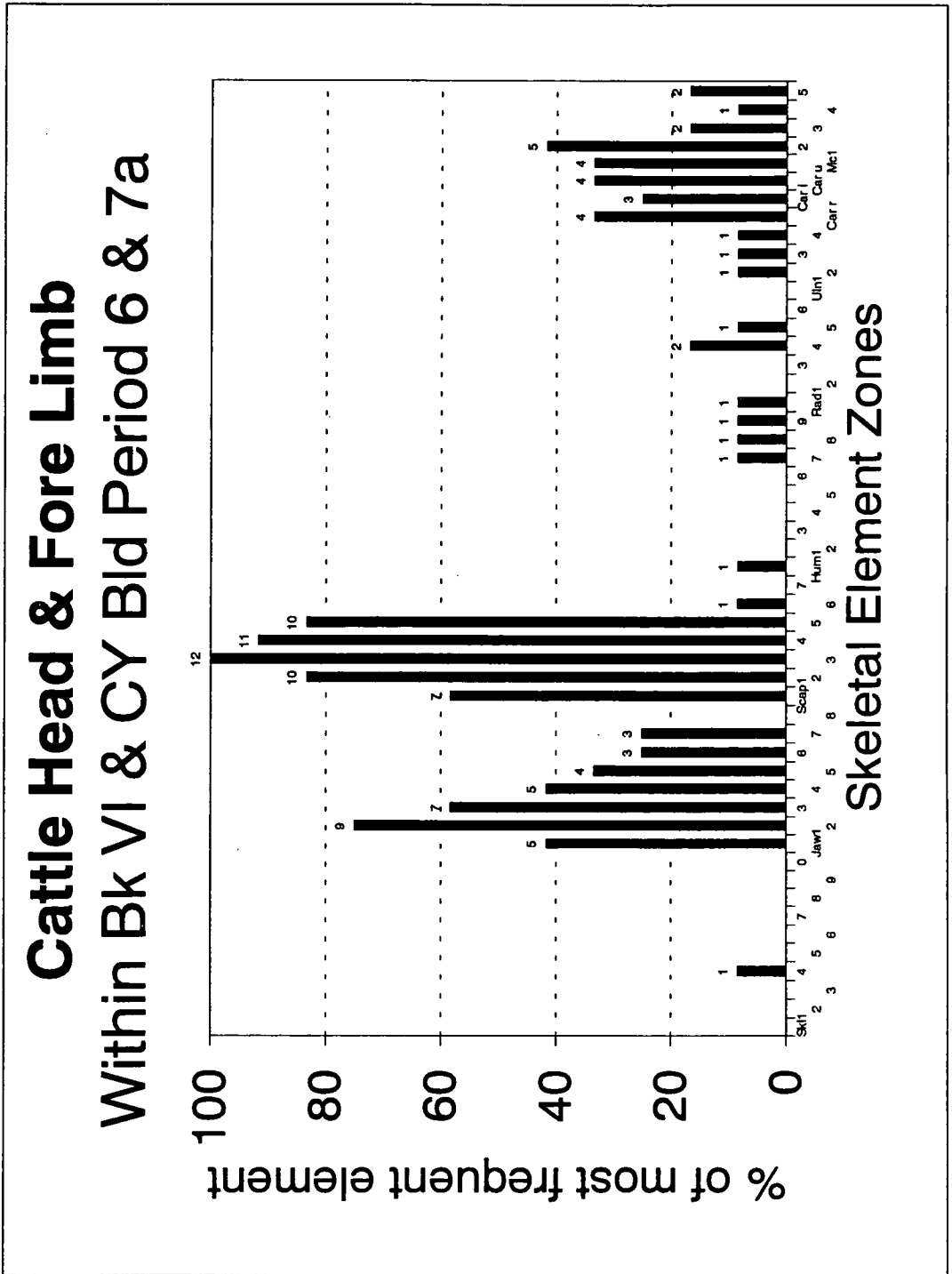


figure 158

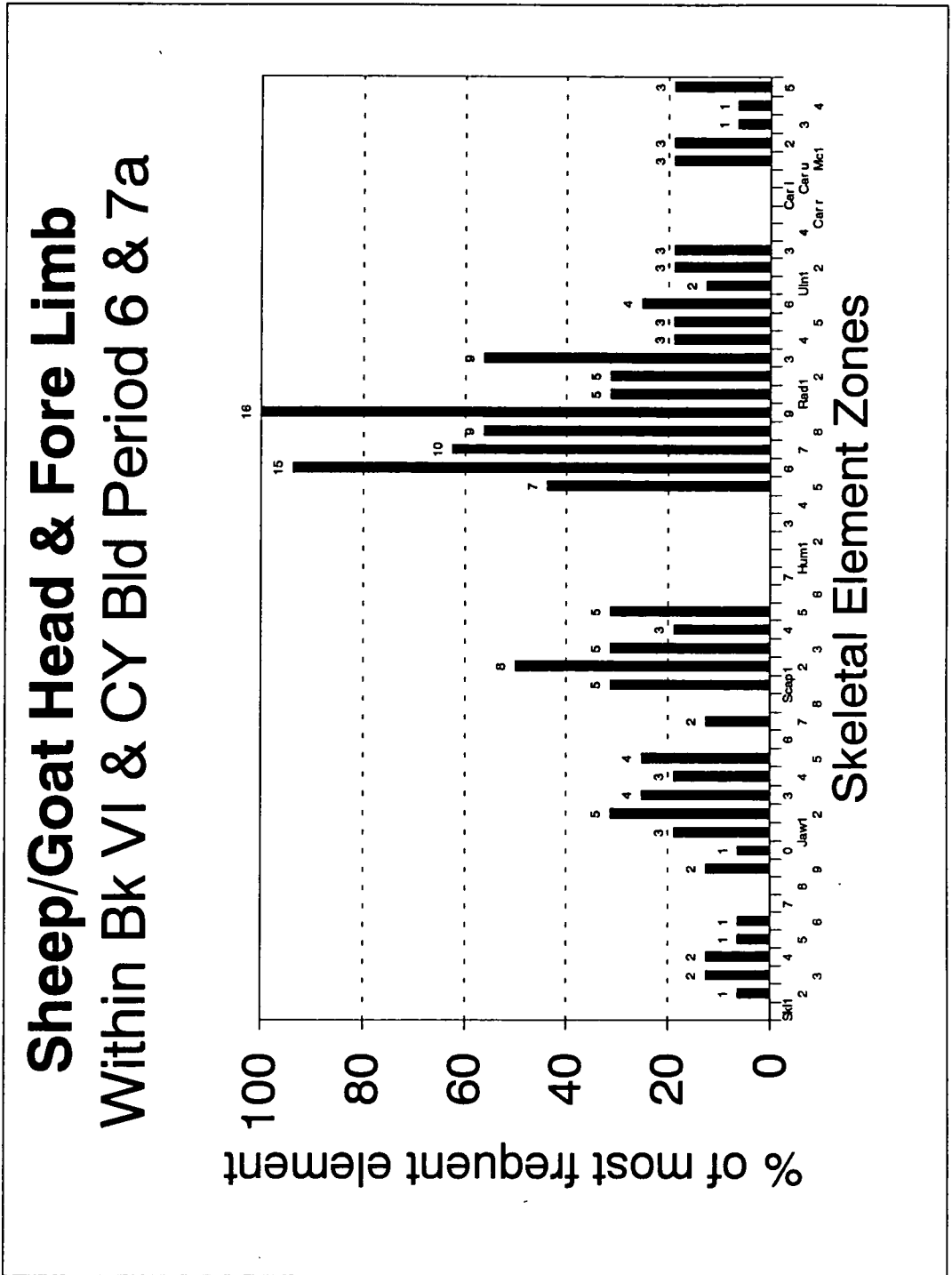


figure 160

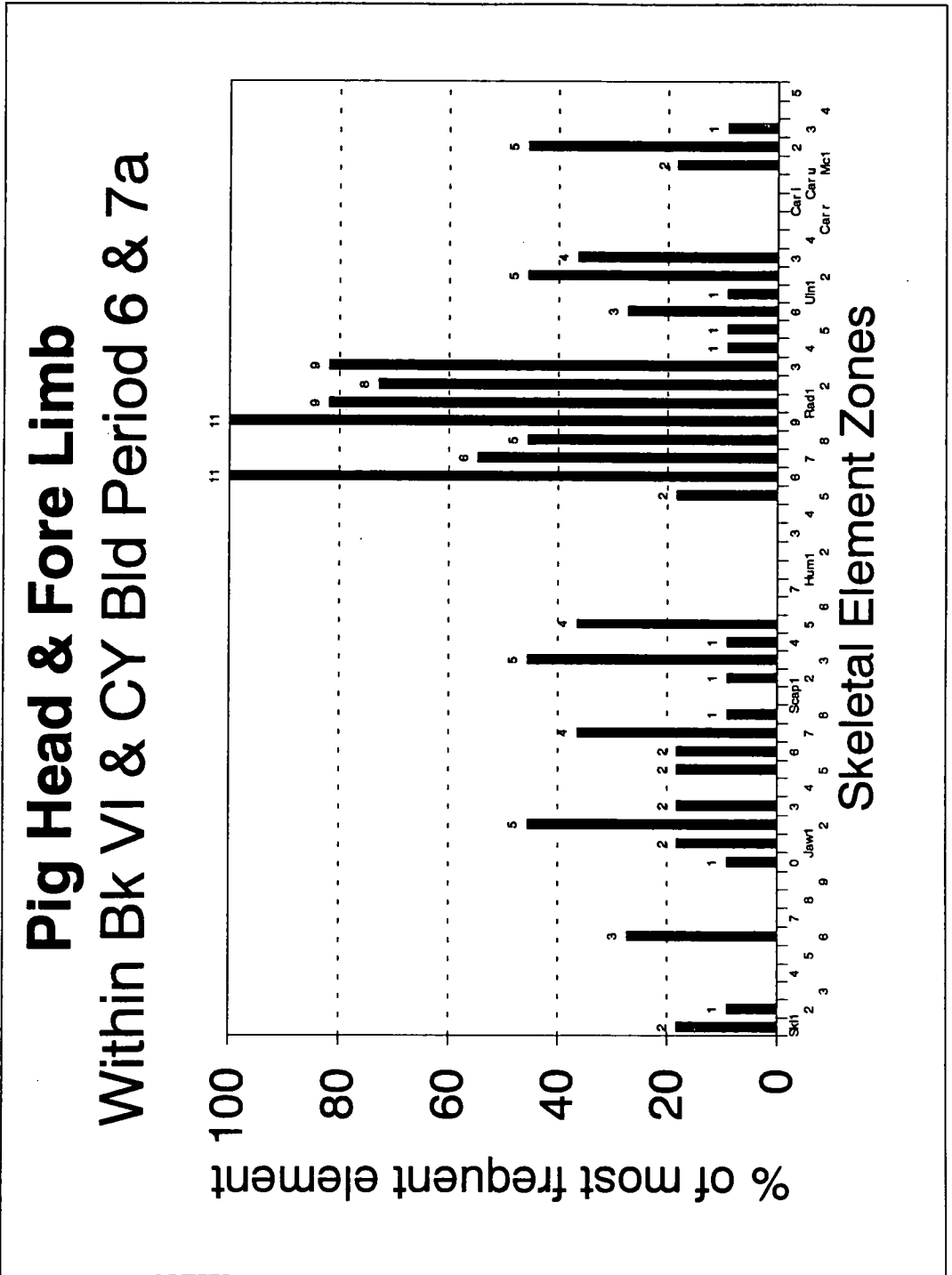


figure 162

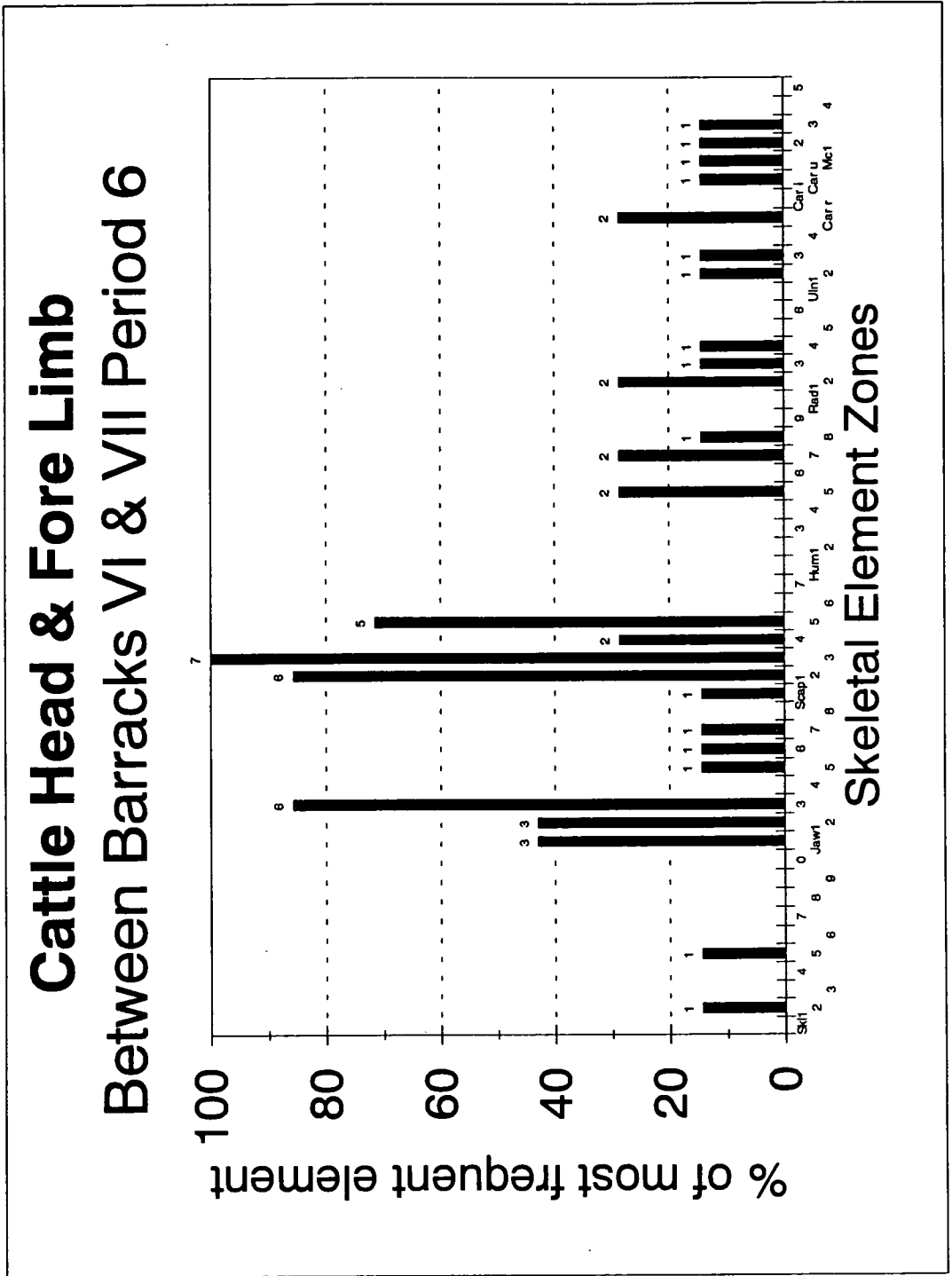


figure 164

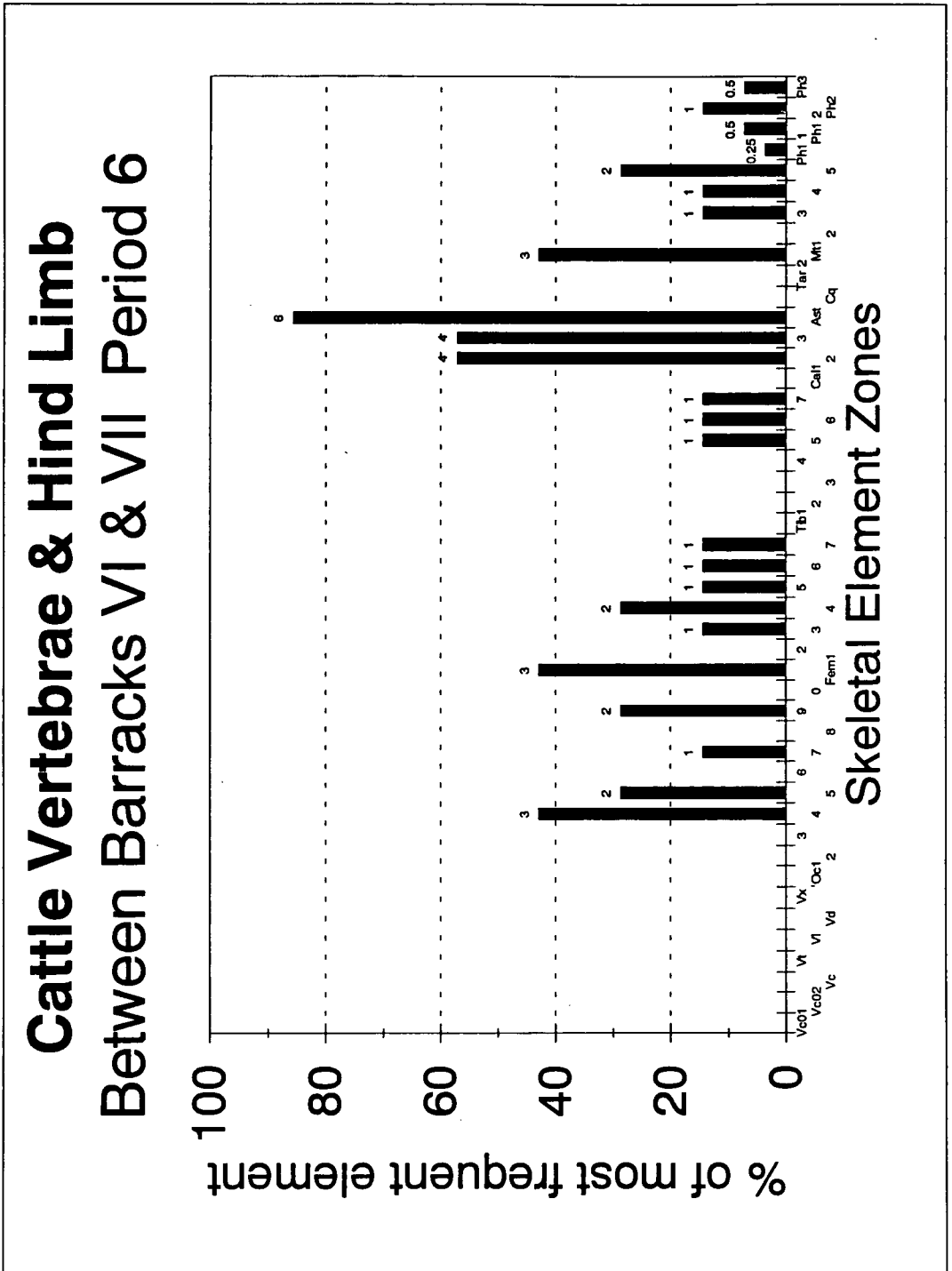


figure 165

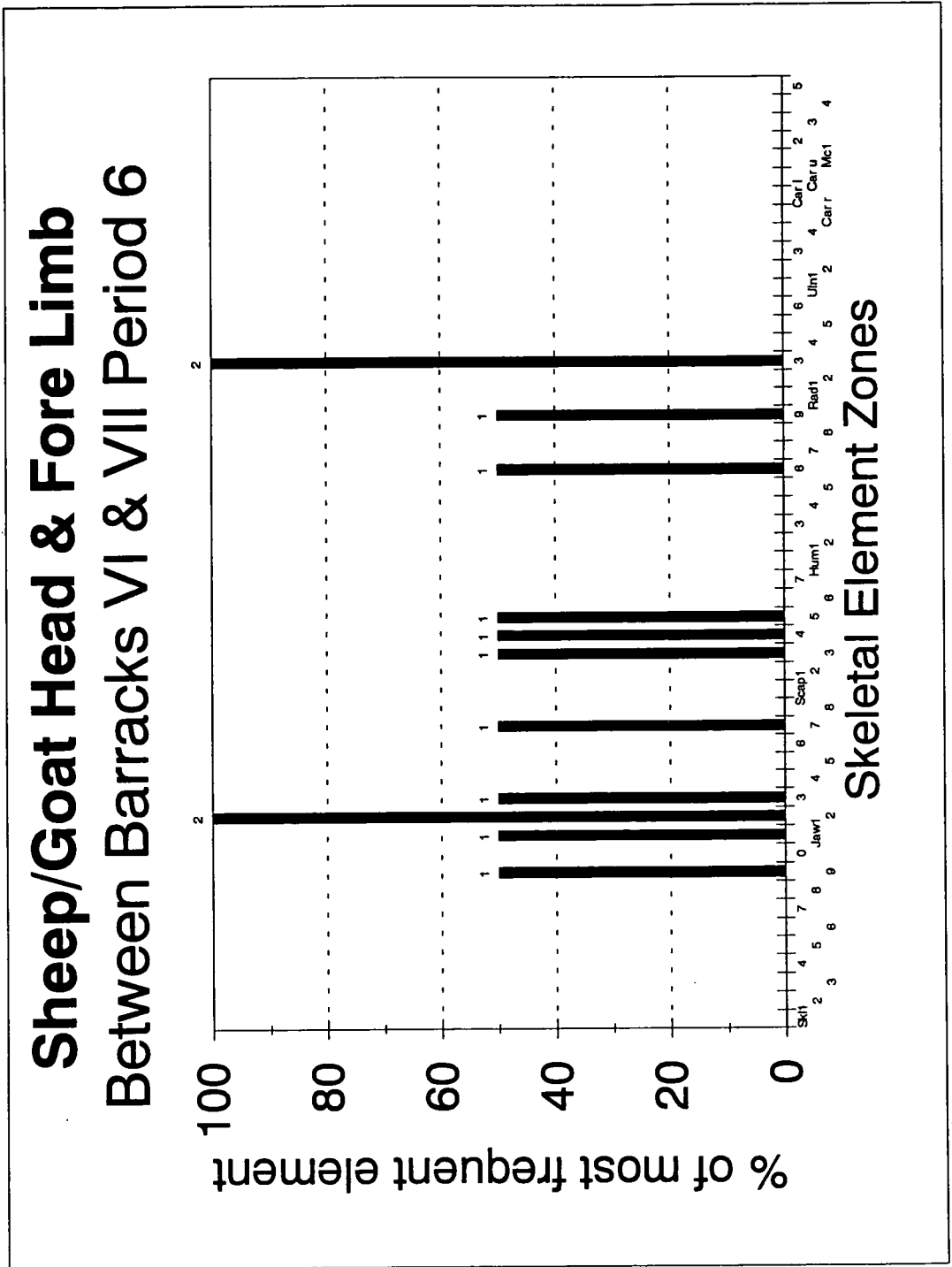


figure 166

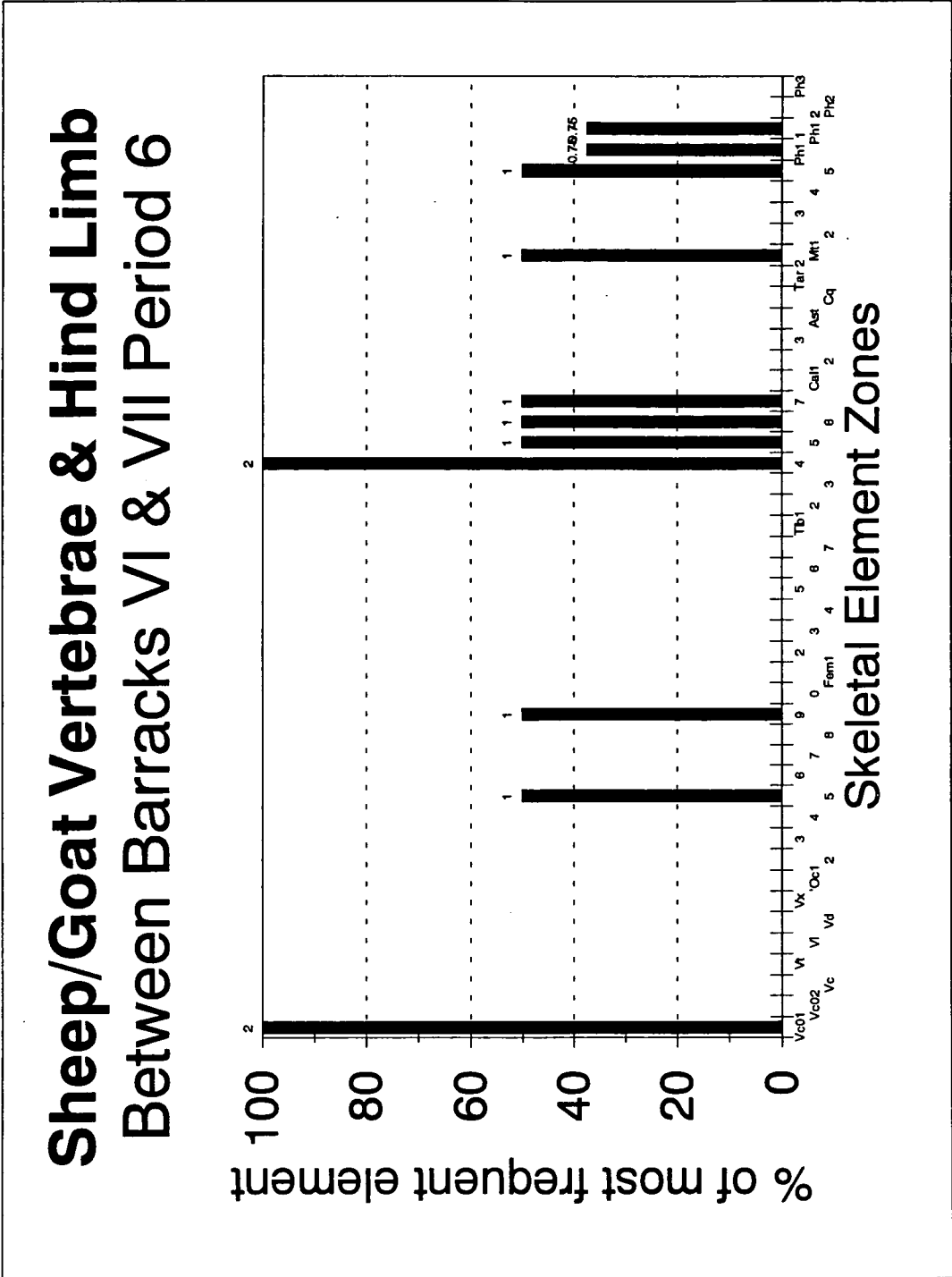


figure 167

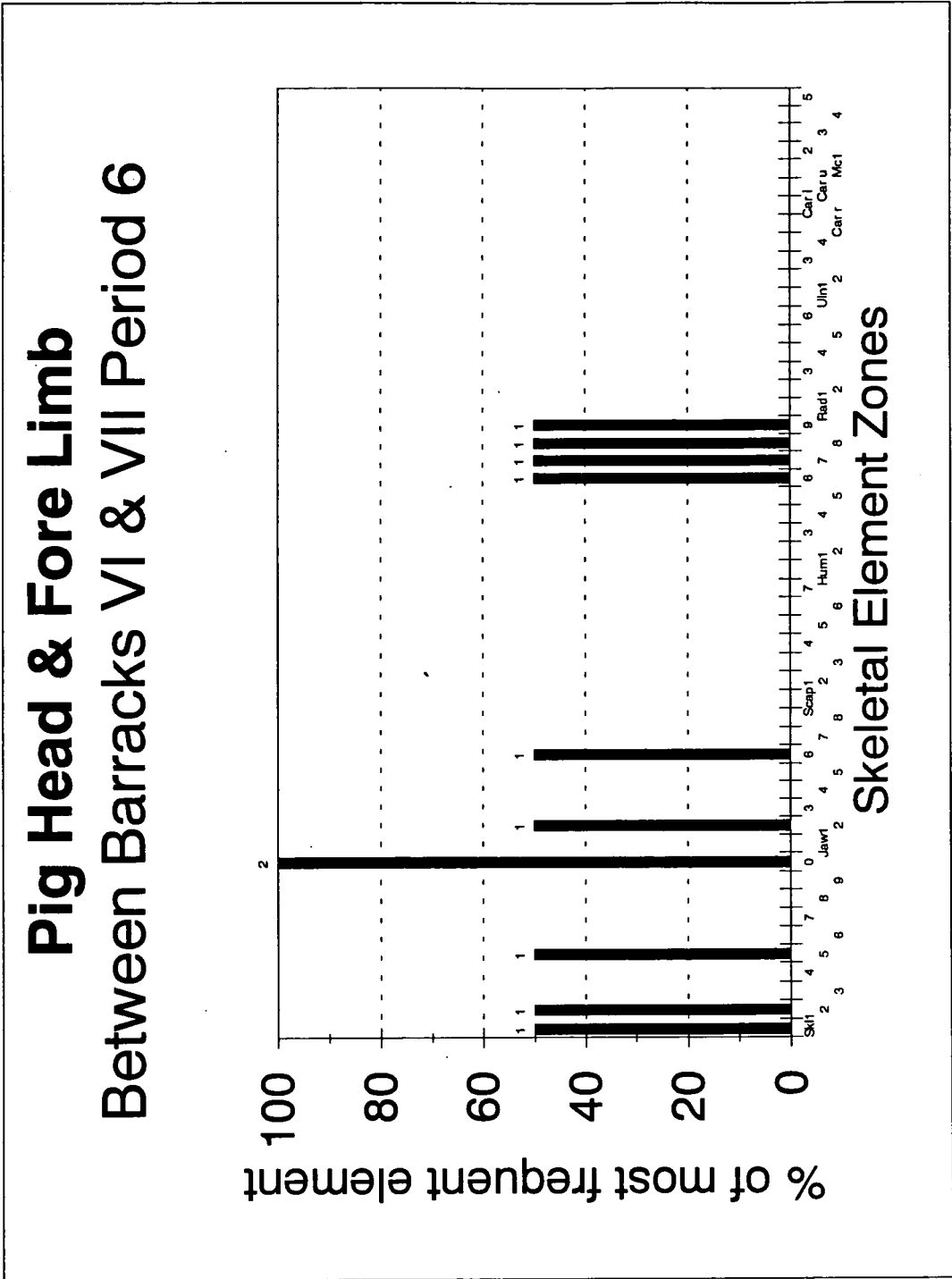


figure 168

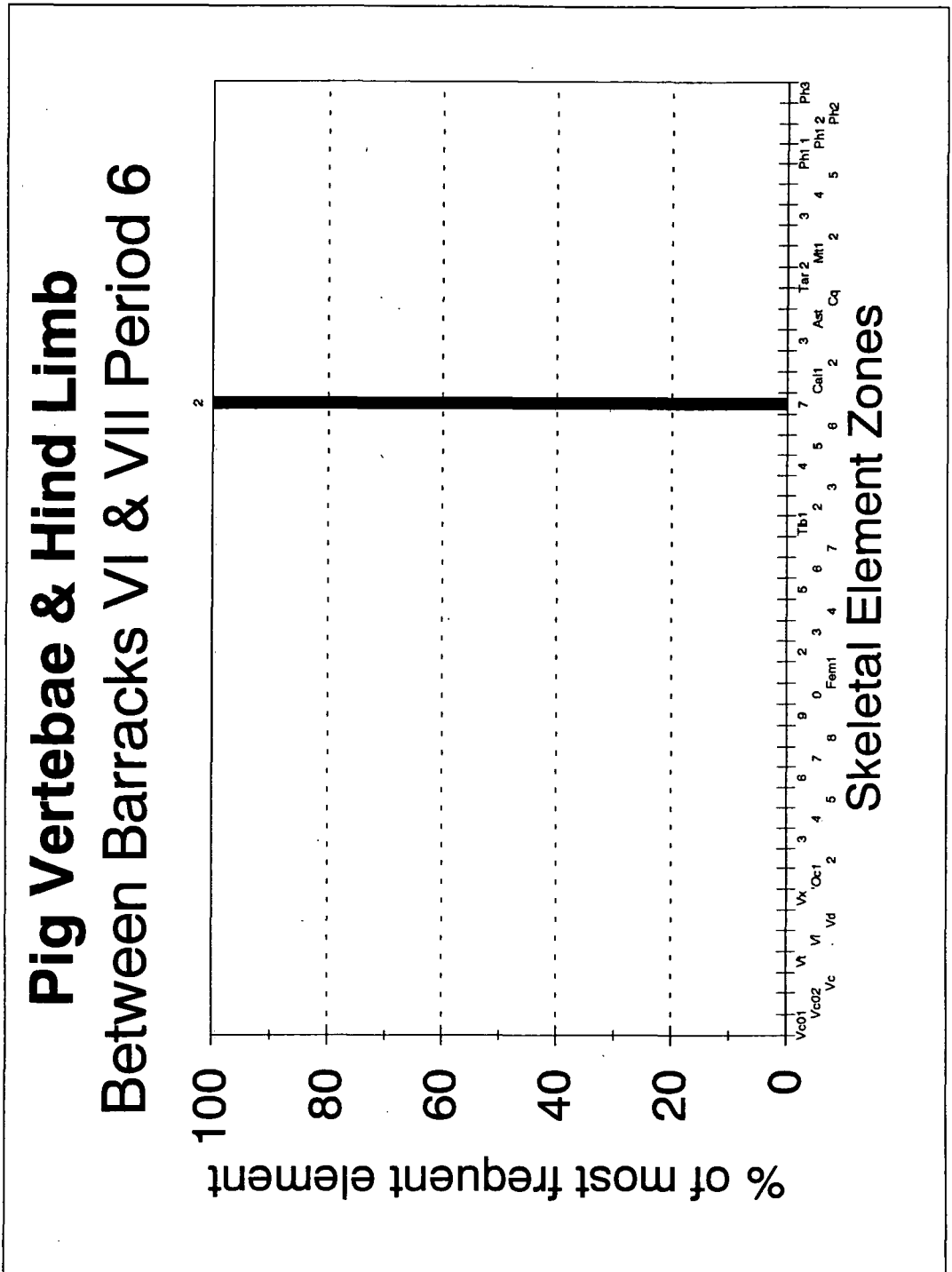


figure 169

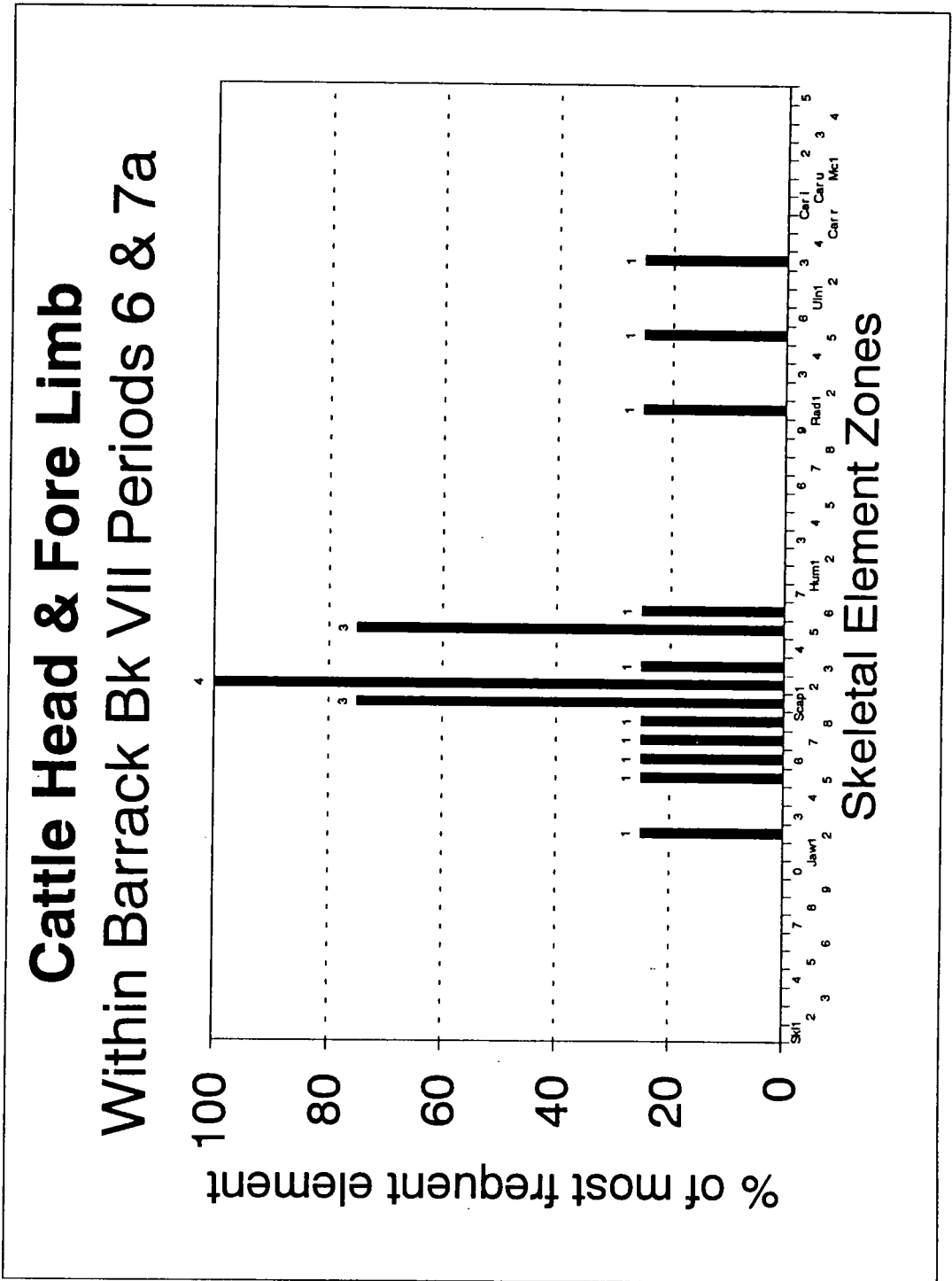


figure 170

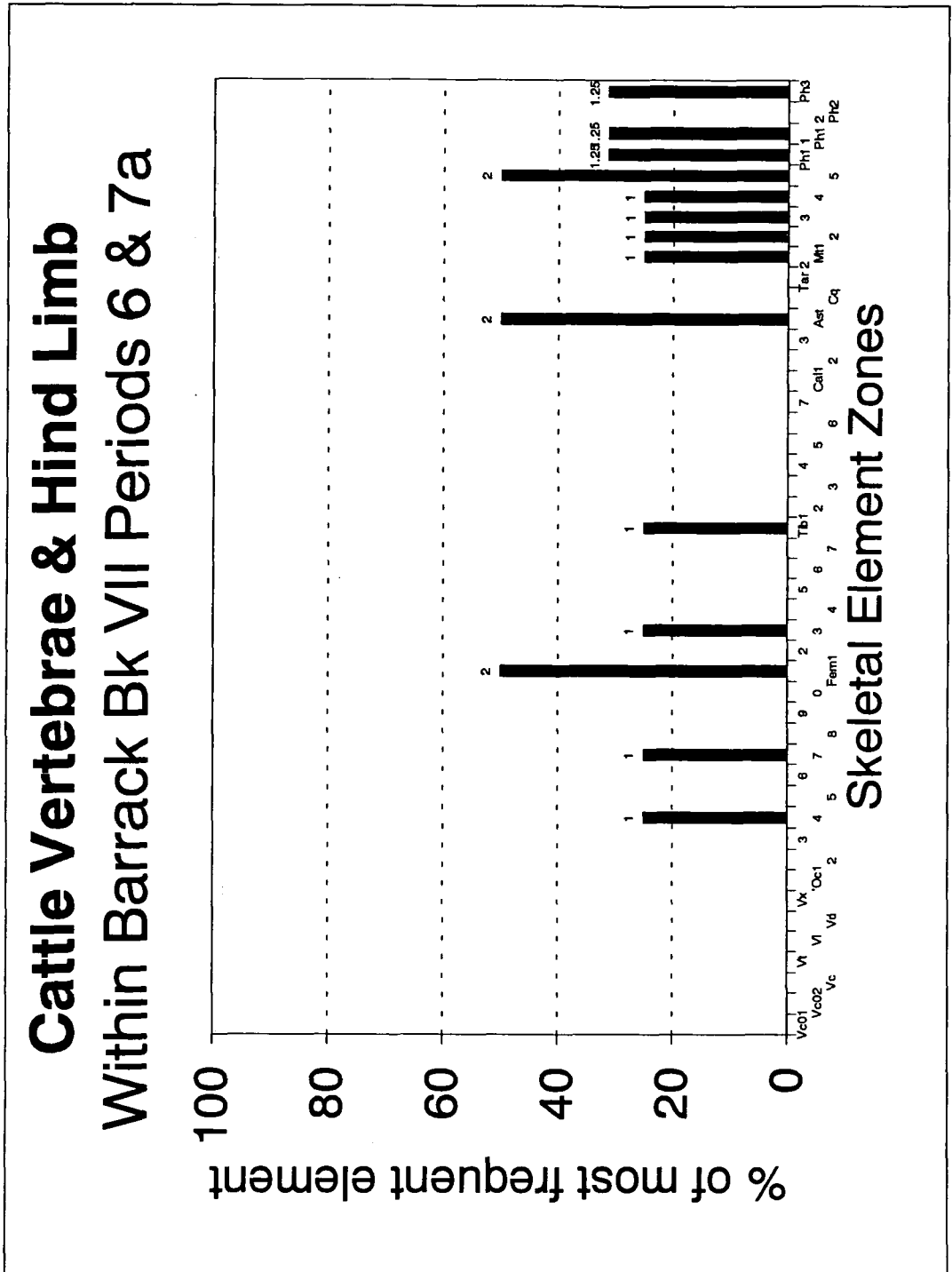


figure 171

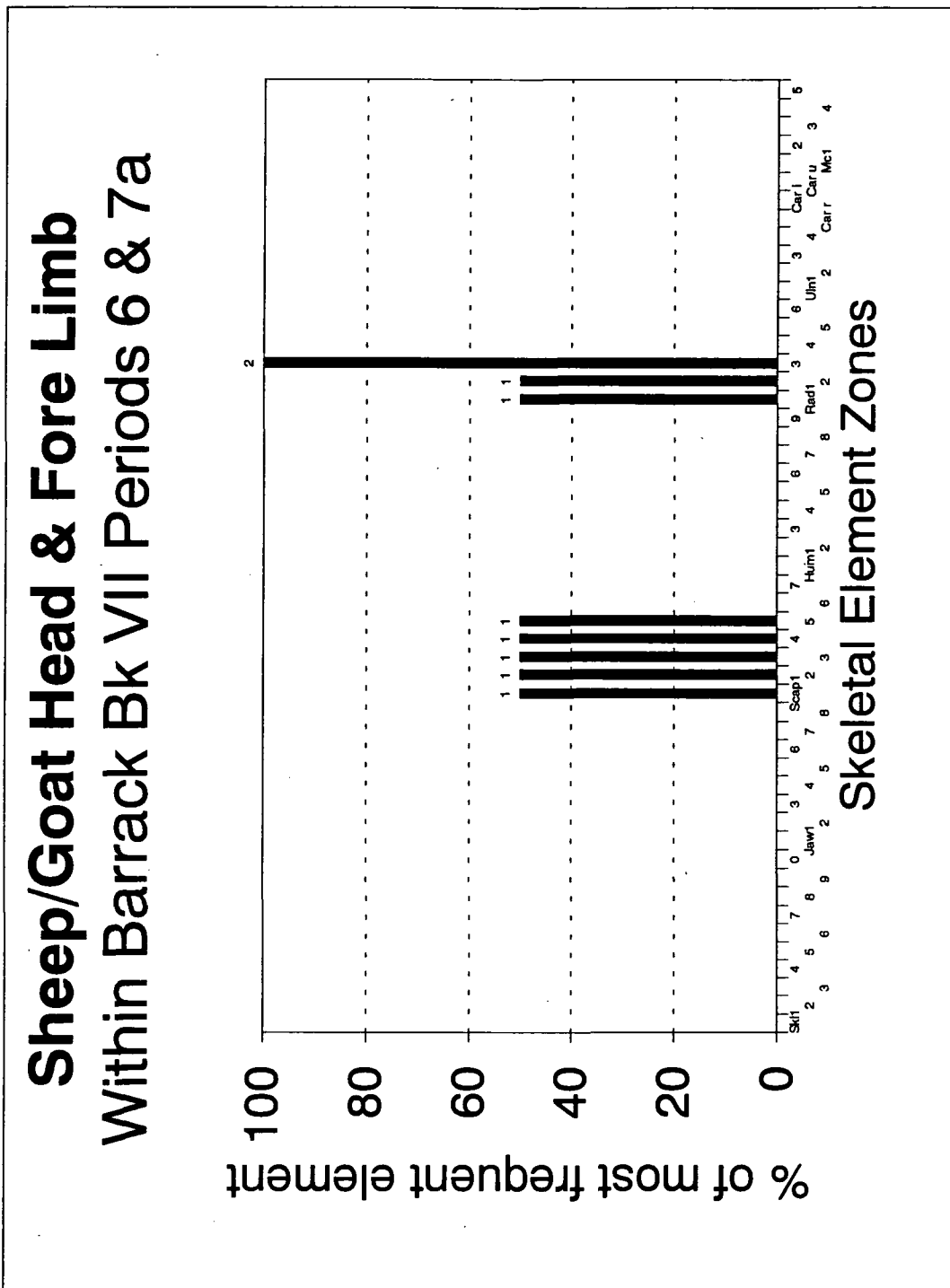


figure 172

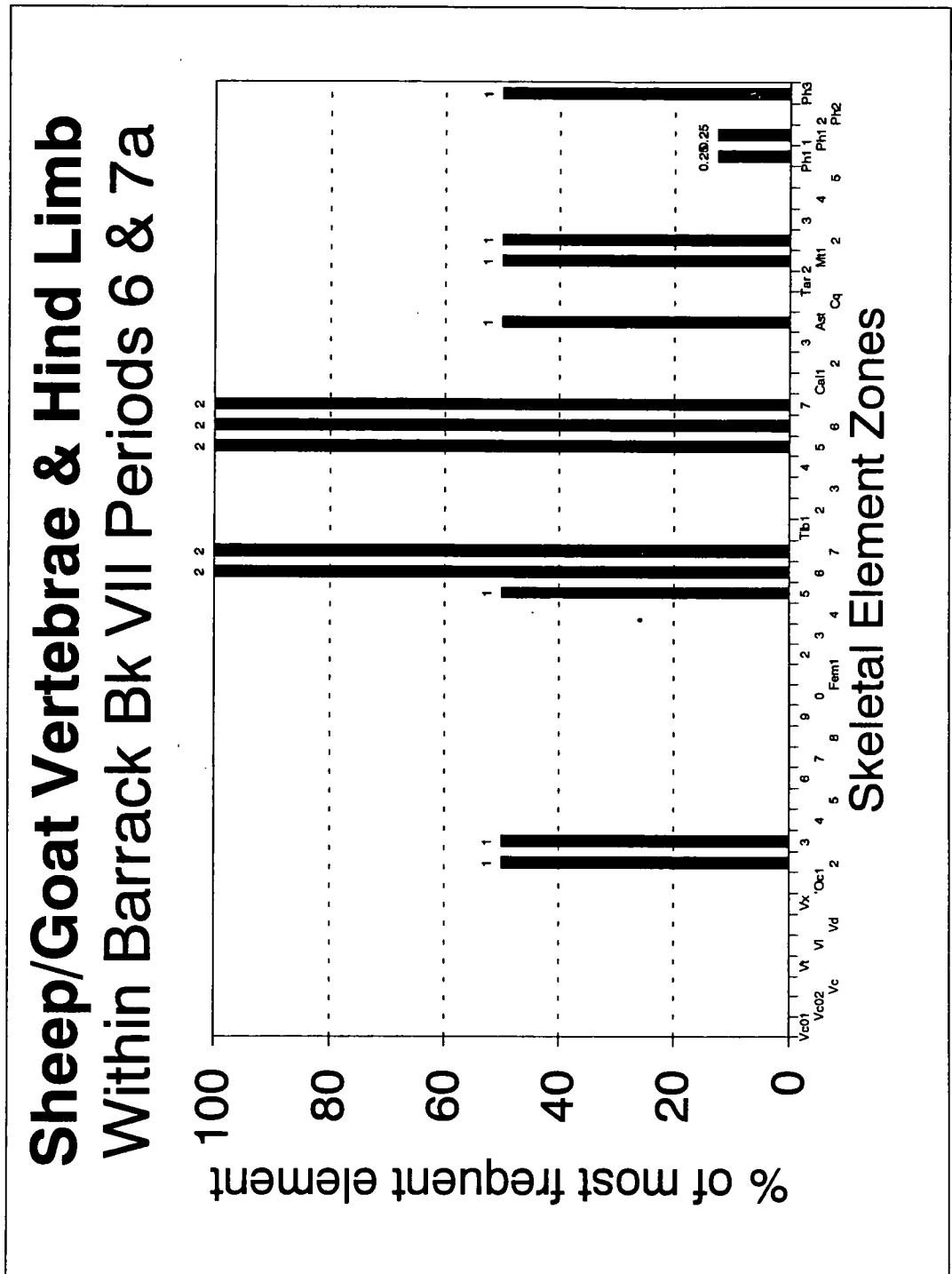


figure 173

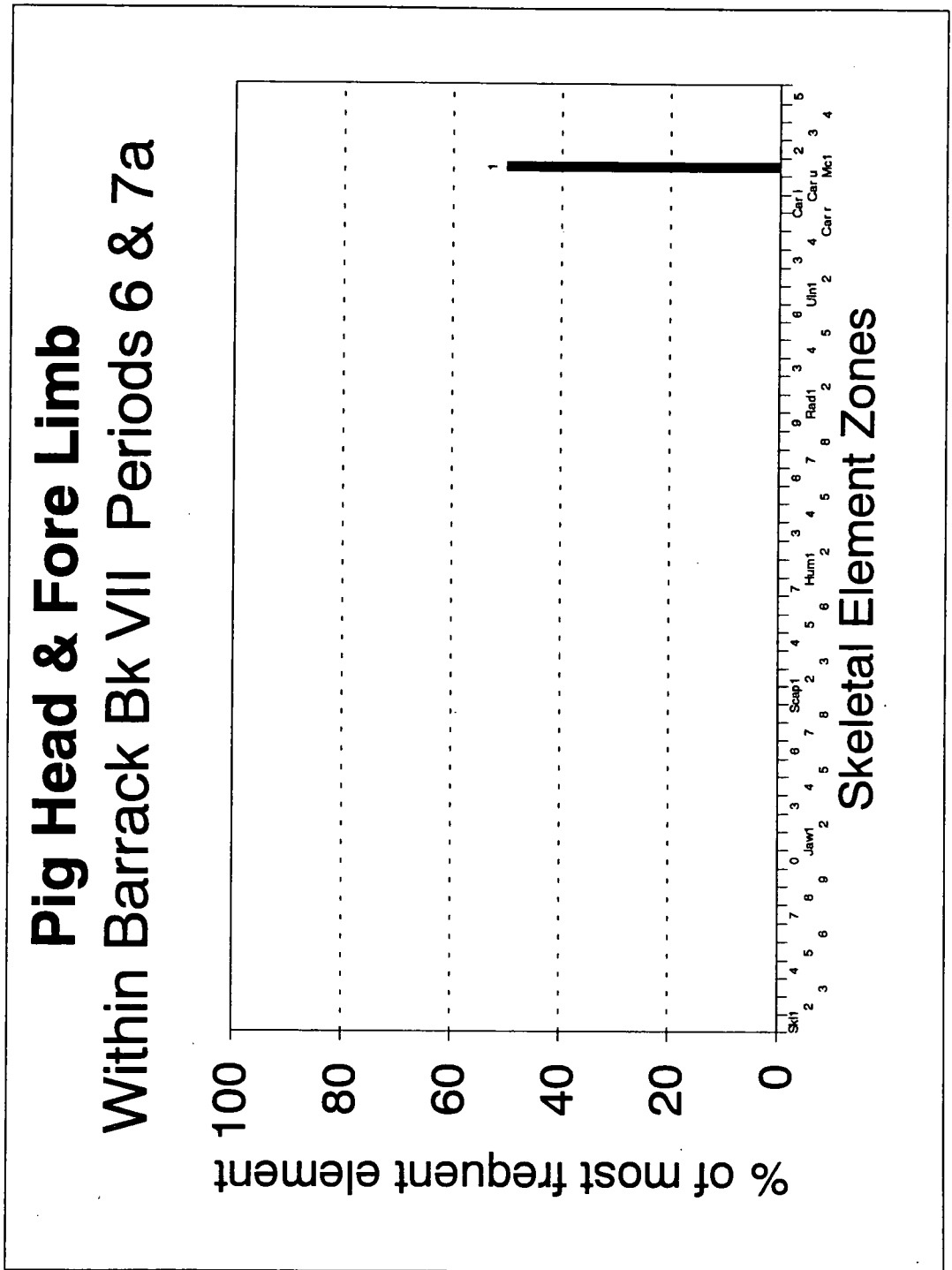


figure 174

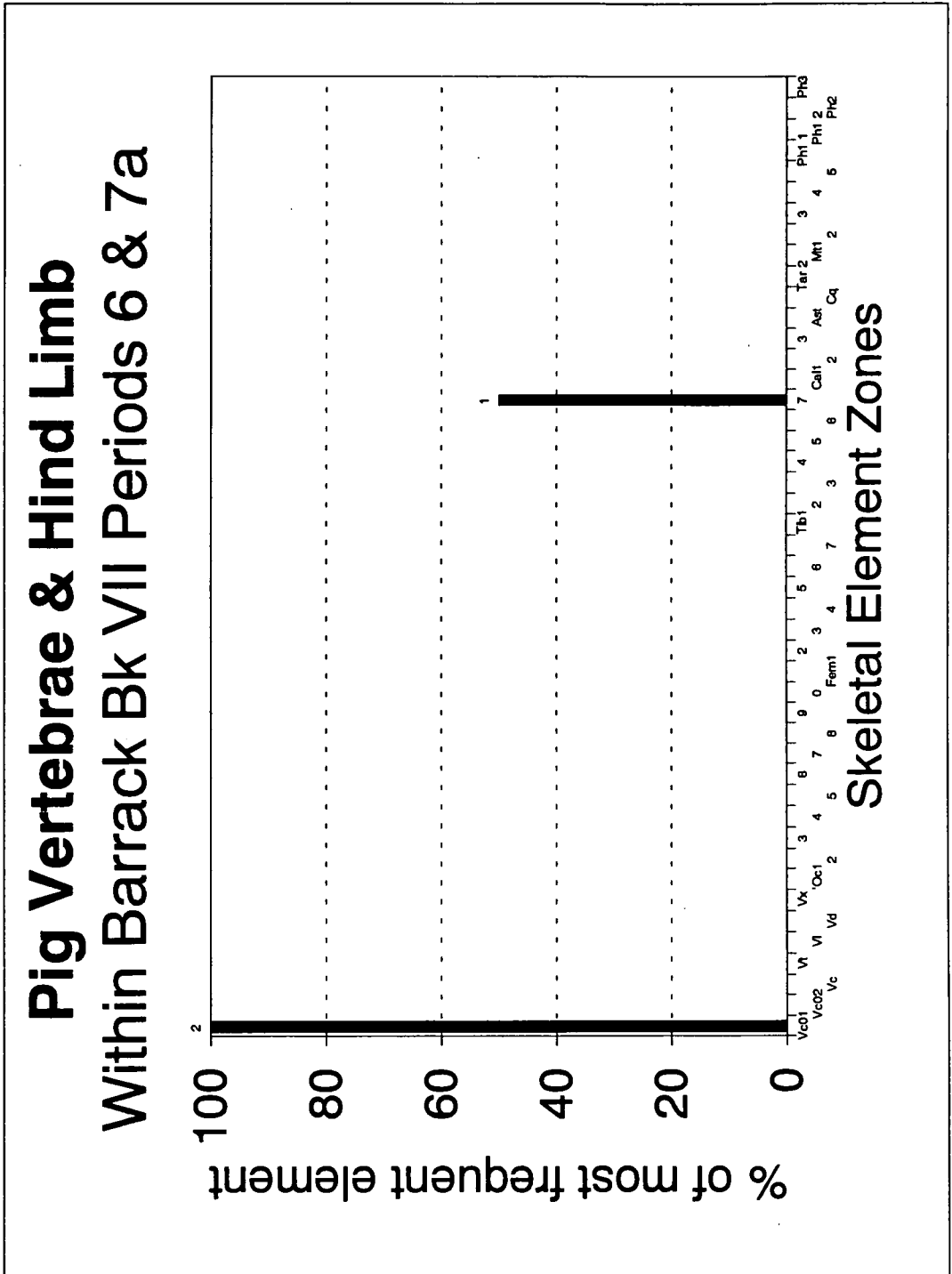


figure 175

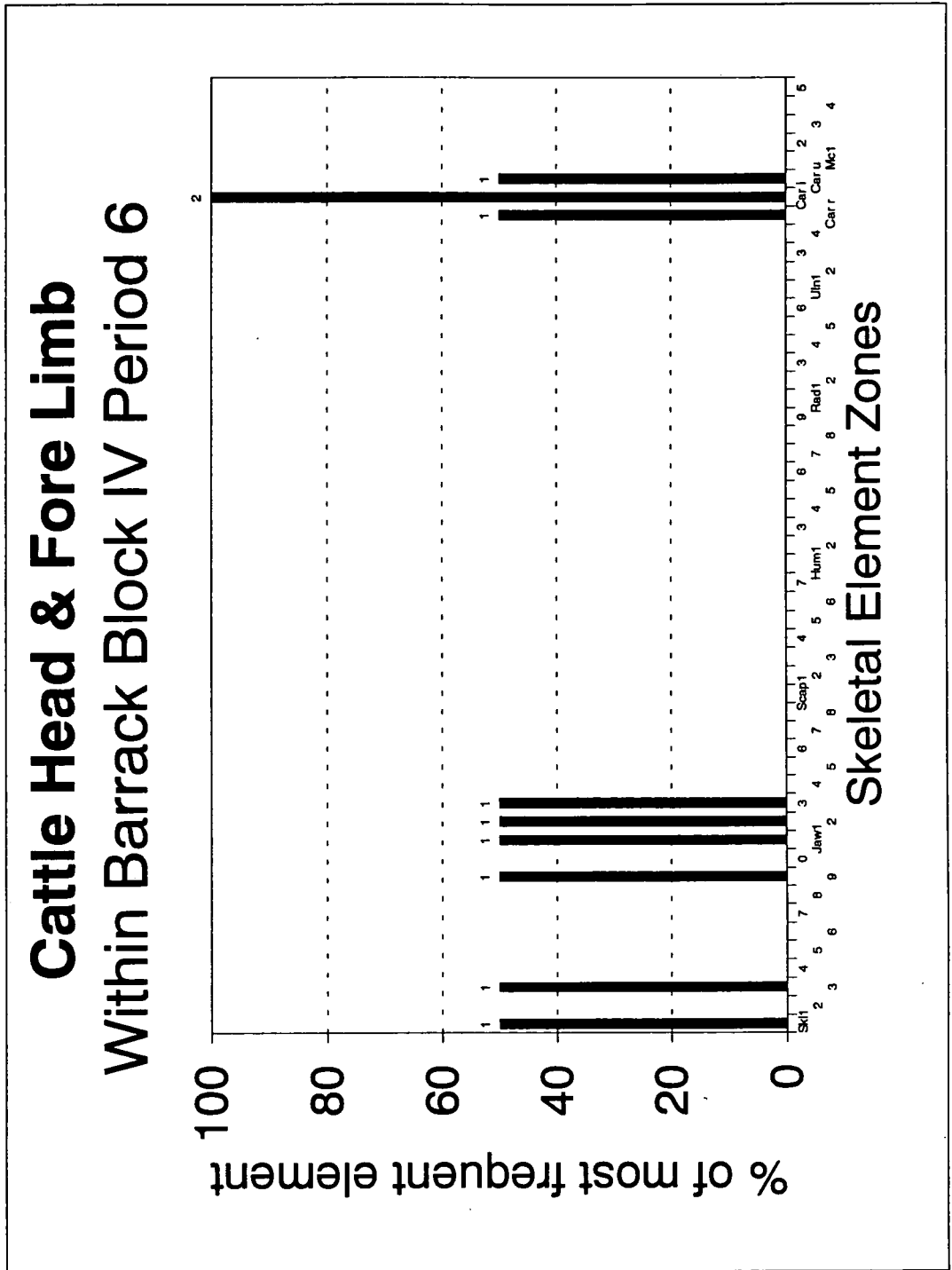


figure 176

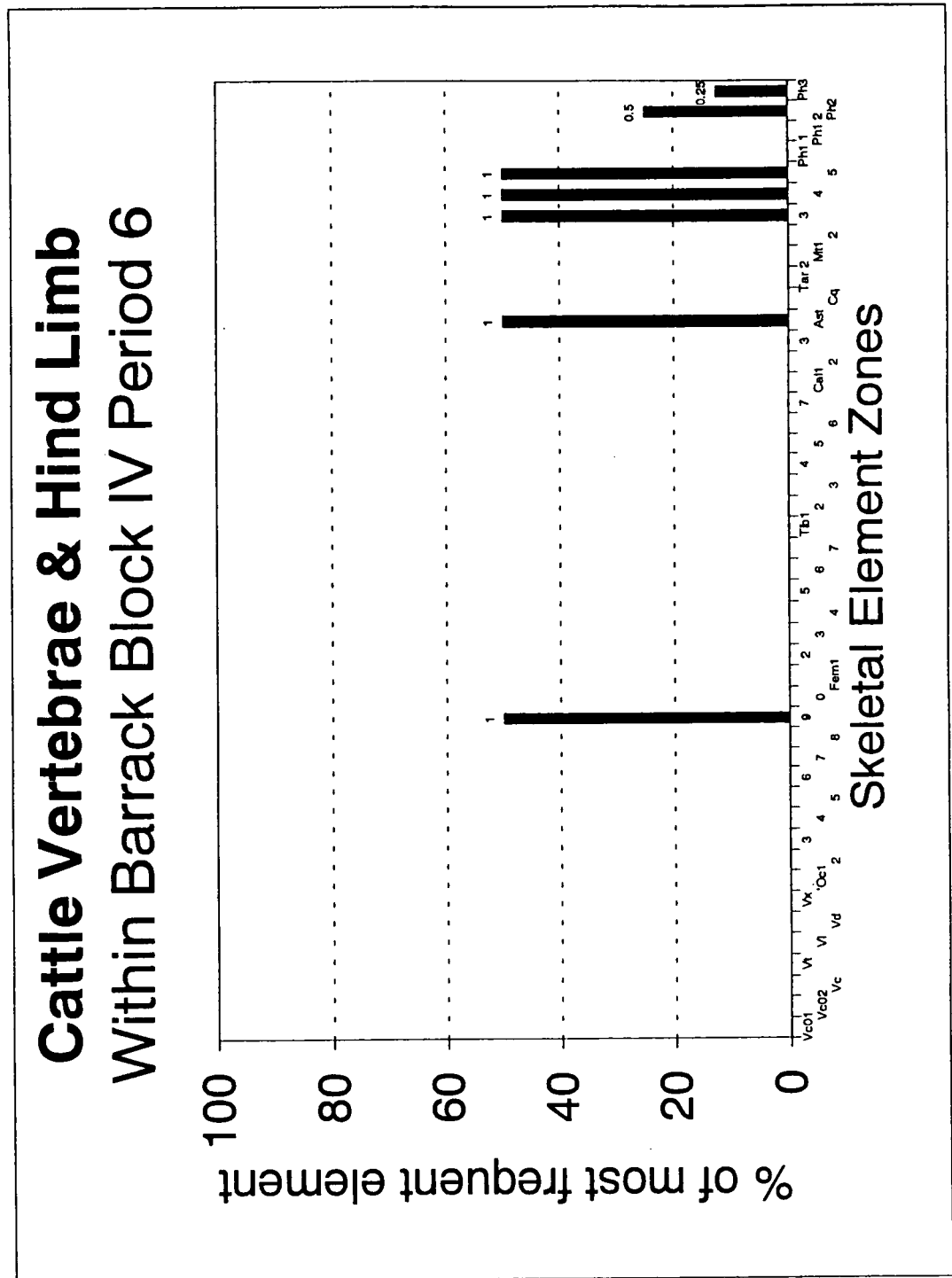


figure 176

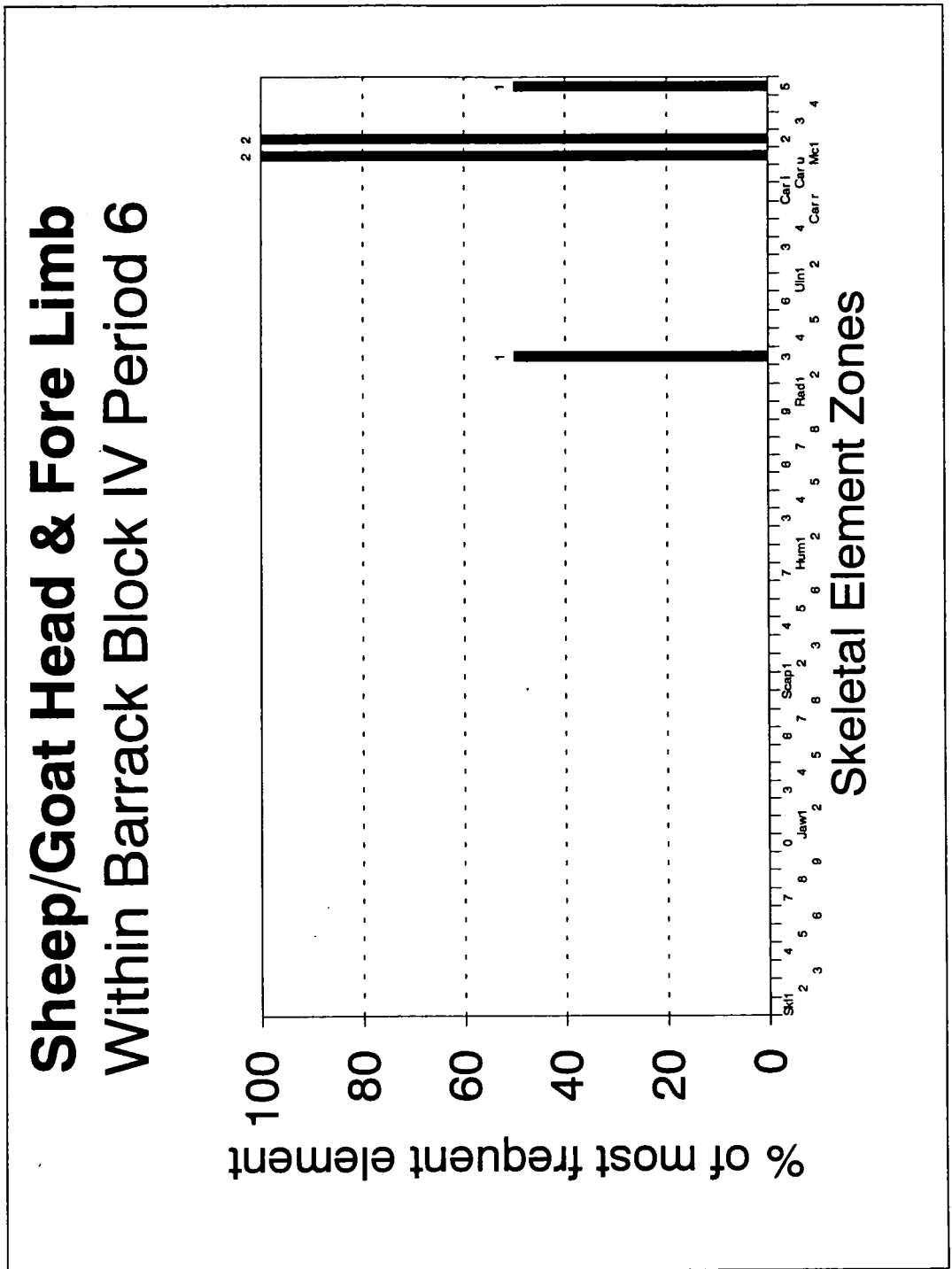


figure 177

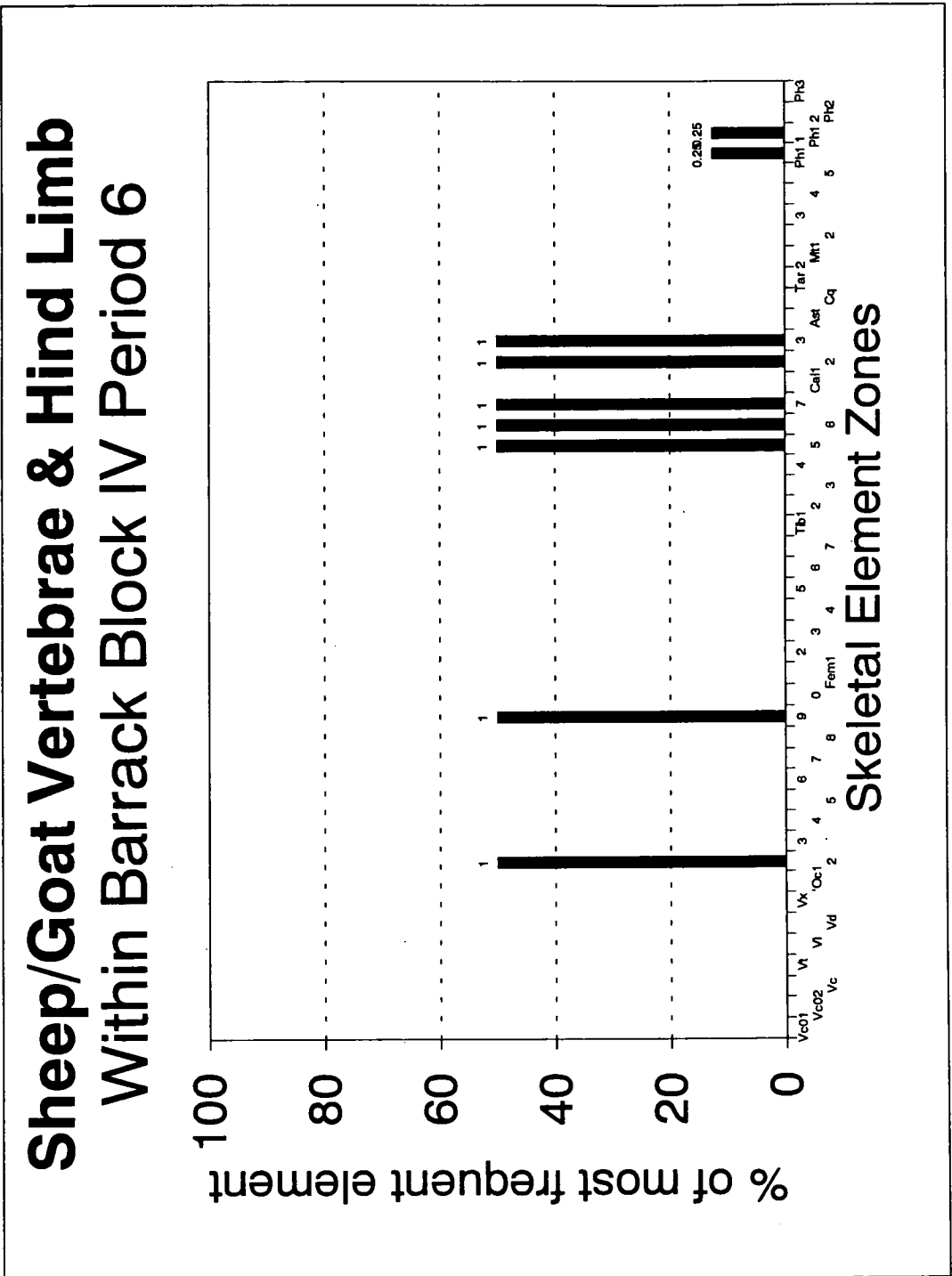


figure 178

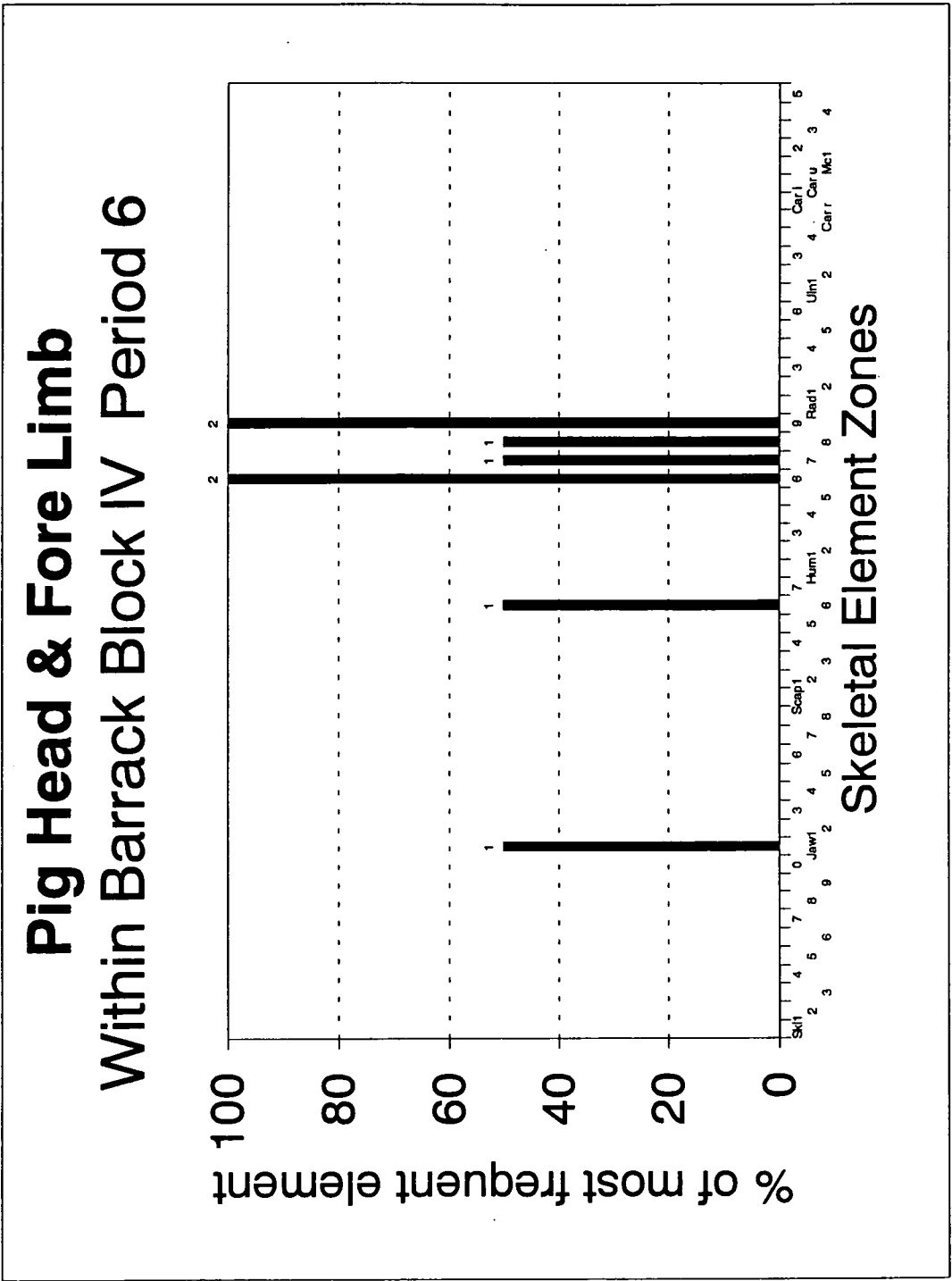


figure 178

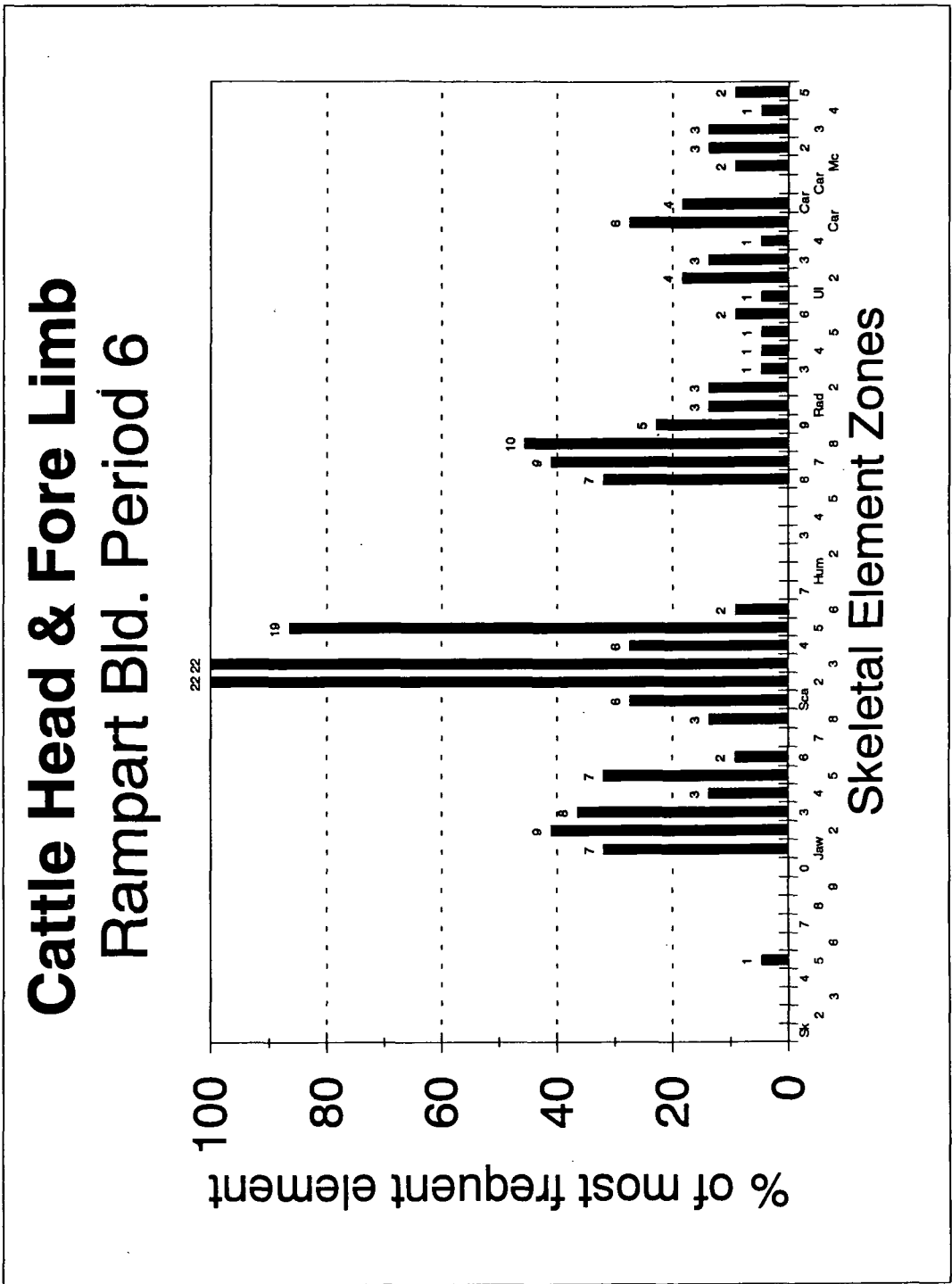


figure 180

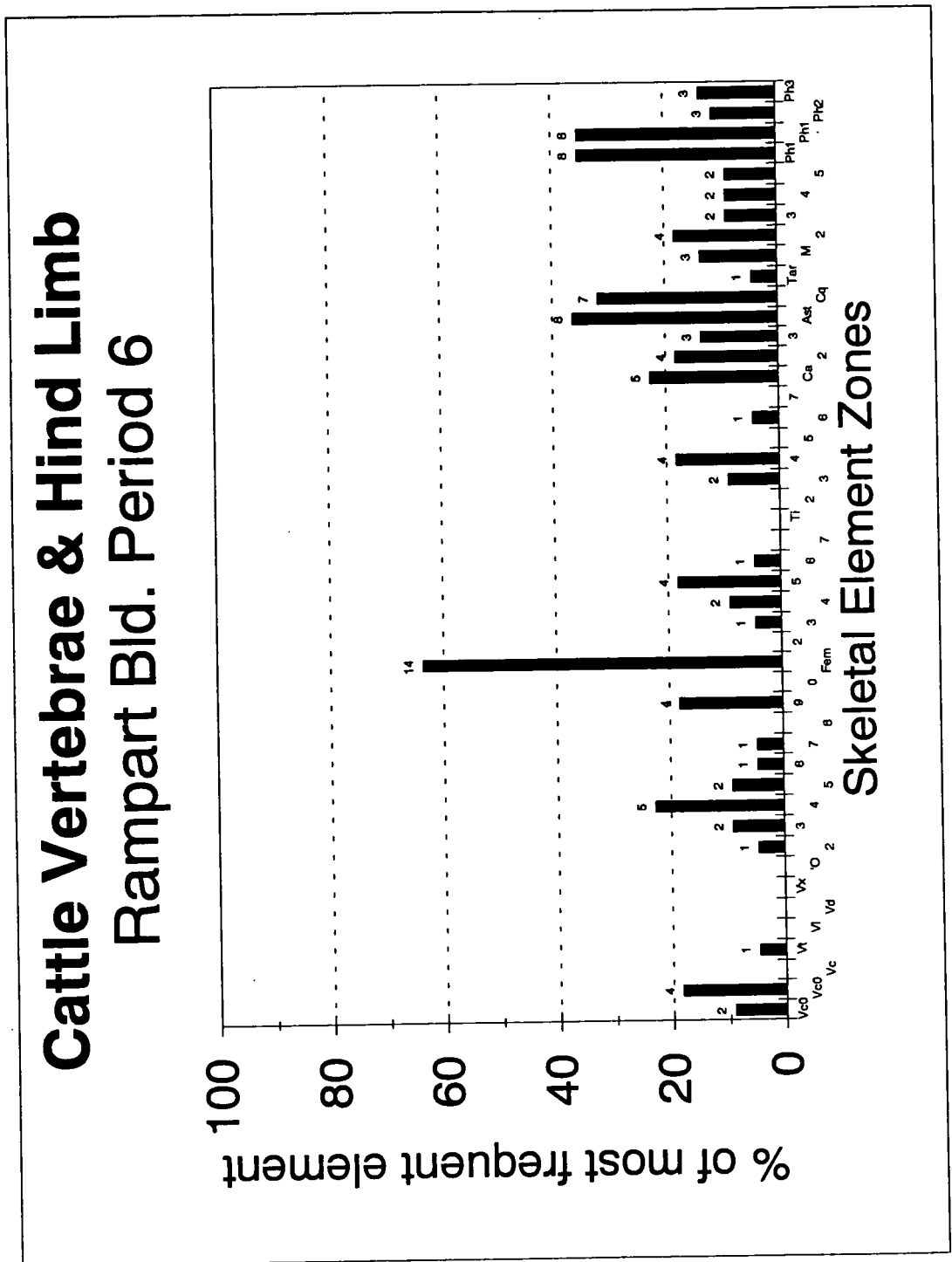


figure 181

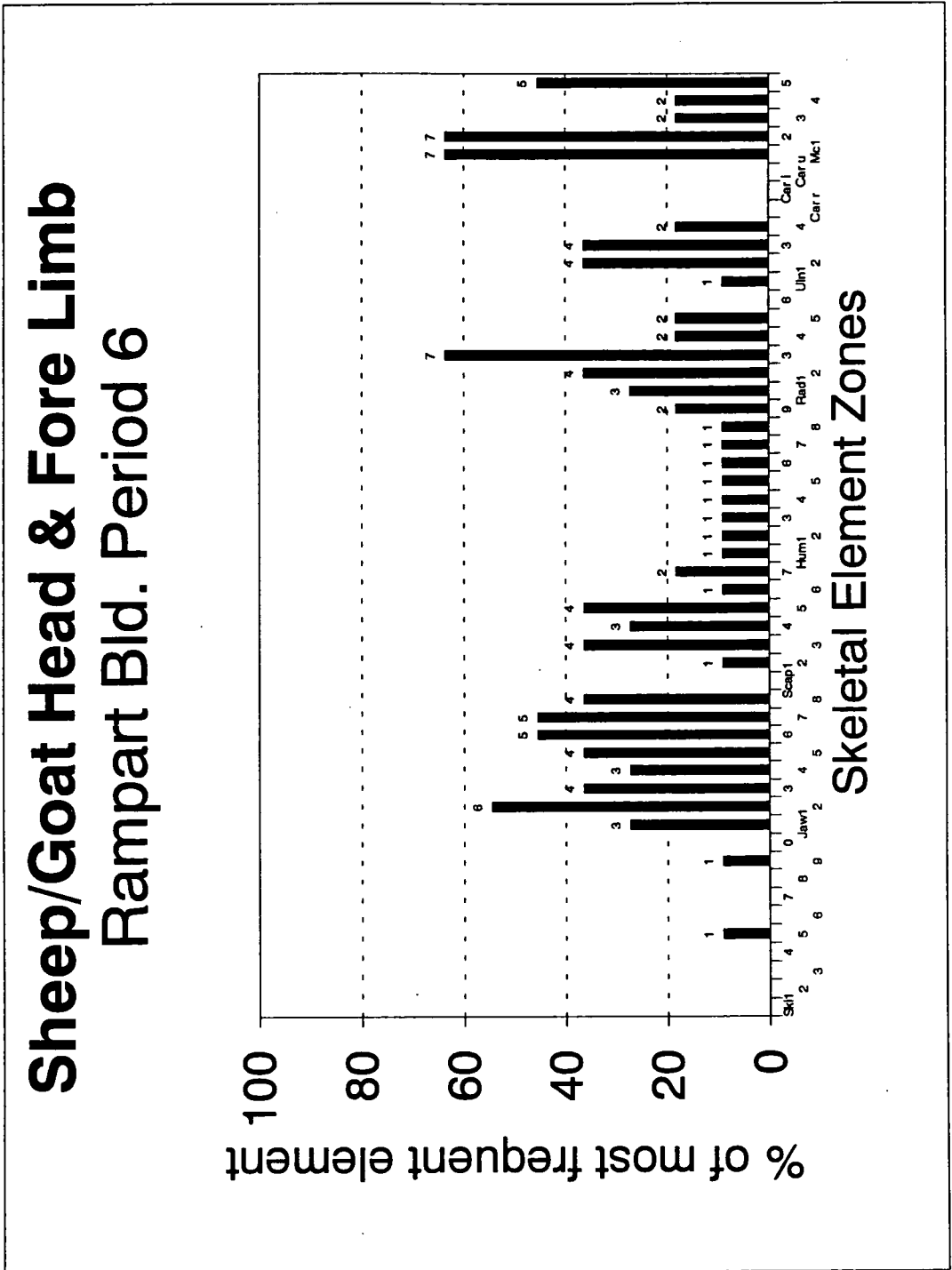


figure 182

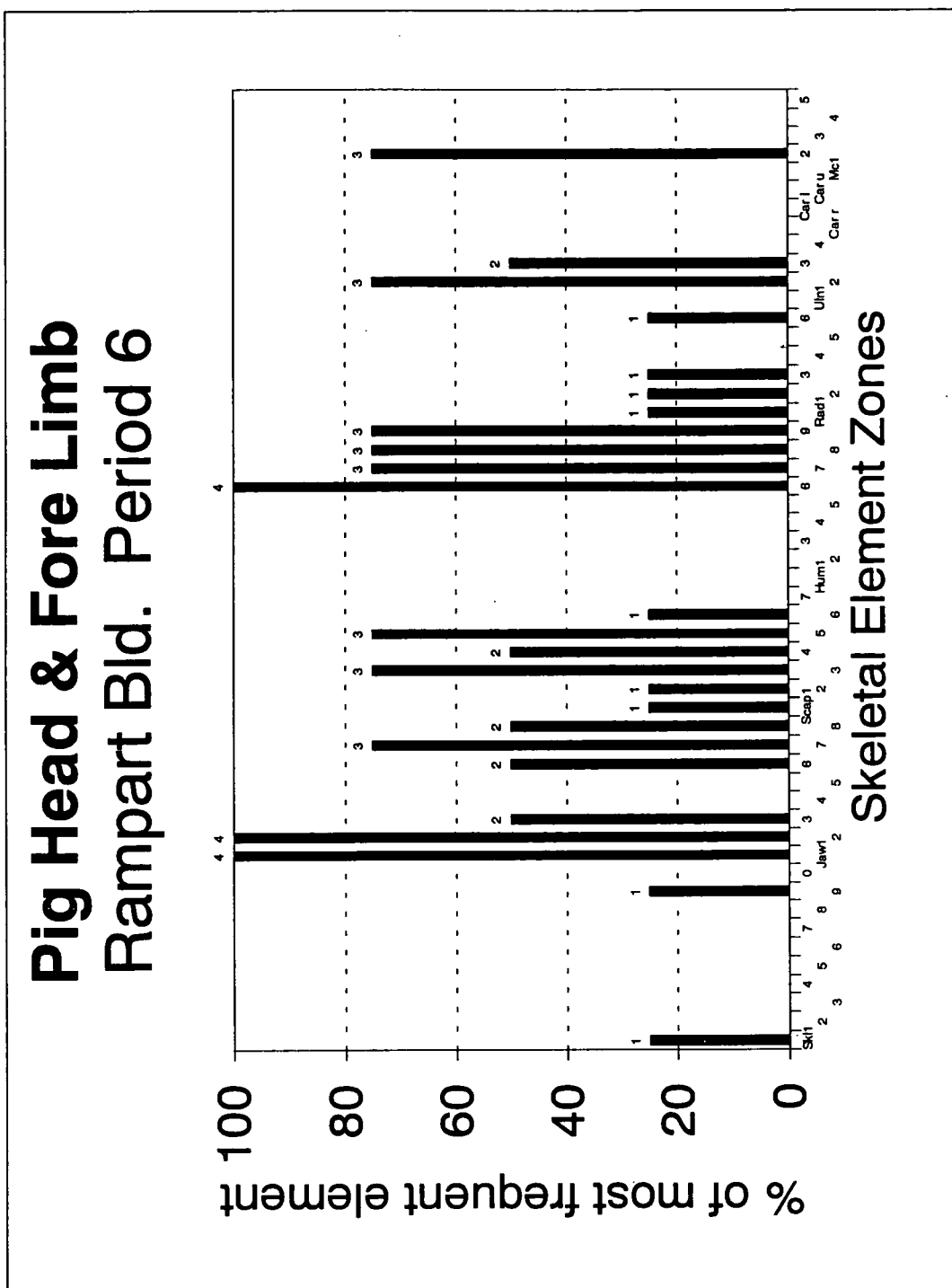


figure 184

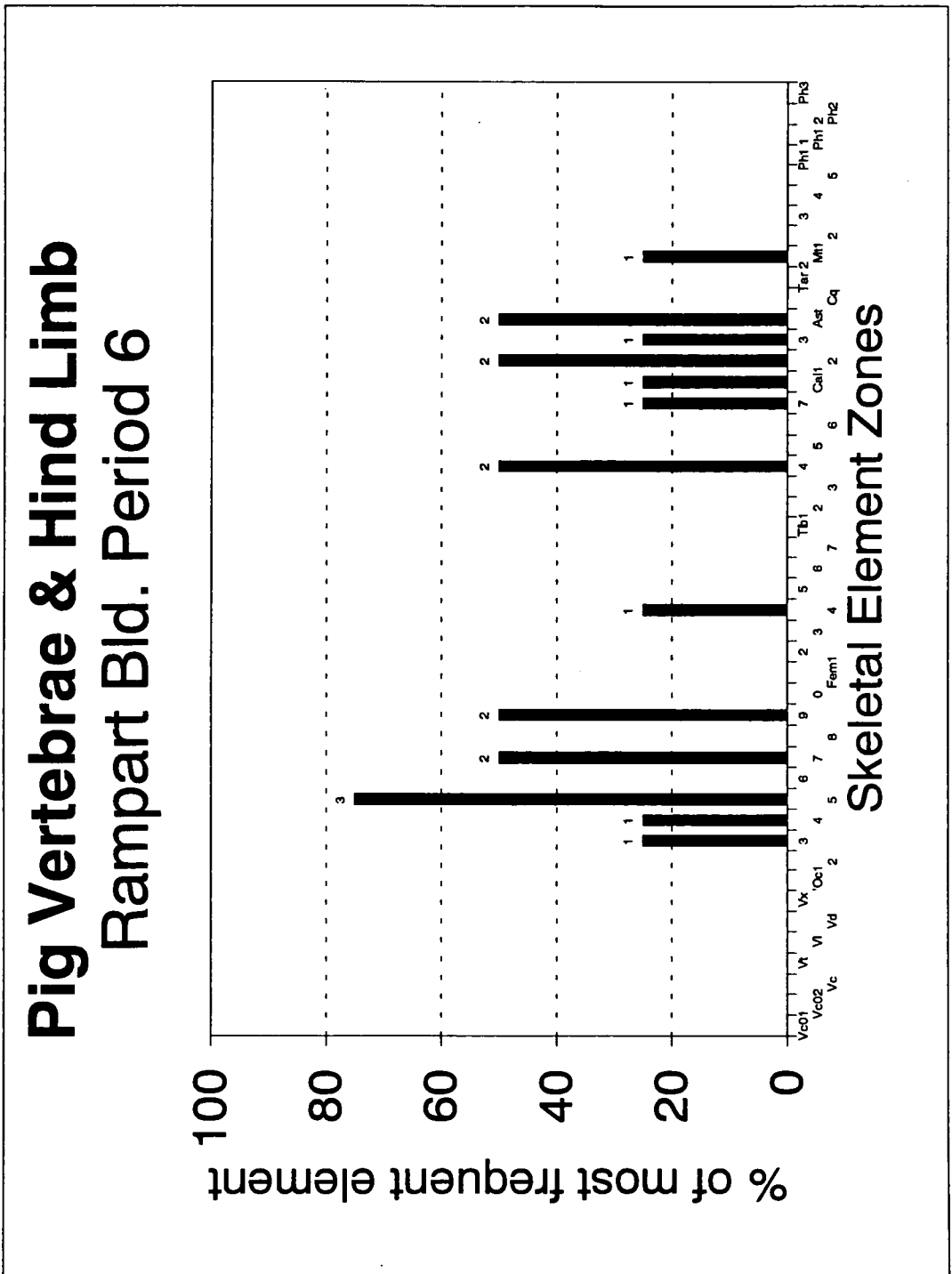


figure 185

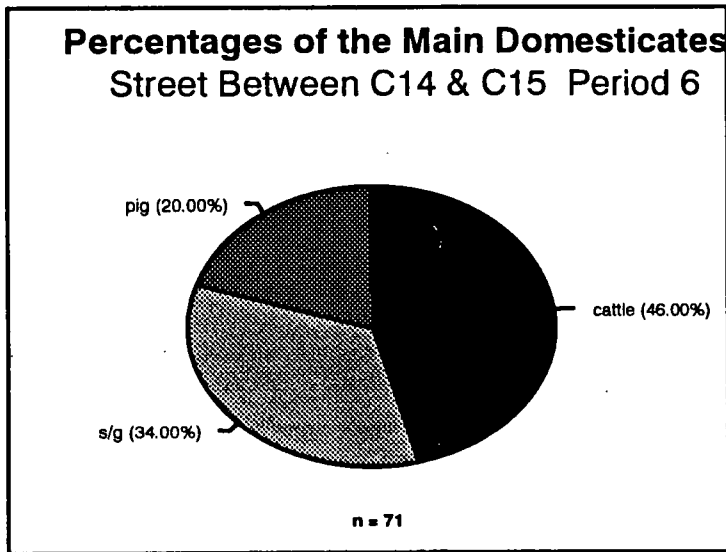
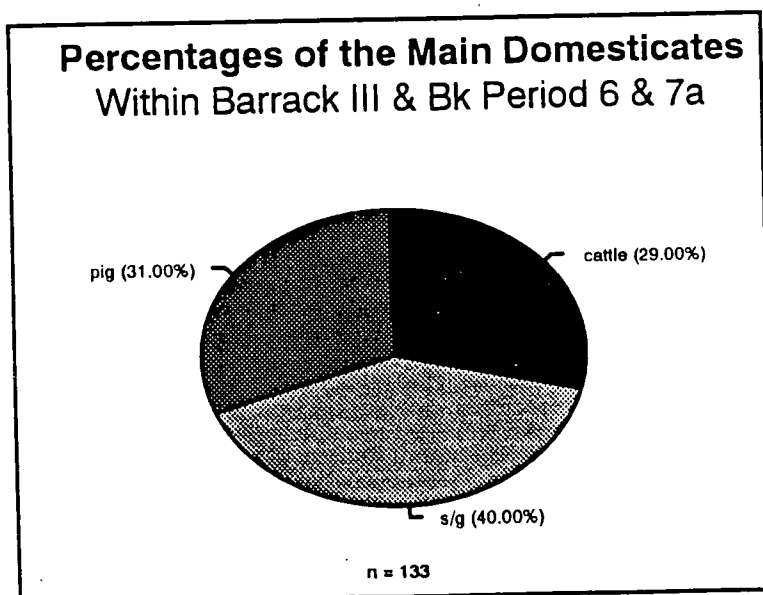
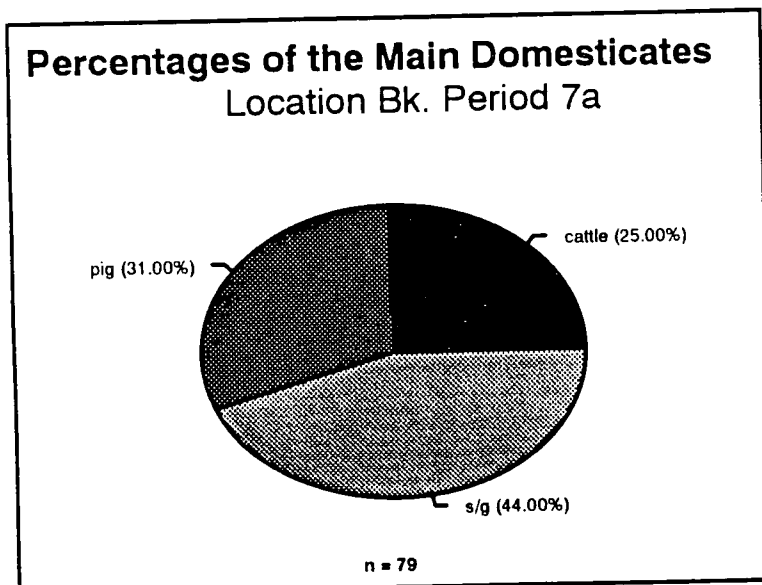
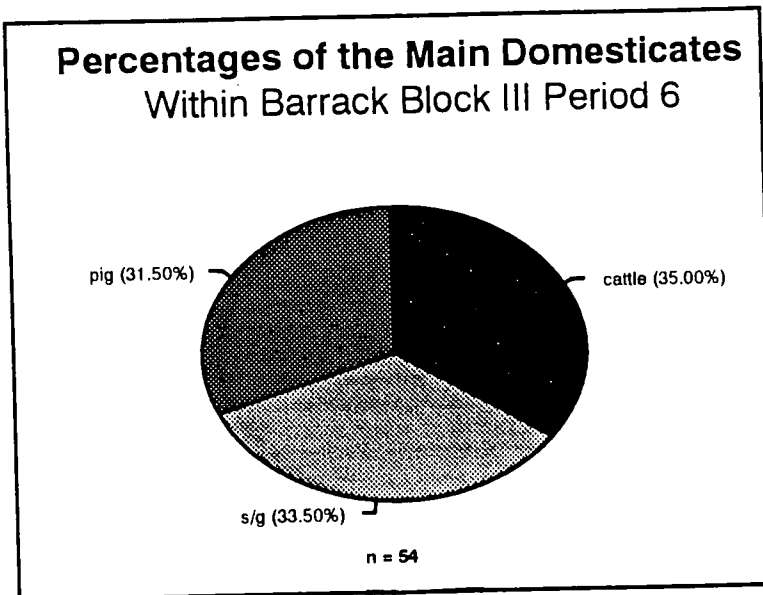


figure 186



figures 187 to 190

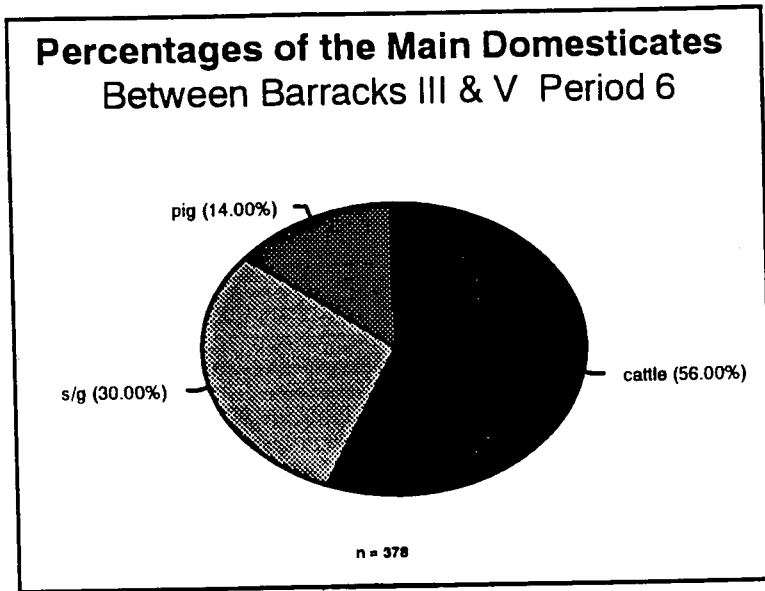
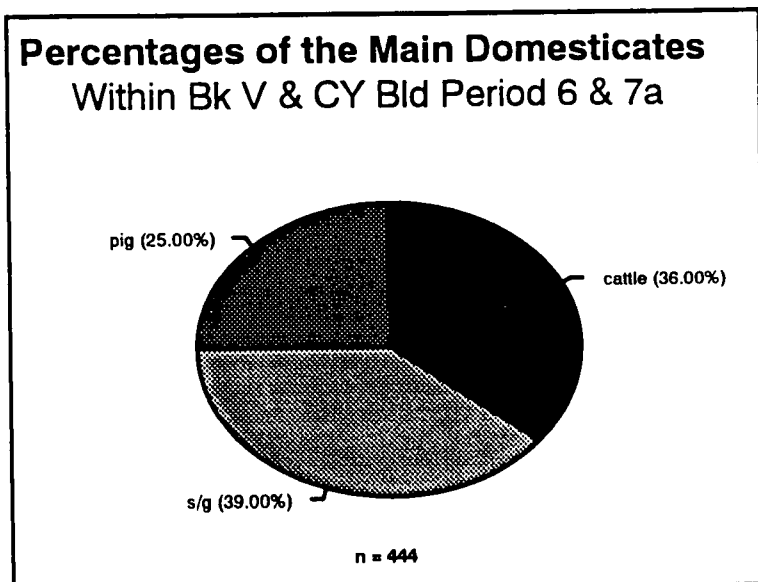
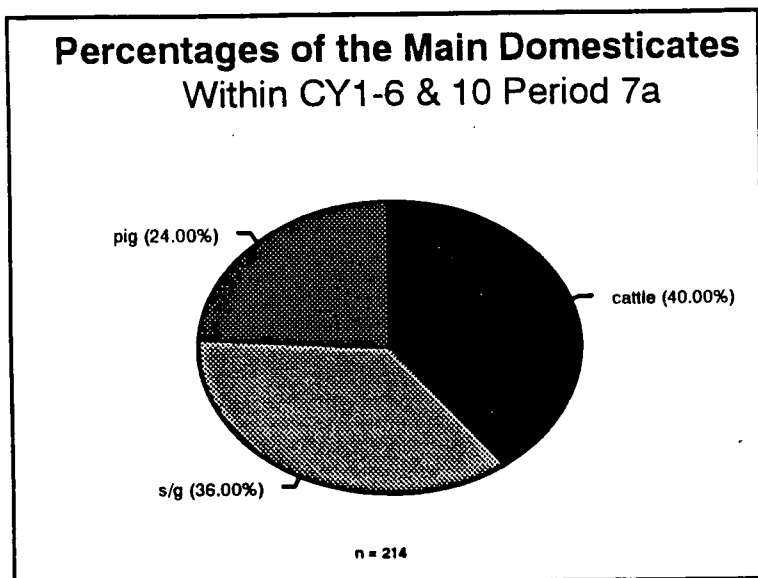
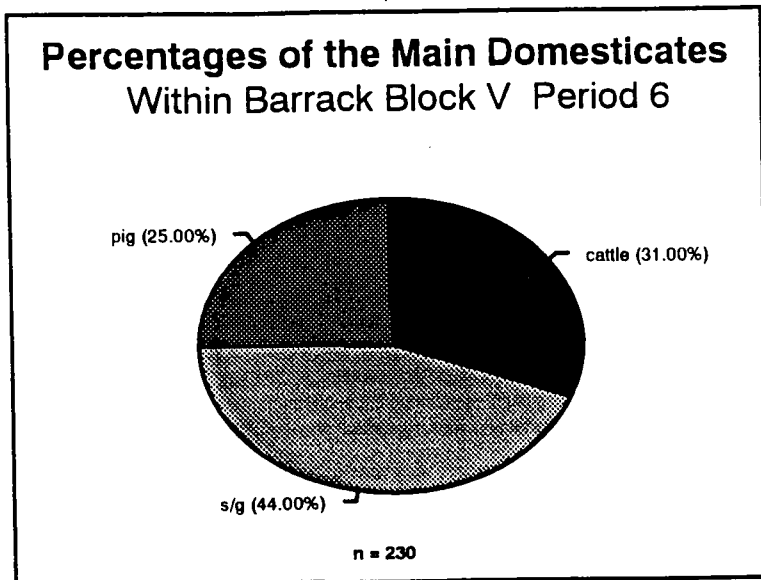


figure 191



figures 192 to 194

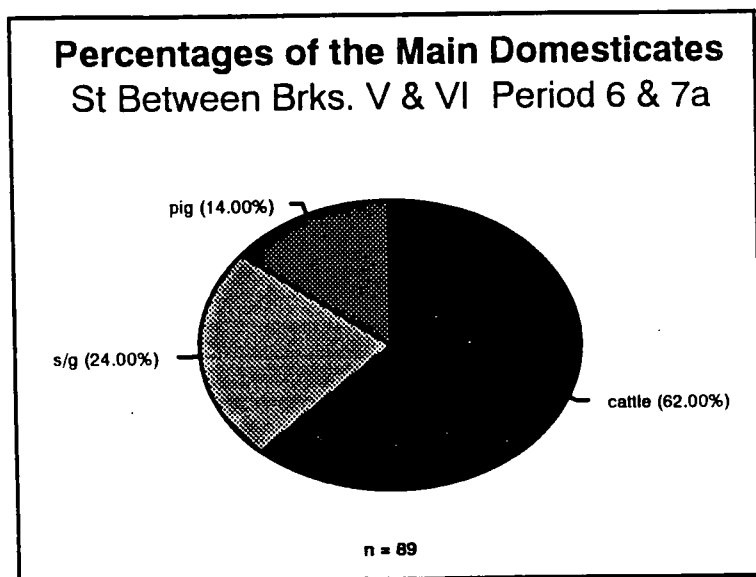
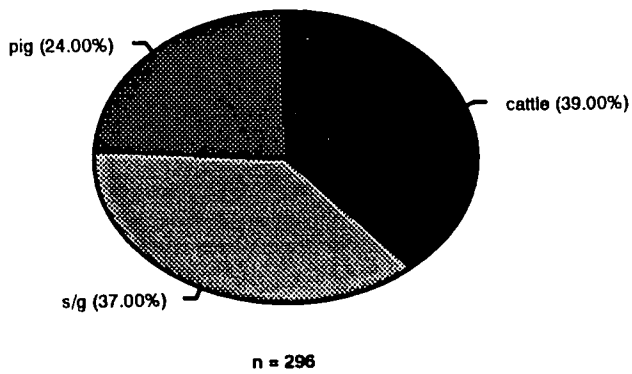
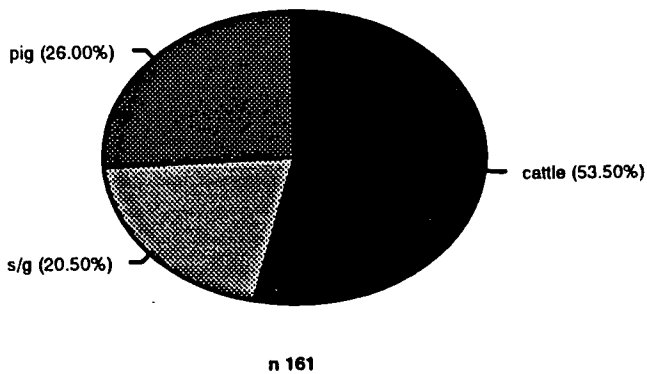


figure 195

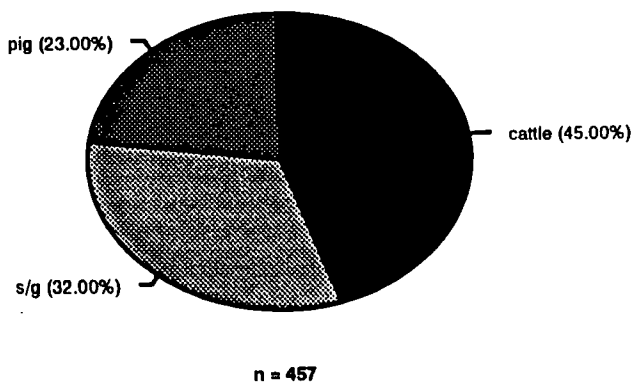
**Percentages of the Main Domesticates
Within Barrack Block VI Period 6**



**Percentages of the Main Domesticates
Within CYCY CYEV CY8 & 9 Period 7a**



**Percentages of the Main Domesticates
In Barrack Block VI & CY Period 6 & 7a**



figures 196 to 198

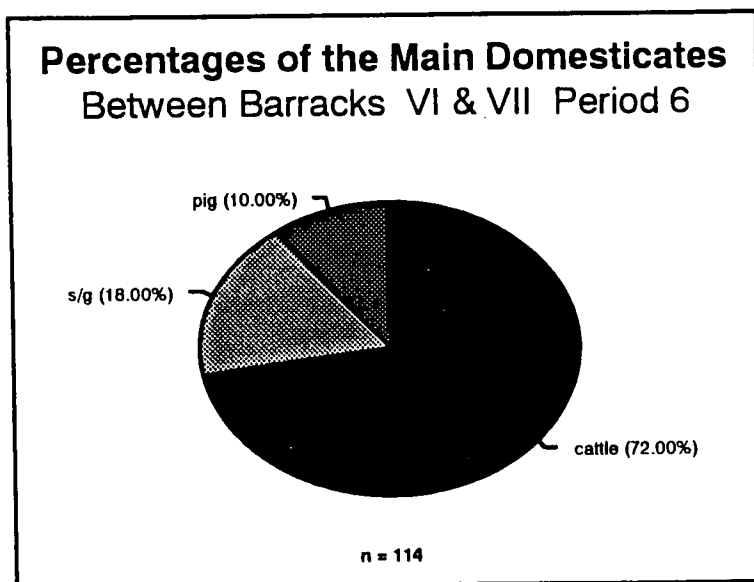
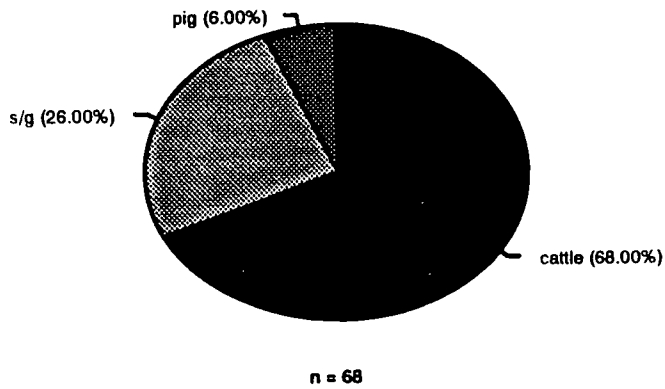
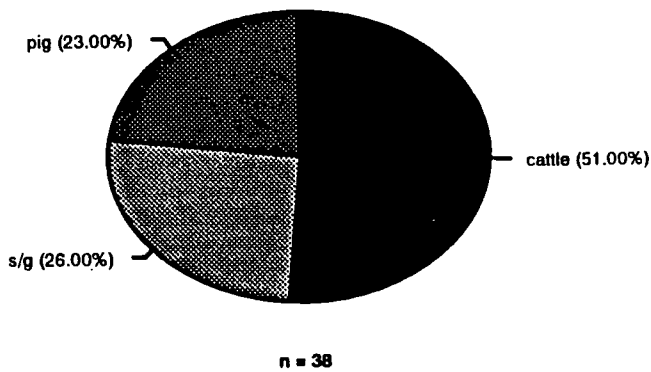


figure 199

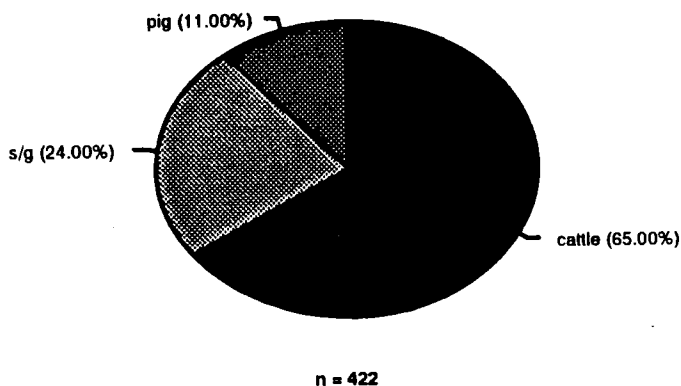
**Percentages of the Main Domesticates
Within Barrack Block VII Period 6 & 7a**



**Percentages of the Main Domesticates
Within Barrack Block IV Period 6**



**Percentages of the Main Domesticates
Rampart Bld. Period 6**



figures 200 to 202

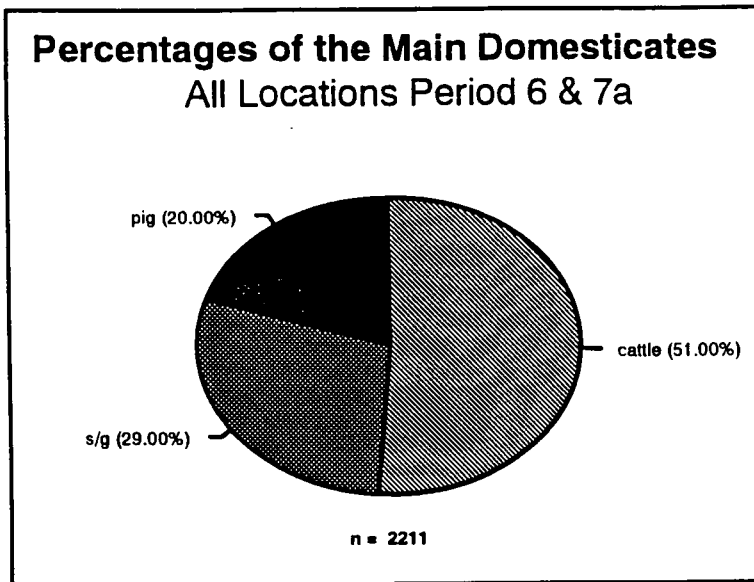


figure 203

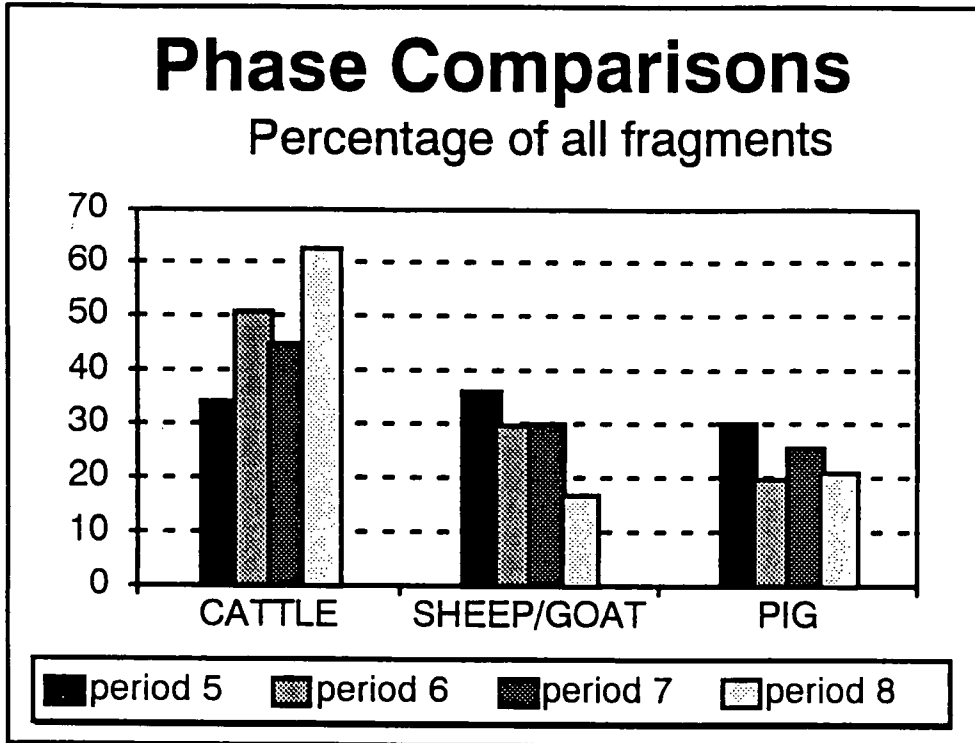


figure 204

Table 1. Fragment counts for the species present

(*) number includes partial skeleton counted as one bone

Cattle		1342
Sheep/Goat		(*) 769
Sheep		11
Goat		3
Pig		513
Red Deer		10
Roe Deer		2
Hare		7
Horse		6
Dog		11
Cat		2
Vole sp.		1
L.Ungulate		117
S.Ungulate		90
Fowl		105
Duck		1
Goose		16
Pigeon		3
Puffin		(*)1
Gull sp.		5
Cormorant		1
Black cock		2
Crow/Rook		1
Passerine		2
Eagle		1
Starling cf.		2
Gadus sp.		3
Mussle		2
Periwinkle		4
		3033

Stokes: Spatial patterning of faunal remains from South Shields fort

Table 2

List of all measurements

Species	Element	Measurements									
		1	2	3	4	5	6	7	8	10	
cattle	ast	59.9	45.6	53.6		36					
cattle	cal	91.4		141.8	36.3	43.1					
cattle	frnt	38.2	24.7								
cattle	hc		35	160							
cattle	hc	48.9	36.5								
cattle	hc	57.3	36.6	150							
cattle	hc	57.9	39.8								
cattle	hc	73.4	54.5	205							
cattle	hum										35.9
cattle	hum										38
cattle	hum										39.2
cattle	hum										50.7
cattle	hum							83.6			
cattle	hum							89.9			
cattle	hum				65.6						37.2
cattle	mc						48.9				
cattle	mc						50.5				
cattle	mc						50.9				
cattle	mc						52.7				
cattle	mc						53.3				
cattle	mc						53.7				
cattle	mc						56				
cattle	mc						57.5				
cattle	mc						59.4				
cattle	mc						62.6				
cattle	mc						63.3				
cattle	mc						65.6				
cattle	mc	180									
cattle	mc	186					59.2				
cattle	mc	188					62.4				
cattle	mc	192					62.3				
cattle	mc	197					66.2				
cattle	mc	200					57.1				
cattle	mt						45.9				
cattle	mt						46.9				
cattle	mt						48.3				
cattle	mt						48.4				
cattle	mt						49				
cattle	mt						52.9				
cattle	mt						53				
cattle	mt						55.7				
cattle	mt						57.4				
cattle	mt						57.5				
cattle	mt						58.2				
cattle	mt						60.3				
cattle	mt	194					47				
cattle	mt	196					47.6				
cattle	mt	204									
cattle	mt	224					60				

Stokes: Spatial patterning of faunal remains from South Shields fort

Species	Element	1	2	3	4	5	6	7	8	10
cattle	ocip	41.5	28.9	115						
cattle	ph1	61.7								
cattle	rad						86.2			
cattle	rad	254	68.7				62			
cattle	scap		36.6		52.5	39.8	48.1			
cattle	scap		44.5			42.3	52.8			
cattle	scap		47.9				56.2			
cattle	scap		54.5				60.6			
cattle	scap		56.9							
cattle	scap		57.7		75.6		64.7			
cattle	scap		60.7							
cattle	sfrag	26.8	40.8							
cattle	sfrag	27.7	41.5							
cattle	skl	50	62.5							
cattle	tib							61.4	47.7	
dog	rad	134								
dog	tib	112.4								
dom fowl	fem	75.3								
dom fowl	fem	86.6								
dom fowl	hum	59.3								
dom fowl	hum	59.4								
dom fowl	hum	66.4								
dom fowl	hum	73.8								
dom fowl	rad	59.3								
dom fowl	rad	62.4								
dom fowl	rad	63								
dom fowl	rad	68.4								
dom fowl	tib	83.6								
dom fowl	tib	98.2								
dom fowl	tib	131.8								
dom fowl	tmt	60.9								
dom fowl	tmt	74.8								
dom fowl	uln	61.8								
dom fowl	uln	62.3								
dom fowl	uln	70.2								
dom fowl	uln	70.7								
dom fowl	uln	71.2								
gadus sp	nc	48.3	24.8							
goat	frnt	27.2	19.8							
goose	cmc	92.1								
goose	tmt	86.7								
horse	cal			114.5						
pig	hum									25.3
pig	hum							30.9		
pig	hum							35.9		24.1
pig	hum					27.4		34.6		25.9
pig	hum					27.7				24
pig	hum					28.3				24.1
pig	hum					29.4				24.5
pig	hum					30.6		36.3		23.6
pig	hum					31				25.9
pig	hum					31.2				25.6
pig	hum					31.6				25.7
pig	hum					33.5				27.9

Stokes: Spatial patterning of faunal remains from South Shields fort

Species	Element	1	2	3	4	5	6	7	8	10
pig	mtc	68.1								
pig	rad		27.6							
pig	rad		27.8							
pig	rad		29.1							
pig	rad		24.6							
pig	tib							24.6	19.3	
pig	tib							26.1	23.3	
pig	tib							29	25.4	
s/g	cal			48.3						
s/g	cal	47.8								
s/g	cal	48.4								
s/g	hc	32.2	21.1							
s/g	hum							26.6		14.6
s/g	hum							26.9		15
s/g	hum							28		16.9
s/g	hum							29		16.3
s/g	hum							29.3		16.5
s/g	hum					24				13.9
s/g	hum					25.1				14.9
s/g	hum					25.4				17
s/g	hum					25.5				16
s/g	hum					25.6				16.3
s/g	hum					25.6				16.5
s/g	hum					25.7				16.6
s/g	hum					25.9				14.5
s/g	hum					26				16.5
s/g	hum					26.3				17
s/g	hum					26.6				16.6
s/g	hum					26.7				16.3
s/g	hum					26.9				16.2
s/g	hum					27				17.1
s/g	hum					27.1				15.7
s/g	hum					27.4				15.5
s/g	hum					27.8				18
s/g	hum					28.3				16
s/g	hum					28.7				18
s/g	hum					29.1				16.5
s/g	hum					29.4				16.9
s/g	hum					29.5				
s/g	mc						21.6			
s/g	mc						21.9			
s/g	mc						25.2			
s/g	mc		22.9	16.5	15					
s/g	mc	101.8					22.3			
s/g	mc	110								
s/g	mc	113.8					22.3			
s/g	mc	116.2					22.9			
s/g	mc	119.4			11.5		20.8			
s/g	mc	121.7					23			
s/g	mc	125					22.1			
s/g	mt						20.9			
s/g	mt						21.8			
s/g	mt		18.5	18.5	11.6					

Stokes: Spatial patterning of faunal remains from South Shields fort

Species	Element	1	2	3	4	5	6	7	8	10
s/g	mt	116.8					20.2			
s/g	mt	123	17.8				19.9			
s/g	mt	125.5								
s/g	rad		25.2							
s/g	rad		25.7							
s/g	rad		27	13.2						
s/g	rad		27.3							
s/g	rad		28.2	14.5						
s/g	rad		29.8							
s/g	rad	133.6	27.3	14.2						
s/g	rad	137.2	27.8				24.3			
s/g	rad	140.3	25.9	13.3						
s/g	tib									
s/g	tib						20.5	16.7		
s/g	tib						21.3	17.2		
s/g	tib						21.3	17.6		
s/g	tib						21.4	16.8		
s/g	tib						21.7	15.3		
s/g	tib						22	17.4		
s/g	tib						22.2	16.6		
s/g	tib						22.5	17.9		
s/g	tib						22.8	18.4		
s/g	tib						22.9	18.4		
s/g	tib						23.1	18.8		
s/g	tib						23.2	19.3		
s/g	tib						23.2	19.4		
s/g	tib						23.4	17.9		
s/g	tib						23.4	19.3		
s/g	tib						23.5	17.9		
s/g	tib						23.5	18		
s/g	tib						23.5	19.5		
s/g	tib						23.7	17.9		
s/g	tib						23.7	18.5		
s/g	tib						23.8	17.7		
s/g	tib						24.2	19.7		
s/g	tib						24.3	18.8		
s/g	tib						24.4	17.7		
s/g	tib						24.4	19.6		
s/g	tib						24.5	19		
s/g	tib						24.7	18.6		
s/g	tib						25	19.2		
s/g	tib						25.1	20.5		
s/g	tib						25.3	18.8		
s/g	tib						25.4			
s/g	tib						25.6	19.6		
s/g	tib						25.7	20		
s/g	tib						26	19.6		
s/g	tib						26.1	20.1		
s/g	tib						26.4	20.9		
s/g	tib			36.4	35.5					
sheep	frnt	23.1	38.9							
sheep	sfrag	27.7	18.5							
sm goose	tmt	75.5								

Stokes: Spatial patterning of faunal remains from South Shields fort

Table 3. Cattle Epiphyses in Approximate Order of Fusion Ages of Fusion after Silver 1969.

	FUSED	JUST FUSED	UNFUSED
by 18 months			
Scap tub	61	-	
Acet symph			4
Prox rad	20		
Dist hum	34		
Prox ph2	37		1
Prox ph1	122	1	2
by 2-3 yrs			
Dist tib	23	1	3
Dist mc	29		8
Dist mt	24		3
by 3.5-4 yrs			
Prox cal	14	1	6
Prox fem	27	1	10
Dist rad	10	3	6
Prox tib	10	1	2
Dist fem	10	2	3
P & D uln	5		4
Prox hum	2	1	2
by >5 yrs			
Ant vert	36	10	50
Post vert	43	11	43

Stokes: Spatial patterning of faunal remains from South Shields fort

Table 4. Horn core measurements

Location	Ora-Aboral Diameter	Dorso-Basal Diameter	Posterior-dorsal Length
CY21	35		160
CYCY	54.5	73.4	205
IV1	50	62.5	
Rampart	36.5	48.9	
Rampart	36.6	57.3	150
Rampart	39.8	57.9	
Rampart	26.8	40.8	
Rampart	27.7	41.5	
V5	28.9	41.5	115

Stokes: Spatial patterning of faunal remains from South Shields fort

Table 5. Canid Gnawing

	Cattle & L.Ungulate	Sheep/Goat	Pig	Hare
Jaw	2			
Atlas		2		
Axis	2			
Thoracic vert	1			
Scapula	2		1	
Humerus	1	2	4	
Radius	1	9		
Ulna	3			
Metacarpal	5	11	1	
pelvis		1		
Femur	6	2	1	
Tibia	2	7	1	1
Patella	1			
Calcaneum	2	2	1	
Centroquaral	3			
Metatarsal	4	12		
Phalanx 1	2	1		
Phalanx 2	1			
Phalanx 3	2			
Total Gnawed	40	49	9	1
Total Frags	1459	859	513	
% Gnawed	3%	6%	2%	

Table 6. Sheep/Goat Epiphyses in Approximate Order of Fusion Ages of Fusion after Silver 1969.

	FUSED	JUST FUSED	UNFUSED
by 1yr			
Scap tub	28	1	8
Acet symph			1
Prox rad	30		1
Dist hum	37	2	9
by 1-2 yrs			
Dist tib	41	9	8
Dist mc	11		17
Dist mt	5		15
Prox ph2	5		1
Prox ph1	43	4	5
by 2.5-3.5 yrs			
Prox cal	14	3	13
Prox fem	4		15
Dist rad	9		12
Prox tib	7		6
Dist fem	6		18
P & D uln	7	2	7
Prox hum	4	2	4
by >5 yrs			
Ant vert	21	6	49
Post vert	20	3	51

Table 7. Pig Epiphyses in Approximate Order of Fusion Ages of Fusion after Silver 1969.

	FUSED	JUST FUSED	UNFUSED
by 1yr			
Scap tub	20		8
Acet symph		1	1
Prox rad	8		5
Dist hum	18	6	4
Prox ph2	3		2
by 2-2.5 yrs			
Dist tib	3	4	16
Dist mc	2		20
Dist mt	2		13
Prox ph1	4	2	15
Prox cal	2	1	14
by 2.5-3.5 yrs			
P & D fem			15
Dist rad			28
Prox tib			4
P & D uln			10
Prox hum	1		2
by >5 yrs			
Ant vert	1	1	11
Post vert	1		15

Stokes: Spatial patterning of faunal remains from South Shields fort

Table 8. Butchery

	Cattle & L. Ungulate	Sheep/Goat & S. Ungulate	Sheep	Goat	Pig	Red Deer	Roe Deer	Hare	Horse	Fowl
Horn core	6	1								
Frontal	3		3	1	1					
Occipital		1								
Jaw	13				2					
Atlas	2	4			2					
Axis	5	3								
*Cervical vert.	5	6								
*Thoracic vert.	12	5								
*Lumber vert.		14								
*Vert??	10	2								
*Rib	2									
Scapula	50	6			8			1		
Humerus	29	9			23					1
Radius	23	7		1	9					
Ulna	16	4			8					
Radial carpal	1									
Metacarpal	24									
*Caudal vert.	3									
Pelvis	3	2			1					
Acetabulum	9	4			6					
Ilium	5	2			1					
Ischium	1									
Pubis	12									
Femur	44	4			3					
Tibia	17	11			4		1	1		
Calcaneum	15	1								
Astragalus	32									
Centroquartal	7									
Metatarsal	24	4				2				
Phalanx 1	19								1	
Phalanx 2	6									
Phalanx 3	1									
Total Butchered	399	90	3	2	68	2	1	2	1	1
Total Frags.	1459	859	11	3	513	10	2	7	6	105
% Butchered	27%	10%			13%					

Stokes: Spatial patterning of faunal remains from South Shields fort

Table 9. Fragment counts including loose teeth ect. as recorded

Num. Frags	Cattle		S/G		Pig	
100	50	50	36	36	14	14
200	107	53.5	66	33	27	13.5
300	151	50.33333	96	32	53	17.66667
400	206	51.5	127	31.75	67	16.75
500	269	53.8	151	30.2	80	16
600	326	54.33333	184	30.66667	90	15
700	372	53.14286	218	31.14286	110	15.71429
800	410	51.25	260	32.5	130	16.25
900	457	50.77778	294	32.66667	149	16.55556
1000	513	51.3	322	32.2	165	16.5
1100	571	51.90909	349	31.72727	182	16.54545
1200	620	51.66667	375	31.25	205	17.08333
1300	719	55.30769	424	32.61538	257	19.76923
1400	778	55.57143	453	32.35714	270	19.28571
1500	805	53.66667	495	33	300	20
1600	861	53.8125	528	33	311	19.4375
1700	904	53.17647	567	33.35294	329	19.35294
1800	948	52.66667	604	33.55556	348	19.33333
1900	989	52.05263	644	33.89474	367	19.31579
2000	1051	52.55	669	33.45	380	19
2100	1100	52.38095	702	33.42857	398	18.95238
2200	1160	52.72727	724	32.90909	416	18.90909
2300	1213	52.73913	745	32.3913	442	19.21739
2400	1248	52	787	32.79167	465	19.375
2500	1287	51.48	823	32.92	490	19.6
2600	1385	53.26923	825	31.73077	490	18.84615
2777	1418	51.0623	852	30.68059	510	18.36514

Stokes: Spatial patterning of faunal remains from South Shields fort

Table 10 Percentages of Cattle, Sheep & Pigs Across the site at South Shields

	Cattle	Sheep	Pig	n
Northwest				
Streets & Alleyways				
C14-C15	46	34	20	64
III-V	56	30	14	378
V-VI	62	24	14	89
VI-VII	72	18	10	114
Southeast				
Northwest				
Barracks Running Southwest Northeast				
Bk III	29	40	31	133
Bk V	36	39	25	389
Bk VI	45	32	23	457
Bk VII	68	26	6	68
Southwest				
Barracks & Other Buildings				
Bk IV	51	26	23	35
Rampart Bld	65	24	11	422

Table 11
Species by location & fragment count

Species	Locations															Total
	Rampart	Bk IV	Bk VII	VI-VII	Bk VI	V-VI	Bk V	III-V	Bk III	C14-C15						
Cattle	273	18	43	82	198	53	135	210	39	29					1080	
Sheep/Goat	101	9	*17	20	148	22	*156	115	53	22					663	
Pig	48	8	9	12	103	13	98	53	41	13					398	
Horse					1		1		1						3	
Red Deer	1			2	1		2	2							8	
Roe Deer				1		1			2						2	
Dog			1		3		1		2						9	
Cat							2								2	
Hare			1				3								4	
Vole sp							1								1	
Dom. Fowl	6	1	7		3	3	36	1	2	3					62	
Goose		1	1		1		3								6	
Duck							1								1	
Eagle														1	1	
Puffin								# 1							1	
Gull sp							1								1	
Passerine sp							2								2	
Pigeon			1	1											2	
Starling cf					1										1	
Gadus sp					1				1						2	
Mussle					1										1	
Periwinkle	1							2							3	
	430	37	80	118	461	94	442	382	139	70					2253	

* = 1 Goat
= partial skeleton

Appendix 1

List of catalogued bone zones for abundance and fragmentation analysis

Scapula

1. Supraglenoid tubercle
2. Glenoid cavity
3. Origin of the distal spine
4. Tuber of spine
5. Posterior of neck with foramen
6. Cranial angle
7. Caudal angle

Humerus

1. Head
2. Greater tubercle
3. Lesser tubercle
4. Intertuberal groove
5. Deltoid tuberosity
6. Dorsal angle of olecranon fossa
7. Capitulum
8. Trochlea
9. Radial fossa

Radius

1. Medial half of proximal epiphysis
2. Lateral half of proximal epiphysis
3. Posterior proximal ulna scar and foramen
4. Medial half of distal epiphysis
5. Lateral half of distal epiphysis
6. Distal shaft

Ulna

1. Olecranon tuberosity
2. Trochlear notch
3. Lateral coronoid process
4. Distal epiphysis

Metacarpus

1. Medial facet of proximal articulation. MC 3.
2. Lateral facet of proximal articulation. MC 4.
3. Medial distal condyle. MC 3.
4. Lateral distal condyle. MC 4.
5. Anterior distal groove and foramen

First Phalanx

1. Proximal epiphysial junction
2. Distal articular facet

Innominate

1. Tuber coxae
2. Tuber sacrale & scar
3. Body of ilium with dorso-medial foramen
4. Iliopubic eminence
5. Acetabular fossa
6. Symphyseal branch of pubis
7. Body of ischium
8. Ischiatic tuberosity
9. Depression for medial tendon of rectus femoris
0. Ischial tuberosity

Femur

1. Head
2. Trochanter major
3. Trochanter tertius
4. Supracondyloid fossa.
5. Distal medial condyle
6. Lateral distal condyle
7. Distal trochlea

Tibia

1. Proximal medial condyle
2. Proximal lateral condyle
3. Intercondylar eminence
4. Proximal posterior nutrient foramen
5. Medial malleolus
6. Lateral aspect of distal articulation
7. Distal pre-epiphyseal portion of the diaphysis

Calcaneum

1. Calcaneal tuber
2. Sustentaculum tali
3. Processus anterior

Metatarsus

1. Medial side of proximal facet. MT 3.
2. Lateral side of proximal facet. MT 4.
3. Medial distal condyle. MT 3.
4. Lateral distal condyle. MT 4.
5. Anterior distal groove and foramen

Mandible

1. Symphyseal surface
2. Diastema
3. Lateral diastemal foramen
4. Coronoid process
5. Condylar process
6. Angle
7. Anterior dorsal ascending ramus posterior to M3
8. Mandibular foramen

Skull

1. Paroccipital process
2. Occipital condyle
3. Intercornual protuberance or position of such
4. External acoustic meatus
5. Frontal sinus
6. Ectorbitale
7. Entorbitale
8. Temporal articular facet
9. Facial tuber
0. Infraorbital foramen

Vertebra

1. Spine
2. Anterior epiphysis
3. Posterior epiphysis
4. Body of centrum
5. Neural arch
0. One side only ie split

Other

1. Whole bones of phalanx 2, phalanx 3, carpals, tarsals, patella.

List of Anatomical Abbreviations

Skl	Skull	Mal	Lateral malleolus
Hc	Horn core	Mt	Metatarsus
Inc	Premaxilla	Mp	Metapodial
Jaw	Mandible	Ph 1	1st phalanx
Max	Maxilla	Ph 2	2nd phalanx
Ocip	Occipital	Ph 3	3rd phalanx
Par	Parietal		
Temp	Temporal		
Zyg	Zygomatic		
Lac	Lacrimal		
Frnt	Frontal		
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	Teeth	
Hum	Humerus	U Maxillary	
Rad	Radius	L Mandibular	
Uln	Ulna	D Deciduous	
CarG	Radial carpal	I Incisor	
CarF	Intermediate carpal	C Canine	
CarH	Ulnal carpal	P Premolar	
CarJ	Carpal 2 + 3	(deciduous)	
CarD	Carpal 4	Pm Premolar	
Mc	Metacarpus	(permanent)	
Oc	Pelvis	M Molar	
Acet	Acetabulum		
Ili	Ilium		
Ish	Ischium		
Pub	Pubis		
Fem	Femur		
Pat	Patella		
Tib	Tibia		
Fib	Fibula		
Cal	Calcaneum		
Ast	Astragalus		
Cq	Centroquartal		

Appendix 2. Measurements taken (after von den Dreisch 1976)

element	meas. no.	measurement
Femur	3	Bd - greatest breadth distal end
	6	greatest depth distal end
Horn core	1	least (dorso-basal) diameter horn base
	2	greatest (oro-aboral) diameter horn base
Humerus	5	BT - greatest breadth trochles
	10	LT - length trochlea
Scapula	2	SLC - smallest length of collum scapulae
	3	thickness of neck
	4	GLP - greatest length processus articularis (glenoid process)
	5	BG - breadth of glenoid cavity
	6	LG - length of glenoid cavity
Tibia	7	Bd - greatest breadth distal end
	8	Dd greatest depth distal end
Radius	1	GL - greatest length
	2	Bp - greatest breadth proximal end
	3	proximal depth
	6	Bd - greatest breadth distal end
	8	BFp - greatest breadth facies art. prox.
	9	BFd - greatest breadth facies art. distal
Metapodials	1	GL - greatest length
	2	Bp - greatest breadth proximal end
	3	Dp - greatest depth proximal end
	4	SD - smallest breadth diaphysis
	5	90 degrees to 4.
	6	Bd - greatest breadth distal end
	7	minimum medial depth distal condyle
	8	maximum medial depth distal condyle
	9	minimum lateral depth distal condyle
	10	maximum lateral depth distal condyle
Phalanx I	1	GL - greatest length
	2	Bp - greatest breadth proximal end.

Appendix 4 Cattle, Counts of identified skeletal elements

* Large Ungulate

Horn core	27
Jaw	122
Maxilla	21
Occipital	11
Frontal	8
Atlas	4
Axis	8
*Cervical v	15
*Thoracic	36
*Lumber v	5
*Rib	32
Scapula	10
Humerus	78
Radius	51
Ulna	39
Radial car	29
Intermedia	16
Ulna carpa	15
Metacarpa	15
Sacrum	58
*Caudal v	16
Acetabulu	30
Ilium	11
Ischium	1
Pubis	22
Femur	80
Tibia	52
Calcaneur	44
Astragalus	47
Centroqua	33
Tarsal 2+3	3
Metatarsa	50
Phalanx 1	138
Phalanx 2	102
Phalanx 3	83
Li	1
Lpm3	2
Lpm4	21
Lm1	11
Lm2	6
Lm3	
Upm2	1
Upm4	1
Um1	9
Um2	3
Um3	4
	1371

Appendix 5 Sheep/goat, Counts of identified skeletal elements

* Small Ungulate

Skull	5
Horn core	6
Jaw	65
Maxilla	17
Occipital	2
Frontal	10
Atlas	14
Axis	4
*Cervical	22
*Thoracic	25
*Lumbar v	29
*Caudal v	1
*Rib	2
Scapula	45
Humerus	69
Radius	71
Ulna	27
Metacarpal	48
Pelvis	15
Acetabulum	14
Ilium	13
Ischium	3
Pubis	3
Femur	48
Tibia	95
Calcaneum	31
Astragalus	12
Metatarsal	48
Phalanx 1	52
Phalanx 2	6
Phalanx 3	6
Lpm4	4
Lm1	8
Lm2	1
Lm3	1
Um1	7
Um2	6
Um3	3
	838

Stokes: Spatial patterning of faunal remains from South Shields fort

Appendix 6 Pig, Counts of identified skeletal element:

Skull	1
Jaw	57
Maxilla	31
Occipital	7
Frontal	13
Atlas	2
Axis	3
Cervical v	7
Thoracic v	5
Lumber ve	1
Rib	1
Scapula	36
Humerus	42
Radius	56
Ulna	32
Metacarpa	27
Pelvis	4
Acetabulu	16
Ilium	5
Femur	19
Tibia	35
Calcaneur	17
Astragalus	11
Metatarsa	23
Phalanx 1	22
Phalanx 2	8
DLi	
Li	6
Lc	3
Lpm2	1
Lpm4	1
Uc	3
Um2	1
Um3	2
	503

Stokes: Spatial patterning of faunal remains from South Shields fort

Appendix 7. Cattle - Counts of Zones

Zone

Skl1	8
2	3
3	3
4	
5	4
6	4
7	
8	
9	4
0	

Jaw1	26
2	39
3	38
4	21
5	30
6	10
7	11
8	8

Scap1	25
2	58
3	56
4	34
5	54
6	4
7	1

Hum1	4
2	1
3	
4	
5	3
6	23
7	23
8	15
9	21

Rad1	16
2	14
3	4
4	10
5	12
6	7

Uln1	6
2	17
3	17
4	4

Mc1	24
2	24
3	24
4	22
5	32

Oc1	
2	2
3	6
4	38
5	11
6	5
7	14
8	
9	18
0	

Fem1	41
2	1
3	13
4	11
5	10
6	7
7	5

Tib1	8
2	4
3	10
4	14
5	24
6	18
7	10

Cal1	20
2	31
3	30

Mt1	22
2	19
3	20
4	22
5	30

Ph1 1	136
Ph1 2	128
Ph2	102
Ph3	83

Carr	16
Car i	15
Car u	15

Ast	47
Cq	33
Tar 2+3	3

Stokes: Spatial patterning of faunal remains from South Shields fort

Appendix 8. Sheep/Goat - Count of Zones

Zone

Sk11	2
2	4
3	3
4	3
5	3
6	6
7	
8	
9	11
0	4

'Oc1	3
2	9
3	8
4	11
5	16
6	2
7	12
8	7
9	17
0	1

Jaw1	15
2	42
3	29
4	18
5	18
6	12
7	15
8	10

Fem1	12
2	2
3	14
4	20
5	13
6	13
7	16

Scap1	22
2	30
3	33
4	20
5	33
6	2
7	3

Tib1	8
2	9
3	9
4	34
5	50
6	51
7	52

Hum1	5
2	3
3	2
4	3
5	7
6	54
7	37
8	36
9	57

Cal1	18
2	30
3	29

Mt1	35
2	35
3	6
4	6
5	22

Rad1	30
2	31
3	56
4	11
5	12
6	18

Ph1 1	47
Ph1 2	52
Ph2	6
Ph3	6

Car r	
Car i	
Car u	

Uln1	9
2	24
3	25
4	3

Ast	12
Cq	1
Tar 2+3	

Mc1	28
2	29
3	16
4	15
5	28

Stokes: Spatial patterning of faunal remains from South Shields fort

Appendix9. Pig - Counts of Zones

Zone

Skl1	5
2	
3	5
4	
5	6
6	6
7	
8	
9	3
0	3

Jaw1	15
2	17
3	9
4	
5	3
6	12
7	12
8	6

Scap1	14
2	22
3	19
4	12
5	20
6	2
7	

Hum1	1
2	
3	
4	
5	4
6	35
7	24
8	22
9	33

Rad1	20
2	19
3	24
4	3
5	3
6	26

Uln1	1
2	29
3	23
4	1

Mcl	10
2	17
3	1
4	
5	

'Oc1	3
2	4
3	3
4	6
5	20
6	
7	11
8	
9	12
0	

Fem1	2
2	
3	8
4	9
5	2
6	2
7	2

Tib1	2
2	2
3	2
4	13
5	8
6	8
7	18

Calc	7
2	17
3	14

Mt1	16
2	7
3	1
4	
5	

Ph1 1	8
Ph1 2	21
Ph2	8
Ph3	

Carr	
Car i	
Car u	

Ast	11
Cq	1
Tar 2+3	1

Appendix 10: Grant's wear stages of individual mandibular teeth

Cattle

	Grant's Wear Stage															
	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p
dp4		2					2	2				1	1			
P4		5		1		13	13	4	1							
M1	2	3	1	2		1	2	3	1	7	11	5	1			1
M2				2	1	1	3	1	2	15	5	1	1			
M3		1	1	1	2	1	9	1	1	9	3	4	1			

Appendix 10.

Data from the Dexter Cattle Society

STEERS FINISHED ON GRASS

Birth Weight lbs.	Age at slaughter	Live Weight lbs.	Carcase Weight lbs.	KO%
52	17 months	671	364	54
50	17 "	660	355	53.2
56	18 "	682	356	52
57	18½ "	704	372	53
58	18½ "	715	382	53.3
56	19 "	627	330	52.5
63	19 "	704	376	53.5
54	20 "	704	375	53.5
42	21 "	638	357	56
52	24 "	703	395	56
52	25 "	715	432	60.5

BULLS FATTENED INSIDE

55	13 months	682	358	52.5
53	13½ "	686	384	56
58	14 "	671	362	54

The Dexter and the Dexter Cross makes a good beef animal whether it is kept as a beef i.e. (entire) or a steer i.e. (castrated).

It yields high quality small joints of meat with a good proportion of meat to bone.

A mature Dexter Bull or Steer can reach nine hundredweight or more in three years, but as an animal intended for beef would not be kept for that length of time the weight to aim for is six to six and a half hundredweight.

Animals kept entire on an intensive feeding system in pens from the time they are weaned will reach a satisfactory killing-out size at twelve months old.

Here is some information from the files of one of our members on animals slaughtered.

Age	Live weight		Dead weight		Killing out %
	Lbs	Kgs	Lbs	Kgs.	
17 mnths	790	358	450	204	56.9
12 mnths	540	245	307	139	57.0
12 mnths	580	263	315	143	54.0
12 mnths	580	263	326	148	56.0
13 mnths	620	281	350	159	56.0
13 mnths	590	267	332	151	56.0
12 mnths	570	258	320	145	56.0
12 mnths	500	227	280	127	56.0

This was a very stunted animal but % good)

13 mnths	540	245	302	137	56.0
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Breeding bulls slaughtered and eaten

4 years	1045	474	580	263	55.0
3 years	920	417	506	229	55.0
3 years	1010	458	576	261	57.00

Appendix 12: Grant's wear stages of individual mandibular teeth

Sheep/Goat	Grant's Wear Stage														
	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
dp4			3	2	3	1		3			6	2	2	1	
P4					1	2	1	4	3						
M1		1		2	5	8	12	2	1	2	2	2	1		
M2			3	6	3	4		5							
M3		1	2			1	5								

Appendix 13: Grant's wear stages of individual mandibular teeth

Fig

	Grant's Wear Stage														
	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
dp4	1				1		1				3				
P4		3	4	6	3	1									
M1				6	3	7	3	2			2				
M2			2	4	4	4		1	2			1			
M3	3	2	1		1			1	1	1					

