

ZOOARCHAEOLOGICAL ANALYSIS OF  
AN URBAN REFUSE DUMP IN CAPE TOWN'S  
WATERSIDE AT THE TURN OF THE  
19TH CENTURY.

Otto H. T. Graf

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Submitted in fulfilment of the requirements for a Masters  
Degree in the Department of Archaeology at the  
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AN URBAN REFUSE DUMP IN CAPE TOWN'S  
WATERSIDE AT THE TURN OF THE  
19TH CENTURY.

Otto H. T. Graf



*In loving memory of*

*my grandparents*

Dr. Hermann Theodor Graf

(1869-1944)

Schwester Lily Amalia Johanna Graf (née Schließler)

(1888-1961)

*and my aunt*

Erica Freja Carla Sperandio (née Graf)

(1926-1995)

## ABSTRACT.

Zooarchaeology - the study of faunal remains - is not limited to prehistoric sites, but extends also into the realm of historical archaeology. Over the last two decades the number of papers and publications on a variety of aspects pertaining to zooarchaeology have grown. Although faunal research extends back into the mid-19 century, historical zooarchaeology has only increased over the last decade or so. This is equally the case in South Africa with historical zooarchaeology a growing avenue of research.

This thesis provides a methodology through which faunal material can be analyzed in-depth, beyond the mere appendices to site reports. Microscopic analysis of more than 2000 faunal specimens from a historical site within Cape Town (South Africa), Sea Street, was undertaken. The majority of the cultural material from this dump site dates to between *c.* 1780 and *c.* 1830. This time period covers the ending of the Verenigde Oostindische Companjie's (VOC) occupation of the Cape and its final succession to British rule in 1806. The explicit aim of this study was to go beyond minimum numbers (MNI) and number of identified specimens (NISP) to look at food-use patterns. A data sheet has been specifically constructed for this purpose. Other than looking at butchery style, the emphasis was to establish a "general butchery pattern", which explains how carcasses were utilized. This thesis only looks at domestic sheep, although the utilization of other domestic livestock is also discussed. All faunal patterns are blurred by the possible inclusion of primary, secondary and tertiary butchery on one faunal specimen. This does not include other cultural and natural formation processes which impact on the archaeological record. An attempt is made to distinguish between butchery done at the central locus and that away from it. Furthermore, an attempt is made to get at the cuts of meat that were actually acquired, not the erroneous results provided by MNI totals. Statistical analyses, especially the Spearman rho rank order correlation coefficient, are used to evaluate discernible patterns, and establish the strengths or correlations of these patterns. As the recoverable faunal record does not include the unpreserved aspects of the original items that were consumed, an attempt is made to fill this gap left in the archaeological record through an analysis of available primary literature, especially diaries and newspapers. Complementary sets of information are also consulted so as to tie in with various aspects of the archaeological record.

The results of the dissertation show that a "general butchery pattern" can be discerned from the dump site material; that a division of primary and other sorts of butchery can be gained; that specific butchery tools are used for specific purposes, although some are multipurpose tools; that emphasis must be placed on the actual items of consumption, not on MNI; that dump site material cannot be ignored; and most importantly that the microscopic analysis of faunal material holds a great deal of promise for future historical archaeology.

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## INTRODUCTION.

Historical archaeology is truly an interesting field and includes zooarchaeology - the archaeology of faunal material. This thesis has chosen to study cultural material from a particular site within Cape Town, namely Sea Street. The site is situated near Cape Town's Old Waterfront and was enclosed within the boundaries of Loop, Prestwich, Riebeeck and Sea Streets. Today the site is no longer existent and the ground has been built on by a large insurance firm.

The street block enclosed by the four streets, yielded much cultural material. Between January and March 1990, four extensive excavations were undertaken within this street block. The material from two of these excavations has been used in this thesis; one in the middle of the street block and one on the corner.

Despite a considerable degree of cultural material that was excavated from the assemblages, the site has provided us with a number of explicit problems, but also interesting avenues for research. Initially the site material was interpreted as being co-eval with the first construction of the houses on the block in the mid- to late-1830s (Hall 1991), and that the refuse emanated from either the owners, occupants or tenants of these dwellings. More recently, analyses of dateable artefacts suggest that the site material belongs to an earlier phase: post-dating *c.* 1760 to the first quarter of the 19th century, with some possible later material. Once we were aware that the majority of the site material did not relate to the period after the mid-1830s, we were left with the conclusion that the cultural material was dumped there. This area along the Waterfront can clearly be seen as undeveloped on various maps of urban Cape Town. Indeed in one case it was shown as "waste land", that is as an open piece of ground that had not been developed.

As the material did not all originate from the later site occupants, one is left to ask: Who deposited the material and where did it come from? Although landfilling practices may have been carried out, it is unlikely that people not in the vicinity, or above the Gardens, would have carted their refuse down to the Waterfront (see Figure 1.1). It is more likely that structures - whether domestic, commercial or both, as many dwellings prior to the mid-19th century performed a dual function of business premises and domestic dwellings - in the vicinity of Sea Street, dumped their refuse on open pieces of "waste land". The houses below Strand Street to the Waterfront and between the Fish Market, lower Heerengracht and the later Gas Works would likely encompass all those who may have dumped their refuse on the waste area fronting the beach (see Figure 1.2). [It is known for instance that waste from the butchers' Shambles was buried along the beach behind the Shambles]. An 1804 map of Cape Town, shows the whole of the beachfront, one street lower than Strand Street, to be undeveloped. Streets and alleys in this area included those with names like Visch/Vis Steeg and Klipvisch/Klipvis Steeg. The people who inhabited these dwellings off Strand Street were mostly artisans, hire slaves, ex-slaves, fishermen, washerwomen, seamstresses, and the like. It is therefore likely that they may have dumped their refuse on the waste ground that became part of the Sea Street excavations in 1990. Nothing in the archaeological deposit suggests that the refuse came from commercial lots. Even the presence of a number of bone buttons and cut-out button holes left in certain skeletal elements would not prove the

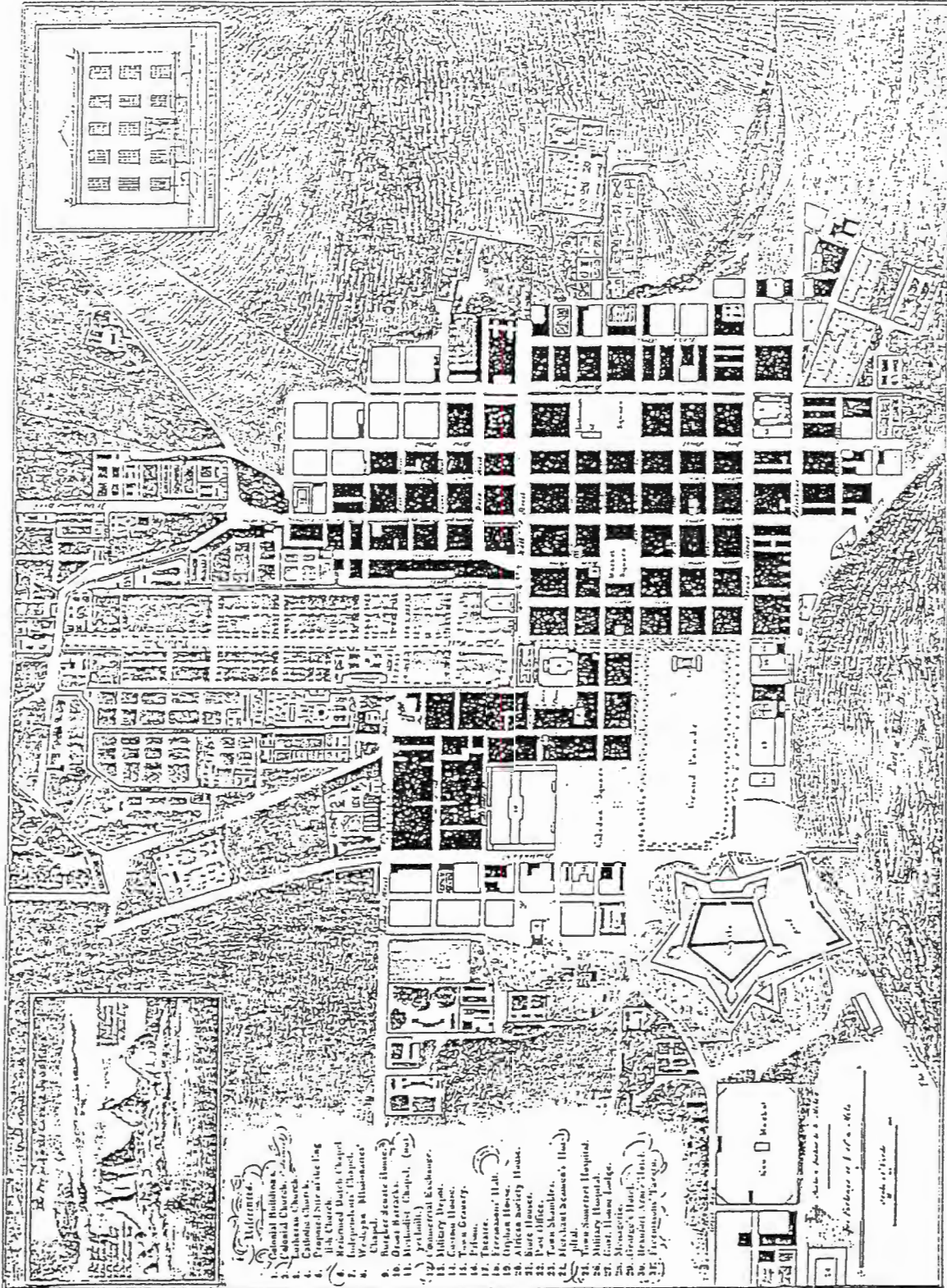


Figure 1.1: George Thompson's Plan of Cape Town and its Environs. Published Feb'y 1827 by H. Colburn, London (M1 1/23. State Archives, Cape Town). This plan of Cape Town has a list of "References" on the left hand side of the map. Included in this list is the "Town Shambles". Other key features on this map include the New Market, the Castle, the Parade, (Green)-Market Square, Hottentot Square and the Gardens in the centre of the map.



Figure 1.2: Snow's 1862 General Municipal Survey (City Council, Cape Town) which shows in greater detail various names listed in this thesis. Of note is Strand, Riebeck, Loop, Prestwich, Waterkant and Barrack Streets, as well as the Commissariat Stores and the Shambles, adjacent to the Parade. The Sea Street block is also indicated on the map, just adjacent to the Gas Works.

contrary, but rather reinforces the domestic nature of the dump site, as certain individuals were making full use of bone refuse to produce buttons, rather than acquiring them through some local retailer.

Although we are more aware of when the material was deposited, who may have deposited it and where it originates, we are still left to ask ourselves, why should we bother to analyze material from a dump site. Firstly in an urban city, the opportunities for excavation are somewhat limited, therefore even material from a dump site cannot be ignored. Secondly, a theoretical question regarding dump sites is whether or not one can gain quantitative and qualitative information from the excavated material or do dump sites simply not lend themselves to investigations. Thirdly, dump sites let us investigate numerous issues relating to taphonomy and the presence and influence of different sets of refuse, such as sheet refuse and landfill patterns, on the site record, which are different from usual forms of excavation. A particular question relating to taphonomy at this site is how does one account for the oldest clay pipe stem material at the top of the deposit in one of the houses, instead of at the bottom. This "displaced layer" contradicts the stratigraphic trend in most sites of youngest at the top and oldest near the bottom and is surely an interesting issue to solve.

My particular interest in this site was the faunal material, especially the faunal remains of domesticated sheep. Not only was I interested in which domestic and wild species were available, I too wanted to discover whether or not the carcasses were handled in a systematic manner, and what types of tools had been used to deal with them. If a "general butchery pattern" could be discovered, I wanted to go further and investigate what "cuts of meat" people were acquiring. In addition, I was interested to see whether patterns could discern between butchery done at a centralized site and that away from the central locus, i.e. could differences between primary, secondary or tertiary butchery be discovered? Furthermore the historical record was utilized to complement areas that the archaeological record left bare, or to explain inconsistencies or discrepancies in it.

To answer these and many other questions, a specific method of faunal analysis was required, i.e. a microscopic analysis of all fragments of bone that were chosen from the faunal samples available. To do so, the presence of each skeletal element or fragment thereof was noted, as were all forms of cultural damage and to a lesser degree non-cultural damage. In addition, note was taken of the type of implement used in butchery, where exactly the butchery act had occurred and where it had originated from. Both a quantification and qualification of a butchery act(s) was seen as an essential component in answering the various questions that had been posed. This thesis aims to establish a methodology by which future historical zooarchaeological analysis at the Cape would be undertaken. To date, no in-depth analysis of historical faunal butchery patterns in South Africa has been done, although two papers have looked at general faunal questions (cf. Avery 1989; Cruz-Urbe and Schrire 1991). Thus there are no local site reports or publications with which to make comparisons on a similar level of analysis. Suffice to mention here is that a considerable degree of information can be gained from a scientific microscopic analysis of faunal material, even if the material emanates from a dump site.

The thesis consists of six chapters, each integral to a clear understanding of either the site, its faunal material or some background component. Chapter One aims to set the scene for Cape Town in the late 18th and early 19th centuries, by providing an impression of those who lived in the city; what occupations they pursued; the role of the service sector in the lives of the people of Cape Town, as it was a service orientated port; and the nature of the general economy, more specifically agriculture which includes domestic livestock. As this thesis is intimately concerned with domestic livestock and food-use pathways, this chapter also looks at the Shambles and the Fish Market - the two central loci where fresh meat and fish were acquired. Issues of consumer behaviour are also touched on, as they influence the choices that consumers make.

One cannot discuss each of these issues without discussing the nature of slavery, as the Cape was a slave-based society, with slaves outnumbering colonists at this period. Slavery permeated every aspect of civil society, not only the service sector. Not only did the institution of slavery provide a basis for the economy, but their emancipation provided the impetus for a local economic boom, which may have indirectly resulted in the building of hire houses on the Sea Street block in the late 1830s.

Chapter Two provides the basis for a clear understanding of the methodology utilized in this thesis. It clearly sets out the reasons for selecting certain assemblages and not others; where exactly they were placed in the stratigraphies of the house lots excavated; and why only one domestic species was chosen for analysis. However, the inter-relationship between faunal analysis and other items of material culture from Sea Street cannot be ignored. Attention is focused on various items of material culture which are also found within the site, including ceramic sherds and clay tobacco pipes which both provide a relative chronology for excavated material. As the reverse pipe stem chronology is intimately linked with site formation processes, it is discussed in relation to other items excavated - the faunal material, the indigenous cultural material, the glass and ceramic fragments. Before launching into the methodology utilized in this thesis, or its results, light is shed on the displaced pipe stem layer noted in part of the site.

Chapter Three provides a review of faunal analytical techniques. It starts off with a discussion and critique of MNI (minimum number of individuals) and NISP (number of identified specimens), but goes on to discuss the merits and demerits of other faunal techniques, with an in-depth investigation into indices used especially by historical archaeologists to evaluate their data. The chapter does not end here, as any form of faunal analysis is incomplete unless some understanding is gained of the cultural and non-cultural processes which affect all faunal assemblages. Besides looking at taphonomy, bone density, differential survivability, food preparation techniques, carnivore damage, collection techniques, among other topics are also discussed.

Chapter Four provides the methodology behind the results of this thesis. Once the reader has been introduced to the worksheet constructed for the historical faunal analysis of this site, the chapter gives a detailed unraveling of the specific methodology utilized in the analysis, not only what equipment was used, but more importantly how each diagnostic faunal specimen was recorded for the maximum amount

of recoverable information. The methodology proposed here forms a basis to calculate both NISPs and MNIs, and to quantify and qualify the various acts of butchery, what tools were used and how they were used.

Chapter Five presents the results gained from the selected faunal samples and the methodology proposed in the previous chapter. The chapter is divided into various sections which present the results of the data on absence and presence of skeletal elements; the percentage survivability of skeletal elements from the selected assemblages; a quantification and qualification of the various forms of butchery that had taken place; an investigation into the relationship between butchery marks and their placement on the skeleton, etc. These bits and pieces of information provide a basis to help define a "general butchery pattern" for the processing of sheep carcasses. The "general butchery pattern" leads onto a discussion of the likely units of acquisition of those responsible for depositing the faunal material. Were people "buying" complete carcasses, or wholesale or retail cuts? What one becomes very aware of, is that faunal remains deal with only one part of the faunal record - the "visible" part, and does not answer for the "invisible" part of the record, nor the contribution provided by botanical remains. This chapter also looks at changes in butchery practices, as well as a theoretical discussion is also entered into on the rate of cultural change of faunal patterns:

Chapter Six goes one step further and looks beyond the mere faunal remains. It asks where did the domestic livestock come from? Who brought them? How did they get to the Cape Town market? Who were they sold to? What happened to them once they got to market? Were they sent elsewhere? Was livestock only sent on the hoof to market, or did people also acquire preserved forms of meat, which includes the "invisible" part of the faunal record which does not make its way into the archaeological record? These questions are not limited to *Ovis aries* (sheep), but also extends to other available sources of food, including beef, pork, fish, fruit and vegetables. The chapter is concluded with some recommendations for future excavations.

Lastly, the conclusion provides a brief overview of both the methodology utilized in this thesis and the results gained therefrom. Furthermore the importance of dump sites is reiterated within the context of historical archaeology and issues pertaining to future faunal analysis are also discussed, e.g. how big should sample sizes be, so as to understand the sample population and to adequately discover and analyze any cultural or non-cultural patterns. In addition, the conclusion also discusses avenues of possible future research which does not necessarily deal with faunal remains, but the utilization of food as a commodity item.

## CHAPTER 1.

### CAPE TOWN - A TALE OF ONE CITY!

#### 1.1. INTRODUCTION.

The material culture associated with the Sea Street site spans the turn of the 19th century and covers four periods of European occupation of the Cape: the Verenigde Oostindische Companjie (VOC), the first British occupation, the Batavian interlude, and finally the second British occupation. The economic foundation and maintenance of the colony was largely supported by the large presence of slaves at the Cape, who outnumbered the European colonists (see Table 1.1). Since colonization slaves had played a large role in the running of the colony. Bank (1991b: 21) notes that by 1806 they represented over half of the total number of resident urban dwellers listed, excluding troops, and probably over 80% of the city's total work force. At the time of emancipation, however, slaves accounted for little more than a quarter of the total number of resident urban dwellers listed, again excluding troops, and well under half of the city's total work force. See Table 1.1 for a demographic profile of Cape Town's population between 1778 and 1836.

Table 1.1: Demographic Profile of Cape Town and the Cape District, 1778-1836.

Date	Slaves	Europeans	White and Free Black	Free Blacks	Khoi	Coloured	Prize Negroes	Total
1778	5541	3251	-	-	-	-	-	8792
1783	5692	3340	-	-	-	-	-	9032
1788	7331	3676	-	-	-	-	-	11007
1793	7189	4152	-	-	-	-	-	11341
1795	9049	4972	-	-	-	-	-	14006
1806	9367	6321	-	1134	624	-	-	17446
1812	8451	7312	-	1134	439	-	-	17336
1817	7498	7719	-	1800	553	-	-	17570
1822	7160	8124	-	1896	485	-	833	18498
1824	6763	8806	-	3093	-	-	-	18662
1827	6222	8805	-	3269	485	-	-	18781
1830	5838	-	13103	-	-	-	-	18914
1831	5827	-	13359	-	-	-	-	19186
1833	5562	-	13680	-	-	-	-	19242
1834	5607	-	13804	-	-	-	-	19449
1835	5574	-	13939	-	-	-	-	19513
1836	5702	-	14041	-	-	-	-	19743

(Beyers 1967: 347-349; Bank 1991: 236, appendix 4; Elks 1986a: table 1).

For this reason, any discussion of Cape Town or Sea Street cannot ignore the presence of slaves both in the economy and on the urban and rural landscape. As we shall see, slaves formed a large section of the service sector, and were fully integrated into the working mechanisms of the city; while at the same time were significantly involved in both the commercial and agricultural sectors of the economy.

So too one cannot ignore the vital relationship between Cape Town as port city and its rural hinterland, the greater Western Cape and later Eastern Cape. It is from these regions that raw produce were sent to the city, either for export or local consumption. Cape Town's status as 'refreshment station' and 'Tavern of the Seas' was dependent on this vital link. It was also from the rural hinterland and further afield that livestock which ended up at the Shambles was sent to the Cape. Produce was also brought in from the immediate vicinity of Cape Town. In the gardens, backyards and courtyards citizens grew and raised their own produce, which ended up either in Marketsquare or on the home table. The coast also made a significant contribution to the diets of both the rich and the poor, as well as providing employment directly and indirectly to those involved in the fishing industry, whether slave, Free Black (an emancipated slave) or poor white.

In positioning Sea Street in time and space there are a number of questions that need to be raised to establish the urban context and the thesis topic. Besides knowing who lived there and what they did, one needs to establish what influences did the economy, different governments and the changing economy have on peoples lives in and around Sea Street between the last quarter of the 18th century and when the first houses on the lot were built in the late 1830s? It is to these issues that we now turn.

## 1.2. THE CAPE ECONOMY.

The establishment of a refreshment station by the VOC at the Cape to provision passing ships, necessitated its non-confrontational policy with the peoples with whom it traded. For the Company to supply passing ships with fresh meat and vegetables, it had to have a regular supply of food and bartered with indigenous people for livestock. Although the VOC's interests lay in and about Cape Town, with little attention paid to the interior (Ross 1989: 292), conflict soon arose with the indigenous people regarding both land and livestock. Thus, colonial expansion was an inevitable process to make the Cape self-supporting and to enable it to serve as a refreshment station. This policy of expansion was characterized by the granting of freehold to married burghers, which was later replaced by the granting of grazing rights for stock farming (Ross 1989: 293). However, this expansion was no particularly quick. As population growth in the Cape was not coupled with significant expansion, an increasing pressure was placed on the land, which resulted in the eastward movement of the farmers around 1780 into the Eastern Cape (Freund 1989: 331).

According to Robert Ross (1993), the Cape Colony became much more market-orientated in its economic life than has generally been realized. The VOC economy had a significant rural component which linked the urban market town with the rural hinterland, with the latter providing the former with produce and goods for either local consumption or export. On the one hand, the leading sectors of

agriculture were the wine and wheat farms of the south-western Cape and commercial pastoralism in the interior. On the other hand, there was a steady increase in the number and power of the merchants, in the sophistication of the credit market, in the amount of money in circulation, and in the regulation of the colonial currency (Ross 1993: 3).

A method employed by the Company to fulfill its quotas was to tender out monopolies to certain individuals, who guaranteed to meet demand at set prices. Out of this *impost* system arose a small, elite group of men, parasitic on the mercantilist order, yet with entrepreneurial ambitions and interests. "The franchise holder or *pachter* thus gained a strong, and sometimes excessive, grip on the market" (Ross 1989: 246). Such were the meat entrepreneur, Dirk Gysbert van Reenen (Meltzer 1989: 17), who had established himself during Dutch rule, and the pioneer of the Eastern Cape, Frederik Korsten, who in 1811 took on a contract to supply Mauritius with salt meat from Algoa Bay (now Port Elizabeth). His raw materials were cattle from the Zuurveld and other eastern Cape districts and salt from the Uitenhage pans. From this base he diversified into sealing, whaling, and later, wool (Ross 1989: 268; 1993: 40). It was only in 1827 and 1828 that the Commissioners' commitment to free trade precipitated the abolition of monopolies, *pachts*, and other special concessions. The monopolies enjoyed by the butchers, the bakers, the wine traders and the vendue masters were no longer (Peires 1989: 498).

However, while the *impost* system was in place, a few privileged people benefited from it. In the meat market the VOC secured its own supplies by putting a contract out to tender for five years, in general to three people. In the early years, and in the western Karoo until deep into the 19th century, the butchers drove their stock to Cape Town on the hoof. For this reason, Cape hairy sheep, which keep their weight well under such conditions, were for a long time raised in preference to European sheep in such areas (Ross 1989: 253). These contractors acquired certain privileges, notably to use the Company's shambles in Cape Town and the Groenekloof farms north of the city, where the stock driven from the interior could recuperate and put on weight before being slaughtered. Robert Ross (1989: 255) has estimated that in the late eighteenth century only about three to five per cent of the colony's cattle and sheep was annually butchered in Cape Town.

However, by the end of the 18th century, the VOC bought only a part of the colony's meat, probably no more than a quarter, and there were alternative uses for cattle in particular, notably as draught oxen and producers of butter. In the face of these competing buyers, contracted butchers could not drive down the purchase price and harm the Cape farmers, so they had to make up their losses elsewhere. As the VOC required all foreign ships visiting Cape Town to buy their meat from the contracted butchers, they could charge the foreigners monopolistic prices and so recoup the losses they suffered in their sales to the VOC (Ross 1989: 247; see Chapter 6).

The sale of foodstuffs was organized in a number of ways. The retailing of wine was closely contracted and there were also licensing systems for butchers and bakers (Ross 1989: 266). Other than official channels for retailing, large numbers of settlers were employed in private retailing of groceries and other goods. It was conducted from home and storehouse and also in the street by slaves, on behalf of

their owners (*straathandel*); the lastnamed being pronounced illegal by the Company on a number of occasions. Linked to this street trade was illicit, private hawking or *smousery* in the rural areas (Meltzer 1989: 18). In the final years of VOC control, settlers were permitted to conduct an import trade with areas on the west coast of Africa, but the export trade remained heavily restricted. In 1792 a proclamation was issued allowing the sale of agricultural goods to passing ships, once Company needs had been satisfied. Despite this, outright smuggling (*smokkelary*) was commonly resorted to throughout the period, to satisfy local import demands and to supply passing ships with food and drink (Meltzer 1989: 19).

The influence the Company had over the Cape declined in the latter part of the 18th century, as a result of general stagnation in the fortunes of the VOC, as the relative importance of the VOC in the colony's economy had declined with the increased presence of foreign ships, and as the general wealth of wheat and wine farmers at the Cape had increased in the late 18th century (Ross 1993: 26). The economy of the Cape was by no means stagnant, and although the figures provided by the census returns or *opgaven* may sound somewhat overimpressive, they nevertheless indicate the agricultural potential of the economy.

In the *opgaven* of 1795 and 1798 the colony's wheat production is recorded as having increased by 419 percent, its cattle herds by 351 percent, and its sheep flocks by 346 percent. The dramatic rise in the figures was due to the farmers' fears that after 1795 the new British government would punish evasion much more severely than the Company had done (Ross 1993: 15). Increased production was both a result of changing trends which emerged towards the end of VOC rule and the ensuing 'open door' policy taken by those in authority. From the late 1770s the Cape economy gradually shed its fetters and became freer and more vigorous. Wars in North America and Europe brought ships and garrisons to the strategic outpost, stimulating investment and agricultural production. Wheat crops increased by more than 50 percent between 1798 and 1820, while wine production doubled between 1795 and 1804 (Elphick and Giliomee 1989: 544). The end of VOC rule at the Cape was also marked by a declining proportion of slaves in the capital (Freund 1989: 330), partly due to their dwindling supply (Elphick and Giliomee 1989: 554) and the availability of substitute labour (Bank 1991b: 22; Freund 1989: 338; Saunders n.d.; Worden 1985: 36), but also due to the loss of slaves to the wine producers in the city's hinterland, the growing craft industry (see Bank n.d.: 23) and to the growing rural hinterland.

The closing decade of the 18th century at the Cape saw the final withdrawal of a bankrupt *Verenigde Oostindische Companjie* (VOC) from a poorly developed economy, characterized by Company-regulated, highly restricted commerce (Meltzer 1989). The incorporation of the Cape into a new world order, certainly affected its future. The early 19th century saw a significant strengthening of economic links between the Cape and Europe, as indexed by the vast increase in the scale of trade after 1806. As Colin Bundy (in Bank 1991b: 19) has elegantly put it, "the British trade connection was in itself a potent new factor in the Cape economy. Once plugged into the more extensive imperial circuit, the Colony pulsed to the energy unleashed by the Industrial Revolution".

The absence of towns of any size outside Cape Town did not mean an absence of commercialization. Throughout the South African interior, trading began not with settled traders but with the pedlars (the *smousen*) and butchers' agents (Ross 1993: 38). Throughout the early 19th century, commercialized pastoralism intensified. Leonard Guelke has argued that the degree of commercialization before 1779 was not sufficient to bring about the switch from subsistence pastoralism (in Ross 1993: 37). Commercialized pastoralism's most spectacular component was the development of wool production, first along the southern coast and later throughout what became known as the Eastern Province.

The VOC made a few attempts to introduce Dutch wool-bearing sheep. Both the introduction of foreign sheep and the export of wool was one of several administrator's dreams that did not achieve much success before 1814. Merino sheep had first been introduced in VOC times. The Batavian Agricultural Commission tried to force farmers to pure-breed their sheep, but to little avail (see Meltzer 1989: 21). Governor Caledon's attempts to encourage the breeding of wool-bearing sheep also failed. The meat and fat products of the Cape sheep continued to be surer market commodities for the farmer than wool (Freund 1989: 333). This was similarly the case in the last quarter of the 18th century, when Graaff-Reinet farmers found it more profitable to sell soap (made from sheep fat) and butter, given the current prices; while the Cape butchers were complaining that they could not get the supplies of meat they required (Ross 1993: 37). Wool had to play second fiddle to wine production during the first four decades of the 19th century. After 1813 when preferential tariffs for Cape wine were implemented in Britain, wine production grew by leaps and bounds (Meltzer 1989; see Immelmann 1955: 72-73). Despite the reduction of these preferential tariffs after 1825, wine remained the Cape's largest export until the early 1840s (Meltzer 1989: 24-25), losing out to French and Portuguese wine (Immelmann 1955).

It was only with the re-introduction of merino sheep, which were suited to the Cape's arid environment, that wool production became important through the first half of the nineteenth century (Ross 1993: 20). Wool exports were beginning in the 1820s and 1830s, a period which saw the acclimatization of merino sheep to South African conditions and the heyday of the colony's largest sheep estate owned by Van Breda, Reitz, Joubert and Co. near Cape Agulhas. In 1840, wool provided around £50,000 to the local economy, and 40% less to the export market than did wine (Immelmann 1955: 81; see Van Zyl 1974). From the 1840s onwards wool came to dominate the colony's exports (see Immelmann 1955; see Blue Books CO 5982-6012), and a large proportion of European capital invested in South African agriculture went into the establishment of wool farms. Nevertheless, the importance of wool for the economic development of the colony should not be exaggerated (Ross 1993: 37-38).

### **1.3. THE SERVICE SECTOR OF THE ECONOMY AND SLAVERY.**

Alongside the expansion of mercantile activity and the associated rise of an indigenous urban merchant strata were changes at the lower and middle ranges of the economy. For the Dutch colonial period the urban economy was firmly service orientated and, as the city's primary work force, slave labourers were overwhelmingly engaged in service activities (Bank 1991b: 26, see diagram 1.1). Under the dual impact of population growth and economic expansion, craft production was transformed into a

numerically, as well as functionally, significant sector of the urban economy. A considerable number of slaves were employed in the urban area, in the manufacturing and service sectors, particularly.

Computations based on the Slave Office registers indicate that, over the period 1816 to 1834, perhaps as many as a quarter of urban slaves worked primarily as artisans; many of whom were involved in the expanding craft sector - from sailmakers to silversmiths, from habitmakers to hatters, from watchmakers to wagonmakers - which were specialized and highly-skilled occupations (Bank 1994: 80).

The 'service sector' included slaves belonging to bakers, butchers and tapsters (Shell 1986: 198). Between 1816 and 1834 45 slaves are listed as butchers in the Slave Office returns (Bank 1991; see Appendix A). Whether they were apprentice butchers, ran stores by themselves, or worked for farmers, is not known. Economic competition between slave owners and poor whites in the same occupation led to some conflict in the service sector. For instance, in Cape Town, burgher bakers without slaves competed directly with slave-owning bakers (Shell 1986: 200). Petitions against such unfair competition, and hawking in the streets, throughout the 18th century, led authorities to ban owners from using slaves in service occupations altogether. In 1794, the penultimate year of VOC occupation, slaves were only allowed to sell "eatables" and nothing else (Shell 1986: 201); but, as we shall see below slaves and others contravened the orders of the VOC.

Some of the work undertaken by the Company slaves was increasingly supplemented by the labour of the privately owned slaves. Certainly many urban slaveowners profited by hiring out their slaves (Worden 1985). Slave hiring was most common in the service sector. Brickmaking, carpentry and work as tailors were the most common and profitable activities of hired slaves. They worked in the docks, shops, warehouses, as coachmen, domestic labourers, in ale houses, bakeries, butcher shops and as masons, brickbuilders, blacksmiths, and porters and to unload cargoes from ships in Table Bay (Worden 1985: 38; Meltzer 1989: 71-72; 1994: 192). Slaves within the service category were also involved in transportation, whether of people or of things, while others were involved in the retail trade (Bank 1991b: 30-31).

Hiring out also allowed for a degree of occupational mobility among slaves. According to Mentzel (in Bank 1991a: 99), the hirer paid the owner four rixdollars a month and had to provide the slave with food and tobacco, but not clothes. Some privileged slaves were allowed to hire themselves out for their own negotiable wage; in some cases 6 *stuivers* a day, and the slave had to find his own food.

Despite the strict monopoly of the Company on all public trading in 18th century Cape Town, there was still some scope for private trade, either by burghers, slaves, free blacks or Company officials. Otto Mentzel, discussing private trade, noted that: "[it was] therefore largely surreptitious, a variety of goods being kept in private houses, the nature of which varies considerably from time to time" (in McKenzie 1993: 45; see Wolpowitz 1990). Even at the turn of the 19th century, Robert Semple (1968: 21), a visitor to the Cape noted that: "[many of t]hose who reside in the vicinity of the town live by the

produce of their gardens and vineyards, which supply the town with fruit and vegetables' (*sic*). Fruit and vegetables grown on plots in Table Valley were hawked in Cape Town by slaves in Greenmarket Square (see Worden 1985: plate 2; see also Semple 1968: 21). For example, the slaves owned by Samuel Hudson and his brother were most likely employed in their various economic ventures at the Cape - the 'garden in Table Bay', the 'little Farm behind the Castle' and their boarding establishment in the Keisergracht (McKenzie 1993: 57). Many of Sir Charles D'Oyly's daily street scenes of life in Cape Town in the 1820s and early 1830s feature slave hawkers going about their business. In some sketches they are shown to be selling foodstuffs - whether fruit, vegetables or fish; in others they were vending baskets or Cape malt (Bank 1991b: 31; D'Oyly 1968).

Slaves were also involved in small-scale enterprises. Mentzel (in Bickford-Smith and Van Heyningen 1994) provides information of slaves involved in owning and/or hiring out their fishing boats, through a system of share-fishing, which had its origins in the 18th century. Mentzel noted in 1787 that:

"Two men provide a boat each, another supplies the net, and various other people [provide] the slaves to man the boat ... fish that are caught are divided into 13 lots ... one for each boat, one for each of the 10 slaves and the thirteenth for the net" (Bickford-Smith and Van Heyningen 1994: 48).

Complementary evidence dating to 1772 is provided by Nigel Worden (1985). Thunberg, describing his arrival in Table Bay in 1772, commented that: 'we were hardly come to anchor before a crowd of black slaves and Chinese came in their small boats to sell and barter for clothes and other goods, fresh meat, vegetables and fruit, all of which our crew were eager to procure'. The mentioning of slaves with boats reveals that some of them may have been fishermen, an occupation that was widespread amongst the Free Blacks of the town (Worden 1985: 39), with many individual boat owners also being Free Blacks (Ross 1986: 7).

The 'openness' of trade also allowed free blacks to do business. For this reason, there were considerable numbers of fruitsellers and small retailers among the Free Blacks, who also owned Cape Town's first 'chop-houses' or cheap restaurants, usually in the vicinity of the harbour (Ross 1989: 267), as well as others being independent small-scale shopkeepers (Malan 1993: 48). A further example comes from the slaughter-houses on Cape Town's Waterfront. A Free Black called David had opened a shamble on behalf of Messrs. Saunders and Johnstone to supply meat to the troops (see CO 3958 #122). This may be the same David van de Kaap who is listed later in the 1833 *Cape Almanac* as the occupant of Shambles No. 10. Of Malays<sup>1</sup>, James Ewart, a visitor to the Cape, noted that they '[...] form no

<sup>1</sup> According to a contemporary, John Mayson defined the term "Malay" as being applied locally "to all *Mahometans*. These include Arabs, Mozambique prize-negroes, Hottentots, and Christian perverts, - too many of the last named pressed by poverty, and allured by Mahometan benevolence, having been induced to join a community where they might secure aid and sympathy" (Mayson 1861: 15). Originally Malays were members of a group of peoples from the Malay Peninsula and the Malay Archipelago (Collins Dictionary 1981: 508), primarily those brought to the Cape by the VOC from Java and Ceylon (Mayson 1861). Later by the 19th century few of these Malays were of pure Javanese extraction. Many were of Malay-Dutch descent - the immediate offspring of female slaves and their Dutch masters (Mayson 1861: 13). While I.D. du Plessis (1944: 1) defined 'The Cape Malay group' as consisting "[...] of many racial elements: Javanese, Arabs, Indians, Ceylonese, Chinese and Europeans have mixed with [...] coloured (and to a lesser extent [blacks]) to produce the community they form today [...]. A mixed community, constantly reinforced by various elements, linked by one bond - religion [Islam]". More recently, the Oxford English Dictionary

inconsiderable part of the population of Cape Town. [...] They are a very ingenious people and are the only artificers in the place. A great many of them keep shops in which they sell salt fish, poultry, fruit and vegetables [...] (Ewart 1970: 27-28). Whether James Ewart's phraseology 'keep shop' implies that Malays owned their own shops or worked as employees is not clear.

Although there may have been a degree of 'openness', Shirley Judges (1977) suggests that this may have been 'narrower'. Even though far fewer slave shop keepers were recorded, slaves were used as shop assistants and hawkers. The old colonial laws had forbidden slaves to have their own shops, but in 1827 an owner applied for a retail license for a slave and it was established that if the license was taken out in the owner's name a slave could keep shop. It seems, however, that very few ex-slaves did become retailers, as only two are listed in the "Free Blacks, etc." section of the 1836 Street Directory (Judges 1977: 43). However one has to acknowledge that the earlier 'Street Directories' were biased towards those individuals of property (see April 1993, Bank n.d.). Although the Street Directory of 1830 only listed 164 retail shops, of which there were 25 bakers, 7 butchers, 10 tallow chandlers and 17 fruiterers (Judges 1977: table 2), this only recognized the businesses that were licensed with the local government, and not those that thrived outside recognized circles, or those that were illegal. The distinction of who owned what, where and how, may be directly related to the price of establishing a "business". Judges (1977: 7-8) has noted that among retailers, participation by coloured<sup>2</sup> people seems much greater in the sort of business where the cost of stock and equipment was relatively low, such as a 'retail shop' or a 'fruiterer'. In contrast, butchers were obliged to rent part of the town shambles in which to slaughter animals whatever the premises from which they used to sell their meat. Similarly whereas a license to sell fruit and vegetables cost 7s.6d. in 1830, a baker's license cost £3.15s.0d. - ten times as much (Judges 1977: 7-8; see Elks 1988: 33). In addition, there was the additional expense of leasing or building one's own premises, as Thomas MacLear noted early in the 1830s:

"The expense of erecting any building here is enormous, excepting among Dutch farmers - who employ their slaves and purchase timber and lime. Each farmer has among his slaves a butcher, baker, shoemaker, stonemason, carpenter, etc., and is thus independent of regular tradesmen" (Meltzer 1994: 193).

Prosperous farmer's and townsmen's households were therefore equipped with a multipurpose labour force to provide them with a miscellany of commodities and a means to satisfy diverse service needs, requiring little necessity for artisanal help in the market place and were in a sense a self-contained closed economy.

Despite slaves being involved in the conventional sphere of the service sector, such as the retail trade, they nevertheless formed a significant portion of these involved in the domestic sphere. Most owners of property owned at least a few slaves and can be seen in contemporary painting(s). One can be

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(1989: 257) defines the term 'Malay': "[...as] that section of the local Muslim community in which the descendants of Malay slaves and political exiles are to be found".

<sup>2</sup> A term used to describe people of mixed descent - often resulting from miscegenation between (ex-)slaves and their masters, or bastard children born to female (ex-)slaves.

seen at the Stellenbosch Museum, Grosvenor House. This oil painting (c. 1760) depicts Captain Hendrik Peter Storm together with his wife, son and daughter and their attendant slaves (Gordon-Brown 1975: 104) in the background.

Domestic slaves in the South African port city seemingly enjoyed a far greater degree of social space and freedom from owner surveillance than their Brazilian or Southern American plantation counterparts (Bank 1991b: 28). Cape Town was a social melting pot. Samuel Hudson noted this at the Cape. He stated that: "The peculiarity of slavery in Cape Town derived, in the first instance, from the very nature of city life" (McKenzie 1993: 54), especially those male and female slaves that formed part of the urban underclass.

Domestic service, washing and sewing were a few of the possibilities available to women working in Cape Town's informal sector in the early 19th century (see Bank 1991b; Erlank 1993; Iliffe 1987; Judges 1977; Murray 1966), with even fewer opportunities in the 'formal sector' (see Bradlow 1987). They also worked as milliners, cooks, nursemaids (Mayson 1861) and wetnurses (Schoeman 1988) and were involved in other industries as well. Judges (1977: 23) noted that J.H. Lesar was employing over one hundred people, mostly the wives and children of poor fishermen, in his fish curing business, which remained an increasingly important economic activity in the Waterfront area until refrigeration took over. The involvement of women in the fishing industry has led Vivien Bickford-Smith and Elizabeth Van Heyningen (1994: 17) to state that:

"In the fish market women cleaned, gutted and dried the fish for sale. They lived in narrow, overcrowded lanes like Sea Street, but they had a strong sense of a common identity. Apart from their fishing skills, many were related to one another. Most were ex-slaves or descendants who practiced Islam, spoke Afrikaans [...]"

Some women were even more enterprising and were involved in a number of small-scale industries to supplement their earnings or support their family. Christina Kriel who in 1825 lived at 15 Riebeeck Street, transecting Sea Street, is just such a case. Her late husband, a Free Black, had taken on the name Visser (see Bank n.d.), and probably fished in Table Bay. In addition, claims in favour of her estate included individuals who owed her money for renting out rooms. Lastly her estate also included items associated with a small-scale retail home industry (see Malan 1993: 114-115). Christina Kriel therefore eked out a livelihood through continuing her husband's fishing, as well as renting out rooms to individuals and selling goods on the side.

Slaves also helped out owners running lodging or boarding houses in Cape Town (Bank 1991b). In 1810 there were 141 retail shops and 6 lodging houses (*Cape Almanac* 1810). In 1830, Judges (1977: table 2) notes 164 retail shops, of which hotels, etc. were divided among 2 hotels, 8 boarding houses, 14 lodging houses, and 5 eating houses. Andrew Bank (1991b: 28) has noted that "an appreciable proportion of house slaves worked in the city's many lodging houses, designed to cater for a large floating population". The activities of these increased with the increase in the number of ships calling at Table Bay during the British period (McKenzie 1993: 57). James Ewart (1970), a British naval visitor to the Cape early in the 19th century, similarly noted that in both Cape Town and Stellenbosch: "Many [individuals]

make a livelihood (*sic*) by keeping lodging houses for the convenience of strangers visiting the place" (Ewart 1970: 59; see Bird 1966; see also Bradlow 1987).

Two inventoried estates graphically illustrate how houses were used for 'hire'. Willem Boonsayer's estate was recorded in 1766 at 1 Klipvischsteeg. Other than owning three slaves, he hired out the house behind the main dwelling, as well as ran a retail store from his house and fished in Table Bay. Clara Maria Pietersz's inventoried estate in 1805, at the same address, showed a similar pattern. Other than owing three slaves described as fishermen, as well as a man cook, an old man and two women, she had a shop counter in one of her rooms, with another room as a 'lounge' and the remaining two rooms with at least four beds as rooms for hire (Malan 1993: 137-139). [This is the same Clara Maria Pieterse of the Cape, a Free Black, of 5 Klipvischsteeg, who is listed in the 1799 Burgerraad census. She was the second wife of Conrad Schrön of Eisenach, who had taken Barbara Vogelsang of the Cape as his first wife (Cairns 1981: 39-40).] Additional evidence is provided by the 1799 census of the Burgerraad. It includes Ward 13 which "comprised the area of the town that lay between Strand Street and the sea" (Cairns 1981: 38), including a number of the lanes and alleys near Sea Street. Of the 77 listings, 56 occupants had one or more boarders (72.7%), other than their own persons or families. Among these seven had more than 10 boarders. One family had 20 boarders, two had 17, one had 16, two had 13 and one had 12. Thus a number of the occupants in the Waterfront area supplemented their earnings by hiring out "rooms" to those who sought shelter.

Use of residences for small scale operations is also not unknown. In 1810, a Sara van Laai, possibly an ex-slave, used her premises in Riebeeck Street as a retail shop (*Cape Almanac* 1810: 89). In 1810 only one dwelling, at 14 Breede Street, is listed as providing lodgings and being a retail shop at the same time (*Cape Almanac* 1810: 79). As Antonia Malan has written: "Though there were no shops as we know them a surprising number of Cape Town houses served as retail outlets for goods obtained from the Company auctions, auctions of deceased, liquidated or confiscated estates and from legal and illegal private trade. A front room often incorporated shelves, glass-fronted cabinets and counters for merchandise alongside the normal living room furniture and storerooms were full of provisions beyond a single household's needs" (Malan 1993: 67). During the post-1815 period, these shops and stores developed into more specialized outlets (Malan 1993: 106, 111-112), with business moving away from private retail shops to more 'definite' shops after 1820 (Malan 1993: 167). This mixed residential/commercial pattern is not unfamiliar to many ports with abodes near the waterside (see Mrozowski 1991).

An important implication for historical archaeological studies in the utilization of households for dual purposes relates to consumer behaviour. Consumer behaviour directly affects what is seen in the archaeological record. In an urban environment residents participated in an urban food procurement system based primarily on the retail purchase of professionally butchered domestic meats, commercially prepared foodstuffs, and non-local imported items. Susan Henry (1987) has identified three specific factors which may affect patterns seen on the ground:

- i. Differential purchase and consumption of meat varied according to household economic status and were assisted with relative price differences among wholesale butchering meat cuts.
- ii. Differential preferences for beef, mutton, pork, chicken, and wild game varied according to economic level, as measured by observed frequencies for these meat types.
- iii. Differential preferences for beef, mutton, pork, chicken, and wild game varied according to ethnic affiliation, as measured by observed frequencies of these meat types (after Henry 1987: 19).

Whether households were acquiring food by status, cost, economic level or ethnic affiliation, their purchasing power, whether by purchase, barter, gift, home production, hunting or gathering, or theft (cf. Henry 1991: 10), may have changed according to the ability of the household to "purchase" consumer items. LeeDecker and Friedlander (1985) have made us particularly aware that the household, not socioeconomic class, is the unit through which individuals are linked to the economic processes of society as a whole, i.e. the household should be the unit of study. In addition, *the household's structure and its economic position may vary over time.* Thus, it is not a simple, direct process of assigning individual households to socioeconomic class (LeeDecker and Friedlander 1985: 6). Furthermore, the ability for the household to "purchase" is influenced by (i) its level of income; (ii) its life cycle and structure; and (iii) its income strategy (LeeDecker 1991: 33). Household income strategy refers to the activities by which income is brought into the household, *including supplementing the head of household's income by the participation of secondary wage earners in the labour market* (LeeDecker and Friedlander 1985: 5); while the life cycle describes the developmental sequence that accompanies changes in age, marital status, residential circumstances, child rearing, and participation in the labour force<sup>3</sup> (LeeDecker and Friedlander 1985: 5-6) of the household. For the Waterfront area, there is evidence for the presence of multiple wage earners, the supplementation of incomes by doing a second job and the taking in of lodgers which would have allowed households to purchase more strongly, than would have been assumed from their socioeconomic status (see footnote)<sup>4</sup>.

<sup>3</sup> At the Cape, the household life cycle and level of income would certainly have been influenced by the fact that much of the local economy was based on the fishing and craft industries (Elks 1986a; Judges 1977) which would have meant that at least some of the work would have been seasonal (see Stedman Jones 1971: 35ff; Bickford-Smith 1988: 66-67) - a direct influence on the level of participation in the labour force. For example, building work would largely have been done in summer, so that men employed in building might well have found it difficult to get work in the winter and so faced periods where their earnings were low. Men working as fishermen or boatmen in Table Bay would have been affected by bad weather and forfeited earnings if they could not take their boats out (Judges 1977). Vines were pruned in June and July. Whales were often caught from June to September. July to August were good months for catching fish in Table Bay. Sheep shearing took place between October and November. Wine and corn were brought to market from September to February (Bird 1966: 97, 115, 117, 120, 160; see Judges 1977: 18-19).

<sup>4</sup> It is known that the presence of multiple wage earners and the presence of lodgers, depending on the age, gender, and occupational status of both householders and lodgers (see LeeDecker 1985: 56) would certainly have affected the purchasing power of that household. In the Waterfront, it was common for people to supplement their incomes by doing a second job (Elks 1986a: 31; Judges 1977: 21), or for whole families, from youngest to eldest, to be employed (see Bickford-Smith and Van Heyninger 1994: 49; Judges 1977: 23). Thus households which had both lodgers and multi-wage earners or secondary occupations would have been able to purchase more strongly, than would have been assumed from their socioeconomic status. This is not inconceivable in light of the above examples of Christina Kriel, Willem Boonsayer, Clara Maria Pietersz's, and Sara van Laai, or from the 1799 Burgerraad Census of the Waterfront area, which showed that 72.7% of the listed residents had boarders (Cairns 1981).

Part of the associated shift from slave to wage labour, was both a change in attitude or consciousness, largely influenced by the unique urban context and the degree of freedom slaves were allowed<sup>5</sup>. One could argue that slavery had already broken down at the Cape, as slaves, through being hired out, were already assimilated into a wage labour economy and not a feudal system. This has led Andrew Bank (1991a: 59) to describe them as a 'proletariat in formation'. The urban context contributed to the fact that the lines which demarcated slave and free labour became increasingly blurred (see Judges 1977: 140). Equally due to changing urban practices and the growing economic flexibility of the urban labour market, "paternalism as a potential mechanism of 'hegemonic' control was severely undercut" (see Bank 1994: 87). Furthermore, due to various external pressures (Meltzer 1989), slavery was gradually seen as in conflict with the ideology of industrial capitalism (Freund 1989; Iannini 1993). In addition, there were growing fears about slavery at the Cape (see Bank 1991a; Bickford-Smith 1981; Elks 1986a; 1986b; 1988; Hallett 1979; Himmelfarb 1985; Iannini 1993; Ross 1986; Shell 1986; Stedman Jones 1971; Warren 1986; Wurst 1991) and thus resulted in various attempts to control the workforce (see Boddington 1984; Cole 1852; Elks 1986a; 1988; Elphick and Giliomee 1989; Freund 1989; Himmelfarb 1984; Iliffe 1987; and Judges 1977) and concerns about their social behaviour<sup>6</sup>. However, the change over also signified the introduction of the wage labourer into the harsh world of capitalism, with his/her subjugation to the owner of the means of production rather than the slave owner.

Lalou Meltzer has demonstrated that in Cape Town the ending of slavery failed to disrupt the city's economy but rather provided the impetus for a minor economic boom, through the arrival of compensation payments. Although the significance of this money should not be overemphasized, it certainly was significant in structuring the future layout of Cape Town's metropolitan area, where people lived and who the owners of the means of production were. The boom in property in the poor areas of Cape Town in this period, is evident in the new presence of wage earners and artisans, as well as the growth in the number of brickfields in Cape Town (Meltzer 1994: 187).

The arrival of new money also provided additional means for generating wealth by the commercial bourgeoisie and well-established merchants (see Meltzer 1989; Warren 1986; 1988; 1991) and allowed some of them to acquire much property in the poorer areas of Cape Town, and resulted in further expansion and subdivision of the city during 1838 and early 1839 (Meltzer 1994: 186). The Sea Street houses may well have been built at this time.

In 1840 the Cape Town municipality was formally established with many of its commissioners already extensive landowners of urban property, particularly in the poorer areas of Cape Town. Warren

<sup>5</sup>. Bank (1991b: 113) has argued that within the freer urban context, the religious seeds of the underclass fell on more fertile landscape, and further facilitated the breakdown of control of the dominant classes.

<sup>6</sup> Although there was great concern about the affects of alcohol (see Bank 1991a; 1991b; CCP 2/2/2/12; Cole 1852; Elks 1988; Iliffe 1987; Immelmann 1970: 18; Jones 1978: 97, plates 88 and 89; Van Heyningen 1991; Warren 1988), taverns were nevertheless focal points where people congregated for various reasons, not only drinking (see Rothschild 1987; 1990). Harrison describes English drinking houses as "embryo labour exchanges" (in Judges 1977: 104-106), and it is possible that for Cape Town's unskilled casual labourers, too, the local drinking house was a place where jobs might be heard of. Interestingly, taverns were concentrated towards the town perimeters (Elks 1986a) including near Sea Street. The 'Ship Tavern and the Globe Inn' depicted by George Duff in Dock Road must have been such an example near the Fish Market and Sea Street (*South African Library*, PHA: CT: Dock Road).

recounts that by the second quarter of the 19th century a number of the municipal commissioners had become landlords of rows of cheap houses in the densely populated 'steegs' and streets of Cape Town (see Warren 1986: 232-234, appendices F, G, and H). Even one of the Special Wardmasters was slum land-lord (Judges 1977: 72; see Warren 1986; 1988).

The Waterfront, Constitution Hill and Lion's Rump, were three particular areas dominated by such men. A study of street maps of Cape Town of the first three decades of the 19th century shows the spatial boundaries of the city had expanded but slightly (Bank 1991: 9). However, between 1824 and 1854, the city expanded by roughly 30% (see Elks 1986a for an in-depth discussion). Sea Street is noted as a block in the 1818 Renvooy map by T.E. Elemans, the 1825 map by Drège (*South African Library*, KCB: CT.) and the February 1827 map by George Thompson (*South African Library*, KCB: CT.), but not in the 1804 street plan of Cape Town (*Cape Town Archives* MI 1/6). It is only in the 1825 Drège map that Sea Street is noted by name. By the early 1840s, the Sea Street area and the area between Buitengracht and the Lion's Rump, were the most heavily populated areas of the town, with about 12% of the total population resident in Cape Town (see Elks 1986a: table 2).

Although we know what the demographic profile of Cape Town was, we still need to establish the occupational and residential make-up of the Waterfront area. The earliest street directories are somewhat problematical. The first street directory that provides the surname, first name(s), occupation, street and house number is the 1810 *Cape Almanac*. However, it has a number of flaws, as only 30.5% of the 108 listings in the Waterfront area have occupations next to the surnames of the occupants. Bank (n.d.) and Warren (1986), however, do provide data for the Waterkant area just prior to the construction of the Sea Street houses. Table 1.2 provides information per occupational category for the Waterkant area.

Table 1.2: Occupation and Residence in Cape Town for 1830.

Occupation:	Area 1: Waterkant: 1830
1	7
2	-
3	5
4	-
5	-
6	36
7	28
8	60
<b>Totals</b>	<b>136</b>

(Bank n.d.: 9-10; Warren 1986: 242, appendix a).

**Key:**

1. Minor Civil Servants and Semi-Professionals.

Clerks, messengers, bookkeepers, police officers, overseers, translators, sextons, storekeepers, midwives, Malay teachers.

2. Senior Civil Servants.

Magistrates, judges, superintendents, justices of the peace, Attorney-General, etc.

3. Professionals.

Doctors, surgeons, attorneys, solicitors, notaries, clergy, missionaries, printers, accountants, teachers, apothecaries, dentists.

4. Mercantile Elite.

Wholesale merchants (import-export trade), shipping agents and shipping houses, wool merchants.

5. Commercial Class.

Wine merchants (local trade), general agents, corn chandlers, auctioneers, brokers, conveyancers, distillers, bankers.

6. Tradesmen and Shopkeepers.

Retailers (general dealers), jewellers, coppersmiths, butchers, bakers, tobacconists, haberdashers, hatters, grocers, innkeepers and publicans.

7. Artisans and Craftsmen.

Tailors, dyers, coopers, dressmakers, shoemakers, carpenters, saddlers, wagon-makers, bricklayers, plumbers, blacksmiths, shipwrights.

8. Domestics and Labourers.

Laundress, coachmen, gardener, groom, 'coolie', pastry cook, boatman, fisherman, sawyer, painter, thatcher, pedlar, mason (Warren 1986: 242, appendix a).

Of note is that the majority of inhabitants are made-up of "Domestics and Labourers", with a smaller equal fraction being made up of "Tradesmen and Shopkeepers" and "Artisans and Craftsmen". This is not contrary to the understanding that a large portion of Cape Town's population was involved in the service sector, and that Area 1, in which Sea Street is found, was populated by ex-slaves, Free Blacks, hire slaves and various other occupational people, but that excluded senior civil servants, and members of the mercantile elite or commercial class.

Although houses in the Waterfront area may have been owned or occupied by slaves or Free Blacks, such as Sara van den Kaap and November (Cairns 1981), individuals of mixed parentage and newly arrived visitors from overseas also lived there. Although more well-to-do people lived in Strand Street, such as Johannes Gysbertus van Reenen and Andries Horak among others, other individuals such as Johannes Fredrik Pönsch, a cooper from Eisenach, lived at 4 Klipvischsteeg, with Christiaan August Bosenberg, a surgeon from Nordhausen, living at 32 Waterkant Street (Cairns 1981). In addition, members of mixed parentage, as well as those who took on (ex-)slave wives, also lived in this ward. The following two examples show this clearly. Pieter van Wyngarden, a ship's carpenter of Amsterdam, living at 3 Mosselsteeg, took Sara Pieterse of the Cape, a freed slave, as his second wife, after his first wife, Christina Elisabeth Borstelman of Bremen, had died (Cairns 1981: 39); while Hermanus Augustus van der Schyff of 34 Waterkant Street, also a carpenter, was the son of Johannes van der Schyff and Magdalena Christina Adolphse of the Cape (Cairns 1981: 42).

Although surnames do not necessarily denote population group, some of the inhabitants of the Waterfront area had very English names. Excluding people living in Strand Street, they include names such as David Alexander, Thomas Murdock, and George Smith (*Cape Almanac* 1810). In addition, the presence of ex-slaves who had taken on Dutch surnames, as well as the surnames of ex-German and ex-Dutch citizens can also be noted in the Street Directories. Surnames include people such as Moses Arendse, Maria Susanna van Bergo, Johannes Davidse, Hendrik van Geerns, Jacob Heynke, and Remmert Munsterman (*Cape Almanac* 1810). Despite the limitations on the use of surnames, Bank (n.d.) has collected data on the ratio of "non-Europeans" to "Europeans" for a given street or lane in the Waterkant area. His data suggests that the Waterfront area was not solely made up of certain racial groups, but that it formed a very mixed neighbourhood, with a slightly larger "white" composition in the larger streets (e.g. Waterkant and Riebeeck Street), while the smaller lanes had a greater coloured composition (e.g. Visch-, Krabbe-, Lelie- or Oester-steegs) (Bank n.d.). For instance, the percentage of "non-Europeans" to "Europeans" in Visch-steeg varies little over three decades. For 1815 it is 47%, for 1835 42% and for 1840 53% (see Bank n.d.: appendix 1).

At the time of the construction of the Sea Street houses, Lalou Meltzer (1989) has noted that that area, as well as Constitution Hill and Lion's Head contained significant sections of poor housing for workers and tradesmen. She states: "The Waterfront area (Districts One and Two), embracing the portion of the town on the shore side of Strand Street, contained a substantial fishing and labouring population, and a smaller group of artisans and tradesmen .... Many of the habitations, especially in the 'rear' of Strand Street (where there was a row of 'steegs' or narrow lanes) were dirty, overcrowded 'Hire Houses', while the drains were 'filled with putrid masses of filth' and the neighbourhood stank of dying fish" (Meltzer 1989: 73; see CO 490 #159 and Appendix B; see Fransen 1993: plate 39 and 93 for views of the living conditions possibly faced; see Judges 1977; see Pama 1975; 1977). Robert Ross has provided an explanation as to why these hire houses were so overcrowded after emancipation. Not only did urban ex-slaves move into the poorer residential areas alongside their friends and kin who had been freed previously, but they were also joined by ex-slaves from the countryside who wanted to move away from their masters, making overcrowding even worse (in Meltzer 1989: 74). Fairbairn however described the overcrowded housing conditions, a result of "the capitalists<sup>7</sup> ... [having] not yet built proper houses ... [The tenants] are, therefore, apparently from necessity, crowded in dozens into cellars, back courts and cavern-like holes". The obvious remedy, he said, would be to pass a law "prohibiting the letting of such places as human habitations" (Meltzer 1989: 61-62). However, human greed and the nature of capitalism of exploiter and exploited prevented these tenants from living in less overcrowded abodes.

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<sup>7</sup>. See capitalism, which is defined as "the economic system in which the means of production and distribution are privately owned and operated for profit" (Collins Dictionary 1981: 125).

### 1.5. THE SHAMBLES, FISH MARKET AND WASTE DISPOSAL IN CAPE TOWN.

The Shambles were a series of twelve shops that were tendered out on a yearly basis to the highest bidders. They were situated with the Parade on the one side and the beach on the other (see Figures 1.1 and 1.2). The selection of those who would occupy the premises was first under the authority of the Burgher Wacht and later under the Commissioner of Police and the Cape Town Municipality. The occupants of each of the twelve shambles had to follow a number of strict regulations, so as to comply with the local ordinances (see Appendix C). Despite this they were frequently at odds with the government over facilities provided to them, increases in tender prices and license fees, restrictive regulations and harassment by Police Officers. Despite having to follow a number of regulations, the butchers nevertheless attempted to get rid of their waste products by the easiest means available - by discarding it along the beachfront.

On the dissolution of the Burgher Senate in 1827 the Superintendent of Police took over the responsibility for providing facilities for the removal of 'Dust, Ashes, Soil, and Filth' (see Elks 1986a, 1986b). It was only in 1845 that the matter was eventually settled with the appointment of a contractor to clean the streets (Elks 1986a: 45). Prior to this the public bore a measure of responsibility - 'all private Avenues, Passages, Yards and Ways' were supposed to be 'kept clean by the Proprietors or Occupiers thereof, so as not to become a public nuisance ...' and people were forbidden to 'cast any Filth, Soil, Earth, or Rubbish ...' into the streets or canals, the penalty being a fine of up to £5.0s.0d. (Judges 1977: 58), with further amendments later (see Cartwright 1978).

The Shambles, those 'receptacles of nastiness', were a particular problem (see CO 4002 #20). The butchers disposed of unwanted offal etc. by throwing it out of the back door into the sea at high tide, but when the tide dropped this refuse was washed ashore. This resulted in an accumulation of 'filth and refuse' which was 'offensive'. The problem was aggravated by the fact that 'a great deal of the refuse of the slaughter' was bought by the poor, who selected what they wanted from it and dumped the remains (Judges 1977: 59). According to a correspondent to the *Zuid Afrikaan* refuse was widespread throughout Cape Town:

"That there is not some pestilential or malignant fever in the Town, must certainly be owing to causes as yet unexplained; for the filth which pervades many parts, and the nuisances to be found in others, whether from putrid skins, or dead whales, or tanners pits and last not least, the fish market, are quite sufficient to bring on disease, or certainly to prevent it being stopped ..." (Judges 1977: 59).

Moreover, 'There is a refuse of pestilential filth at almost every door in Cape Town, and fish, dead dogs, cats, dead rats and poultry are suffered to remain and impregnate the air with their putridity' (Judges 1977: 61). The only place that refuse could legally be dumped was on the beach between the Amsterdam and Chavonnes Batteries, a long way from many parts of the town (Judges 1977: 68; see Laidler 1939: 294). The dumping of refuse on the beach led to an ironic poem entitled 'Ode to Rogge Bay' discussing the effects on eye, brain and nose (see Laidler 1939: 286)

The Shambles remained "a very serious nuisance to this Town ..."; overall, "more effectual regulations ..." were the only way to preserve "the cleanliness of the Town ..." (Judges 1977: 60). One reason identified by contemporaries for the generally filthy conditions was the lack of an adequate water

supply (Judges 1977: 63; see CO 490 #159; CO 3998 #18; CO 4000 #89 and annexed report by John Chrisholm, Department of Water Works; CO 4002 #32; CO 4004 #75/1), with requests for even individual water supply being denied (CO 3998 #18); which directly or indirectly points to the Cape Town municipality's inability to provide adequate water, as well as accusations of 'jobbery', decisions to keep taxes low, indecisiveness and unwillingness to spend funds, and petty competition within the local municipality (see Bickford-Smith 1983; see Warren 1986: 235, 1988: 49; see CO 3959 #51; CO 4002 #32; CO 4002 #31; CO 4004 #75/1). The only 'regular' supply of water was the public pumps. However, at these public pumps, people also washed "their persons', linen, scrubbed and scoured their kitchen utensils and emptied coffee grounds and tea leaves; they cleaned meat as well as fish, mason's pails and even the soil tub" (Judges 1977: 65; see CO 4002 #32).

It was a combination of unsuitable premises, overcrowding which had its roots prior to 1838, badly designed and constructed houses, bad ventilation, the general housing shortage, the cost of rent, social diseases and high child-mortality rates as a result of this (Judges 1977: 76-79, 92, 98) that presented itself to the wardmasters in 1840 (see CO 490 #159), and to the municipality again later in the century (see Bickford-Smith 1981). The shock with which the public viewed the smallpox outbreak in 1840, clearly brings to light some of the 'conservative' attitudes of British middle-class. The way they saw the situation was no different from that presented in the Select Sanitation Committee's report later in the century:

"A walk through the slums of Cape Town affords at a glance an instructive insight into the truth of the statement that one half of the world does not know how the other half lives, and a closer look into the daily life of human beings who inhabit them, cannot but make any ordinary Christian recoil with horror" (in Bickford-Smith 1981: 40).

The 1840 Special Wardmasters' report (see CO 490 #159 and Appendix B) repeatedly linked a high incidence of smallpox with the narrow, filthy lanes in which poorer people lived (Judges 1977: 86). In the area around Sea Street which encompasses parts of Ward 1 and 2, the occupational density figures given by Judges (1977: table 4) range from 105% to 225%. Overcrowding seems to have become even worse in the later 19th century and was not limited to specific areas of Cape Town (see Bickford-Smith 1981: 34).

An aspect of the general problem of uncleanliness in Cape Town in the 1830s was the prevalence of livestock in the streets. Poultry has already been mentioned but a greater nuisance were the wild dogs which roamed 'at large' throughout the town and especially in the area of the sea-shore. Pigs also tended to 'prowl about the streets ...', and so did goats. Even cattle occasionally escaped the shambles or their owners creating a direct risk of injury as well as adding to the general filth in the streets (Judges 1977: 69). A number of butchers, including G.N. Mechau, P.J. Redelingshuys, G. Brinkholt and J.H. Bam, wrote a memorial to the Secretary of Government, complaining that their livestock escaping from the shambles was due to the failure by the government to make repairs and not due to their negligence (see CO 3992 #25). A number of ordinary citizens were also fined for letting their livestock stray into the streets. J Allen, A. Rothschild and Anthony were each fined 1s. for allowing their ducks and fowls to stray in the streets. Abdol Kader was fined 6d. for allowing his fowls to stray. The Widow Bryne was

fined Is. and E. van Dyk £1 for allowing their pigs to stray; and J. Kreisz was fined 10s. twice for allowing his sheep and oxen to be driven through the streets (see *Shopkeeper's and Tradesmen's Journal*, July 14, 1848).

Although animals strayed from the shambles or from individual backyards, these areas were also the sources from which certain individuals decided to try their luck and steal food. Due to whatever unfortunate circumstances may have left some impoverished, many of them were left to their own means to survive (see Bickford-Smith's 1981; CCP 2/2/2/12; De Beer 1992: 131; Himmelfarb 1984; Iliffe 1987: 99, 101; Judges 1977: 18, 20-21, 26, 48, 52; Stedman Jones 1971; and Van Heyningen 1989; 1991: 128-143). Some help was provided by religious institutions such as the Dutch Reformed Church and later by Islam<sup>8</sup> (see Mayson 1861: 16, 24; Van Heyningen 1991: 134-135). One of the survival strategies would have been petty crime (Elks 1988), what Elks (1986a: 124) has termed 'casual criminality'. The following cases illustrate the point, with some successful and other unsuccessful attempts at stealing. Firstly, the case of Cornelius Fraay, who broke into the shambles and stole an ox hide (see CSC 1/1/1/2 #February list). David, a 'free coloured', was caught stealing three sausages from a butcher's shop. The sausages were found hidden in his hat (Elks 1986a: 122). Gardens were also fairly easy picking grounds, where fruit, vegetables and even livestock could be obtained, and the only obstacle was probably a garden wall (Elks 1986a: 121), as the case of Mrs. Dale shows, who had two of her fowls stolen by thieves (Murray 1966: 128). In another case in the late 1820s, two Cape-born slave adolescents, Damon and Jacob, were sentenced to 25 lashes and six years with hard labour for deserting and stealing meat, money and other articles from the butcher's shambles in Cape Town (Bank 1991b: 152-153).

The conditions under which food was handled and sold were another area of uncleanness. The state of the shambles has already been described - their refuse was left rotting on their own door step. Moreover the poor 'carried [on] behind the Shambles ...' - that is, in the area where refuse from the Shambles had accumulated - the pieces of meat they brought cheaply 'for the purpose of cleaning and selecting what they liked best' (Judges 1977: 69). The water for cleaning the shambles was taken, not from the public pumps, but from a nearby canal and there is evidence to suggest that the state of the canal was dubious (see CO 4002 #32; CO 4004 #75/1). Yet all butchering had to be done at the shambles and 'everybody had to send there for their meat' (Judges 1977: 69-70), even the government troops (see CO 3992 #41). What is equally interesting is that despite opposition to the shambles' existence by the general public, little was achieved. Local citizens and visitors were quick to condemn the effluvia arising from putrid animal matter from the Shambles. Despite the large uproar by citizens, the irony lies in the almost ineffectual result. Although the New Market was established to replace the Boerenplein, and livestock were to be slaughtered outside the confines of the town, livestock were nevertheless paraded through the streets and the efficiency of the New Market seems to be in doubt (see Judges 1977). On top of this the

<sup>8</sup>. Bank (1994: 91) believes that the extensive secular support systems provided by Islam helps to explain why at least one-fifth of the urban slave population, probably more, had converted to it by the early 1830s. The implications hereof would lie in that certain food items would not be expected in the faunal record, as they were considered taboo. These include pork, predatory animals and fish without scales. Similarly other food items that are consistently used by Malay people, such as rice, would not find their way into the faunal record.

Shambles still seems to be in existence in the 1880s<sup>9</sup> and was only destroyed to make space for the extension of the railway station (Cook and Oliver 1949).

The state of the fish market was also bad, but apparently it was hardly used (Judges 1977). Instead, fish was landed on the beach, 'amongst an accumulation of the most disgusting filth ...' of both livestock and fish (see Bickford-Smith and Van Heyningen 1994: 18), and sold there. The conditions by which vegetables, fruit and other produce were sold seems to have been similar. In 1834 the *Advertiser* described 'the wretched exhibition of rags and slovenliness, called the Green Market in Market-square'. In the New Market beyond the Castle conditions were particularly bad during rainy weather - the place was not properly drained and 'cramps, and rheumatism and lame sickness [held] their *carnival* there' (Judges 1977: 70).

## 1.6. CONCLUSION.

The Cape was established as a refreshment station in the mid-17th century. In the early years of settlement, the self-sufficiency of the refreshment station was dependent on the VOC's ability to barter or acquire foodstuffs from the indigenous people or through the growth of vegetables in the Company's gardens. Despite having problems in maintaining an adequate supply of fresh resources for passing ships, land was granted to the free burghers who had been in the employment of the Company, but who had petitioned for their freedom. Slowly these free burghers moved further and further away from the Castle, establishing farms and cultivating various crops in their quest for "new land". To maintain the functioning of the Cape settlement, slaves were brought into the colony from an early date. By 1806 more than half of the colony's population were made up of slaves. Slaves were involved in the service, commercial and agricultural sectors of the colony. Even prior to emancipation, they had already been assimilated into a wage labour economy through the hiring out system, with many of them involved in the artisanal and retail trade. Some worked as hawkers and fruiterers, and others as butchers or 'kept shop' at the Shambles, or worked in the Fish Market. Once emancipated these ex-slaves moved in with their kin, workmates, friends, and Free Blacks who had been living in the poorer areas of Cape Town, including the Waterfront area where Sea Street is situated. Living next to them were also many European immigrants who were similarly involved in the artisanal or retail trade, or as domestics or general labourers. It is from these areas in and around Sea Street that the domestic refuse, which included the left-overs of meals, were probably dumped in the Waterside area.

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<sup>9</sup>. 1882 *General Directory and Guide Book*, p.514. Saul Solomon & Co. Printers and Publishers, Cape Town.

## CHAPTER 2.

### THE SITE.

In the previous chapter, a brief overview of Sea Street was given, with particular reference to the development of the area after the first deeds were granted in 1816 and 1817 to Gerrit Hendrik Meyer and Jan Marthinus Horak respectively. Within the Sea Street block, four test trenches were systematically excavated between January and March 1990, where archaeological refuse of previous occupants were thought to be. The principal excavators were Jonathan Kaplan and Tim Hart. Their reports were written up by Martin Hall, who allocated various phases to the site based on its stratigraphy. The final site report was prepared by the Archaeology Contracts Office and completed in 1991 (Hall 1991).

Figure 2.1 shows the layout of the block. Each of the houses were designated a shortened name after a particular occupant who lived on the site. The four houses were abbreviated to ADA, JAM, MAN, and PRI. House ADA at 25 Sea Street, was named after Jacob Adams, a cook who lived as a tenant of the property in 1848. The house at 8 Sea Street (JAM), was named after James, a boatman, who is listed in the 1848 Street Directory. The yard as part of excavation MAN, was named after Abdol Manan, who is similarly listed in the same directory as a tenant fisherman. The backyard of 25 Sea Street (PRI) was named after a fisherman, Prins, who had rented the property.

The stratigraphy of each of the four houses is shown in Figures 2.2 to 2.5. In the original excavation four distinct phases were identified. Phase 1 consisted of the oldest material on the site, while Phase 4 consisted of the most recent material. The summary below is based on information contained in the original site report prepared by the Archaeology Contracts Office in 1991 (Hall 1991), and a follow-up paper by Hall *et al.* (in prep.) on the four Sea Street houses.

- Phase 1 :        Stratigraphically this phase constitutes the oldest deposit in each of the four backyards. However, in all cases, the material which is part of Phase 1 does not constitute domestic refuse, or archaeological material, but rather the foundations on which the deposit built up. In all cases Phase 1 is made up of beach sand, with a degree of water-worn shell and stone in the deposit and has been suggested to be part of the beach/dune cordon of Table Bay. The artefacts that have been found are considered to have intruded from the upper deposits.
- Phase 2 :        Overlying the sandy deposit, there are a number of layers rich in artefactual material. The density of artefacts varies from one house lot to the next. The percentage of ceramic material in Phase 2 is dominated by oriental porcelain. Towards the base of this phase a degree of sandy deposit is included, becoming more gritty with depth.
- Phase 3 :        Above Phase 2, the deposits similarly contain a high degree of cultural material. The deposit is usually of an orangey brown colour with a degree of clay in it. Both Phases 2

Figure 2.1: Layout of the Sea Street block (Hall 1991: figure 4).

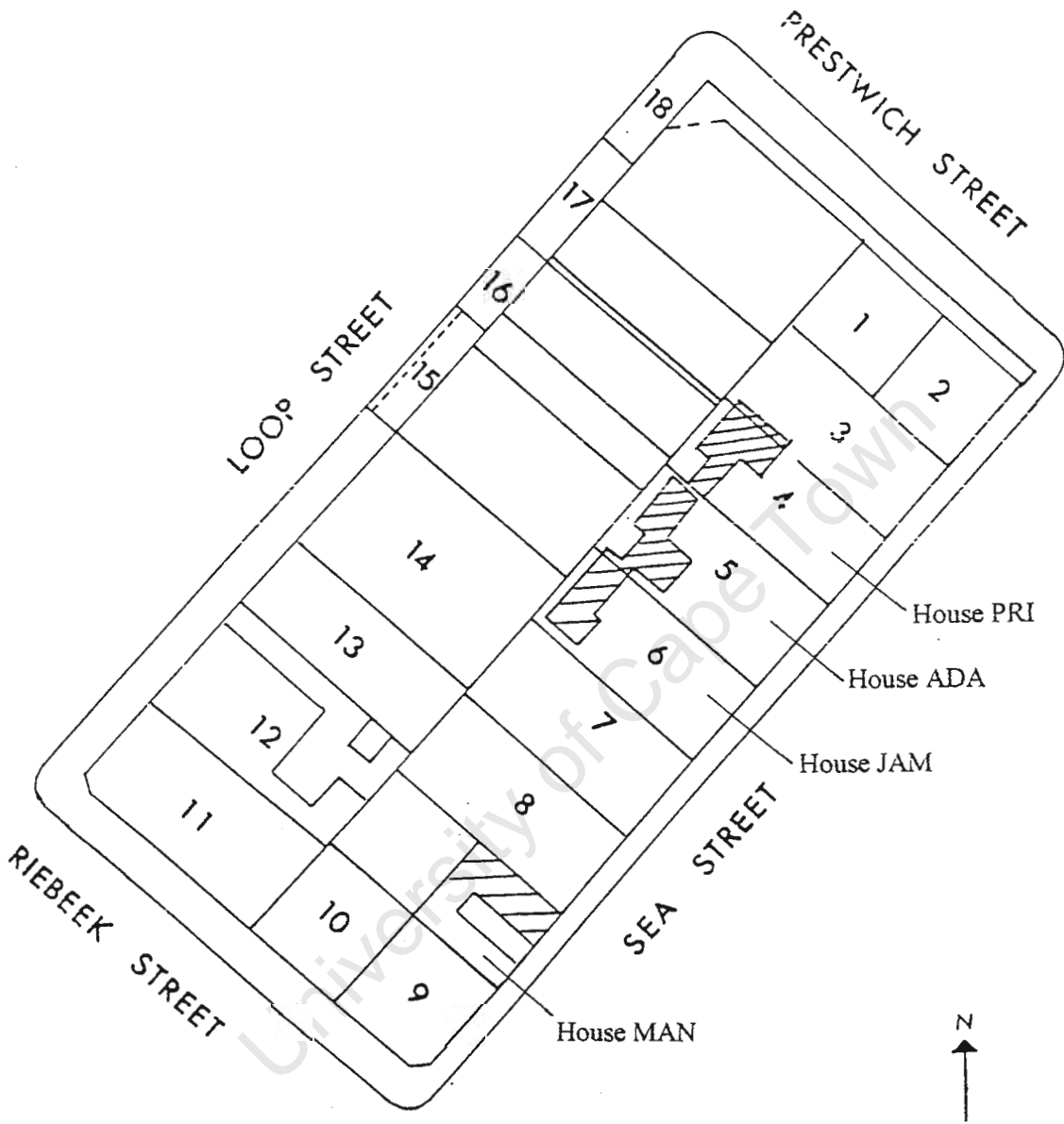


Figure 2.2: Detailed Stratigraphy of House ADA (Hall 1991: figure 6).

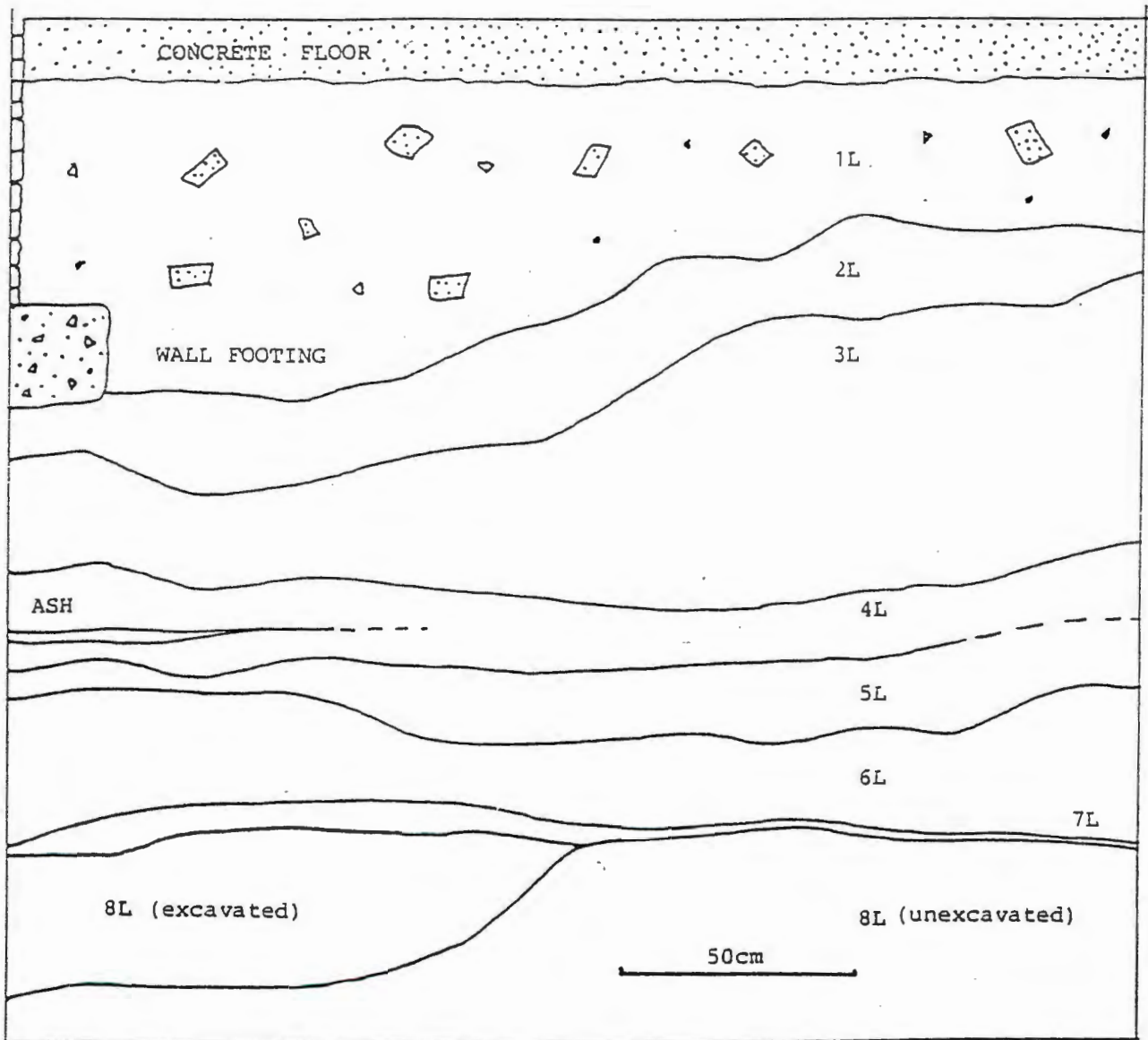


Figure 2.3: Detailed Stratigraphy of House JAM (Hall 1991: figure 7).

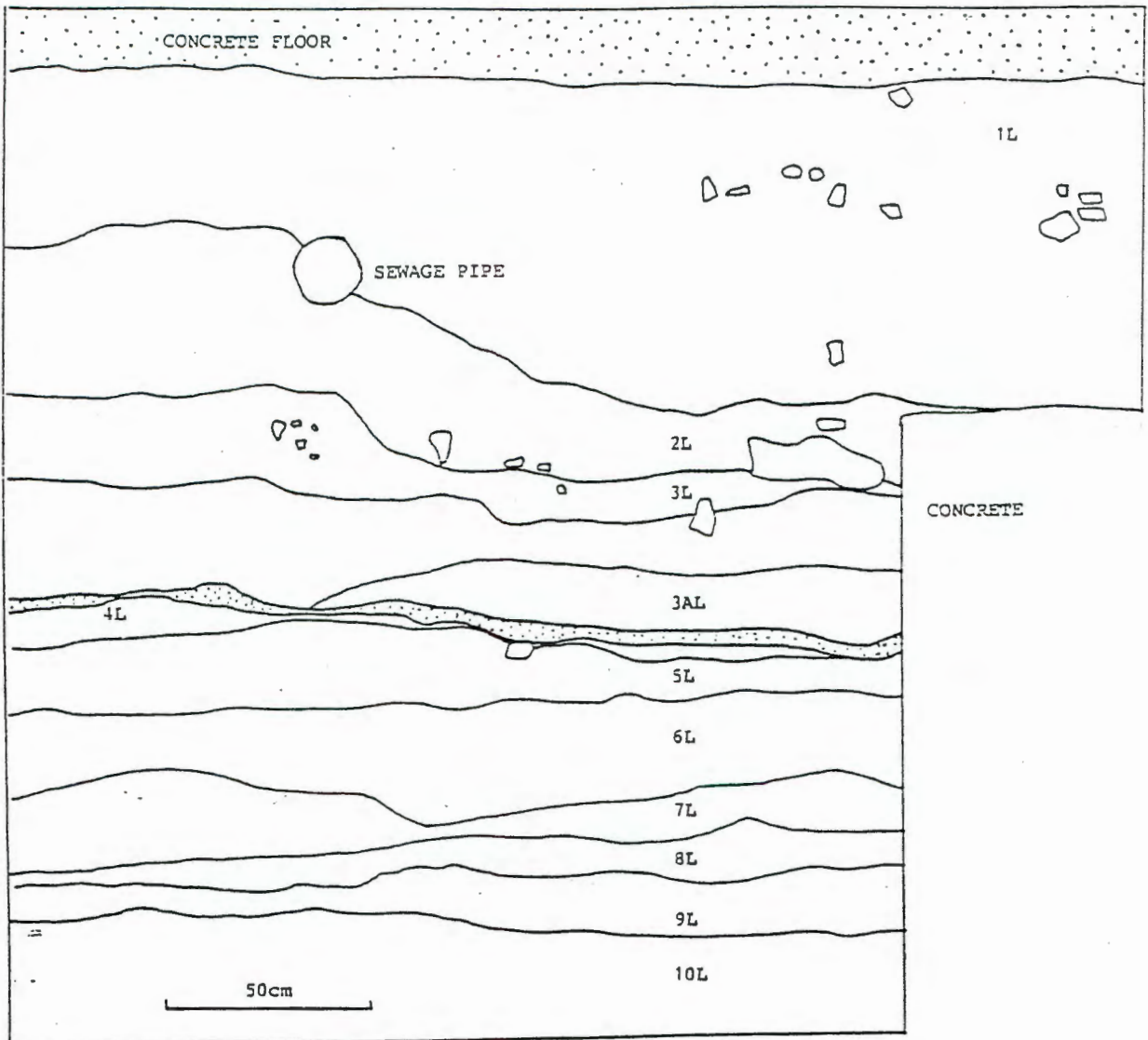


Figure 2.4: Detailed Stratigraphy of House MAN (Hall 1991: figure 8).

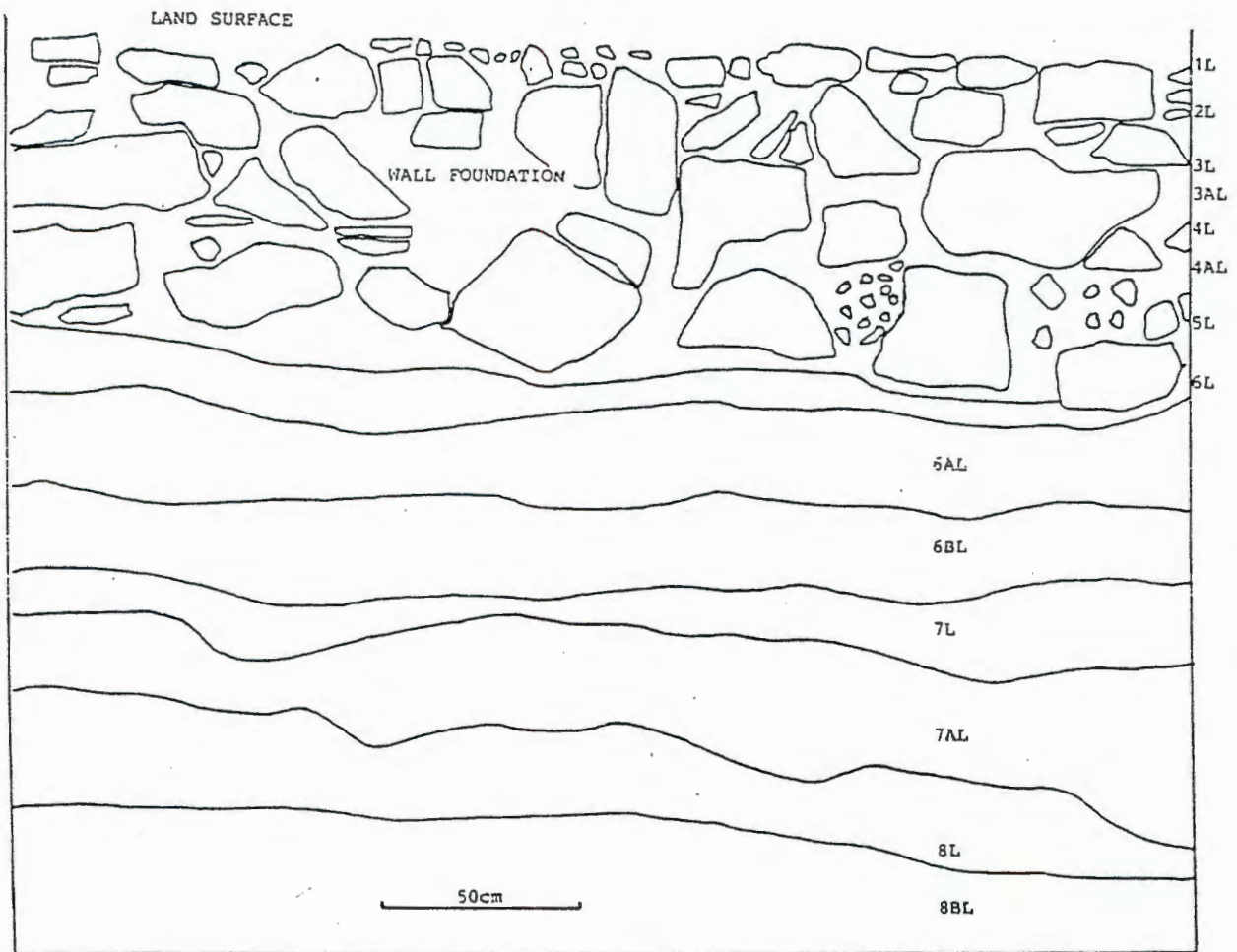
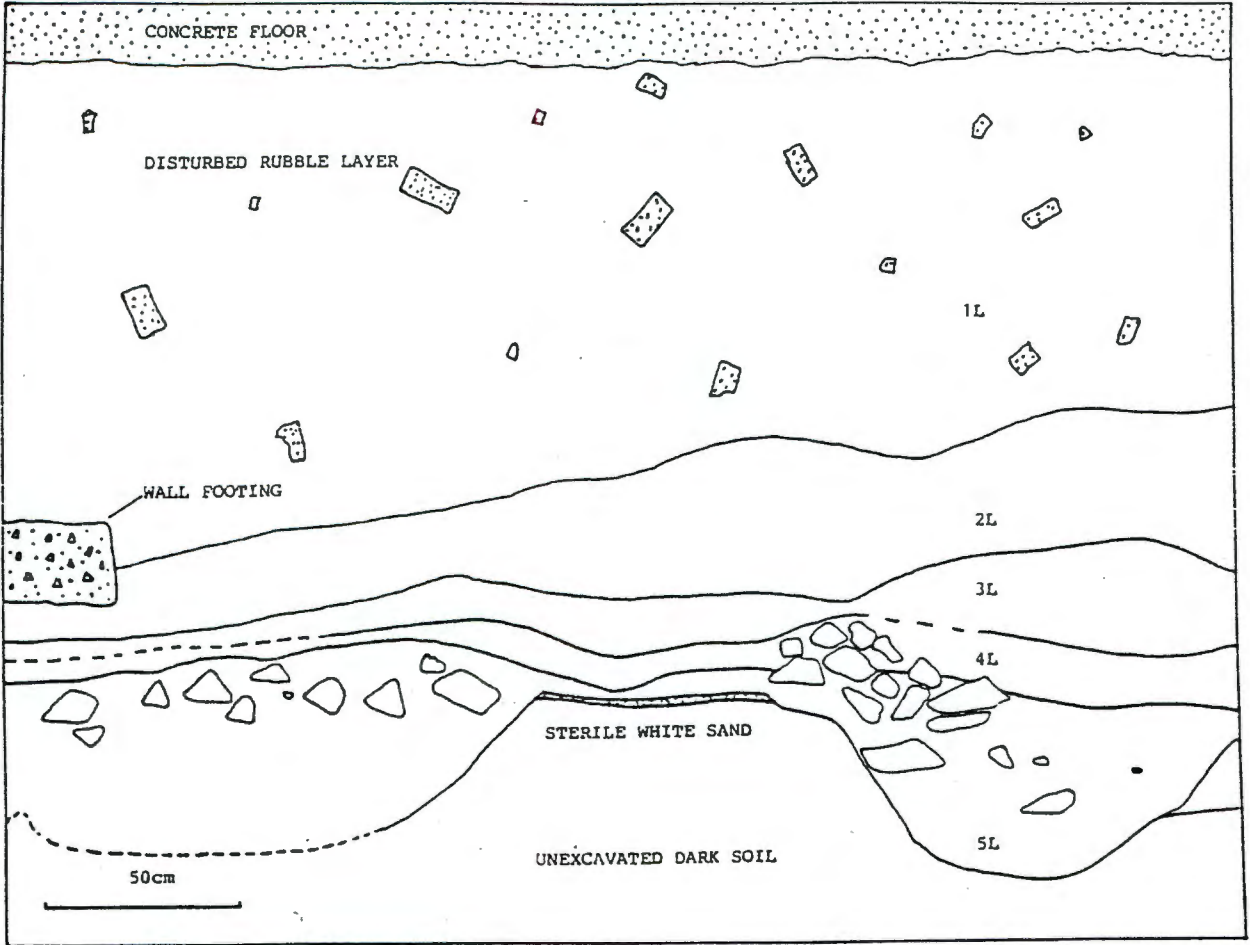


Figure 2.5: Detailed Stratigraphy of House PRI (Hall 1991: figure 5).



and 3 have ash/charcoal lenses associated with them, either relating to fire waste (see Lyman 1982: 350), kitchen hearths being regularly cleaned out, or domestic refuse that had been removed from a particular trash pit and was dumped elsewhere. One should remember that both the Castle moat and the town *grachts* were used as local dumping grounds, as people were generally not willing to go outside the boundaries of the town to dump their refuse. These forms of activity resulted in thin layers of grey/black interspersing the dominating brownish matrix. In contrast to Phase 2, Phase 3 the ceramic assemblages are dominated by refined earthenwares and not oriental porcelains.

Phase 4 : This phase across all the houses constitutes the most recent activity. In all cases, it consists to a greater or lesser degree of disturbance at the site; either relating to a building phase in the past with building rubble, the installation of a sewage pipe, the building of a wall footing, or the recent use of MAN as a temporary parking lot.

The following table shows the relationship of each of the layers to one another and to the phases across the four excavated backyards.

Table 2.1: Sea Street excavated units/layers divided up per house and per phase.

	ADA Layers	JAM Layers	MAN Layers	PRI Layers
<i>Phase 4</i>	1	1	1	1
	2		2	
<i>Phase 3</i>		2		2
	3	3	3	3
		3a	3a	
	4	4	4	
			4a	
	5	5	5	
<i>Phase 2</i>				4
				4/5
				5
	6	6	6	
			6a	
			6b	
	7	7	7	
			7a	
	8	8		
		9		
<i>Phase 1</i>			8	
			8b	
		10		

On the basis of the stratigraphy, for this study it was decided to exclude any faunal material from Phase 1 and Phase 4, and to concentrate on Phases 2 and 3. This decision was influenced by concern about sample size and the original site interpretation. The original faunal analysis (Amann n.d.) showed that of all the wild and domestic species found at the site, sheep (*Ovis aries*) constituted the bulk of the material and enough material to establish a viable representative sample.

The selection of the units used in the analysis was also influenced by the amount of faunal material that had been recovered from each of the four houses (ADA, JAM, MAN and PRI) (see sample size discussion in Chapter 3). Although no bucket count was kept during the excavations, an estimation of each of the backyards excavated was gained from the section drawings for each of the houses. ADA =  $\pm 5.13\text{m}^2$  of deposit, JAM =  $\pm 5.93\text{m}^2$ , MAN =  $\pm 6.53\text{m}^2$  and PRI =  $\pm 7.31\text{m}^2$ . Despite the greater size of the PRI deposit, according to the original preliminary faunal report it provided the smallest MNI total for any of the houses (see Table 2.5). For that reason and because of the dearth of sheep (*Ovis aries*) faunal remains from that house, PRI was excluded from any form of analysis. Similarly, as ADA provided the second smallest total MNI count of sheep for any of the houses, and as it constituted the smallest excavated deposit relatively speaking to the other houses, it was also excluded from any form of analysis (see Table 2.2). Both houses JAM and MAN had similar sized MNI counts for sheep, namely 106 and 107 respectively, with house MAN nevertheless providing a 50 per cent greater quantity of faunal material as expressed in MNI figures (see Table 2.3 and 2.4). Phases 1 and 4 were considered of little archaeological importance and interpretation, as they relate, respectively, to the beach sand as part of the original shoreline and a disturbed upper layer whose integrity has been compromised for various reasons. For these reasons, a selection of units from Phases 2 and 3 from House JAM and MAN was made.

It was decided in discussions with Liora Horwitz of the Jerusalem State Museum (*pers. comm.*) that NISP samples greater than 200 would be required for comparative analysis, and that samples between phases should be of comparative size to overcome problems of sample size influencing observable patterns. As no NISP lists were available from the original preliminary report, the selection of the units was based on three criteria: (i) the MNI totals for *Ovis aries* for each of the units; (ii) the exact positioning of the units within their respective phases; and (iii) the positioning of units in relation to others within a particular phase where NISP counts were considered too small. On the basis of these criteria the following seven units were selected for analysis: JAM 4L (Phase 3); JAM 7L and JAM 8L (Phase 2); MAN 3AL, MAN 4L and MAN 4AL (Phase 3); and MAN 7L (Phase 2). None of these units happened to fall on an interface between two phases; and in the case where two or more units were selected for analysis because of small sample size, those chosen were either above or below the other - allowing for the units to be combined if necessary. In all the units, except JAM 4L, all the diagnostic faunal material was analyzed at the 100 per cent level. In the case of JAM 4L, the sample size for this layer exceeded the total sample size of *Ovis aries* for either House ADA or PRI based on MNI counts. Therefore, approximately a 50 per cent sample was taken, where three randomly selected boxes were chosen for analysis. The resulting NISP counts for all the units were:

Table 2.2: Preliminary unpublished faunal list expressed in MNI for the various layers at House ADA (Amann n.d.: table 3).

HOUSE ADA	1L	3L	4L	5L	6L	TOTAL
<i>Ovis aries</i>	1	6	4	13	8	32
<i>Bos taurus</i>	1	2	2	1	1	7
<i>Sus scrofa</i>				1		1
<i>Raphicerus campestris</i>	1	1	1	1		4
<i>Homo sapiens</i>					1	1
<i>Equus caballus</i>						0
<i>Lepus capensis</i>						0
<i>Procavia capensis</i>						0
<i>Herpestes sp.</i>						0
<i>Felis domesticus</i>				1		1
<i>Canis familiaris</i>	1					1
Small carnivore indet.	1			1		2
Small mammal indet.				1		1
Medium mammal indet.		1				1
Microfauna indet.				1		1
Cetacean						0
Crab					2	2
<i>Chersina angulata</i>		1		5	1	7
<i>Jasus lalandii</i>					3	3
<i>Diomedea sp.</i>		1		1		2
<i>Phalacrocorax capensis</i>		2	1	2		5
<i>Spheniscus demersus</i>						0
Anatidae	1		1	1		3
<i>Meleagris gallopovo</i>						0
<i>Gallus gallus</i>	1	2	2	2		7
<b>TOTAL</b>	<b>7</b>	<b>16</b>	<b>11</b>	<b>31</b>	<b>16</b>	<b>81</b>

Table 2.3: Preliminary unpublished faunal list expressed in MNI for the various layers at House JAM (Amann n.d.: table 2).

HOUSE JAM	1L	2L	3L	4L	5L	6L	7L	8L	9L	10L	TOTAL
<i>Ovis aries</i>	9	6	8	38	6	9	10	15	3	2	106
<i>Bos taurus</i>	1	1	1	2	2	2	1	2	1		13
<i>Sus scrofa</i>	1		1		1		1	1			5
<i>Raphicerus campestris</i>		1		3	1	2	2	1			10
<i>Homo sapiens</i>											0
<i>Equus caballus</i>											0
<i>Lepus capensis</i>				2							2
<i>Procavia capensis</i>											0
<i>Herpestes sp.</i>								1			1
<i>Felis domesticus</i>			1		1	1					3
<i>Canis familiaris</i>	1		1		3	1				1	7
<i>Small carnivore indet.</i>								1			1
<i>Small mammal indet.</i>											0
<i>Medium mammal indet.</i>							1				1
<i>Microfauna indet.</i>		5		2							7
Cetacean											0
Crab								1	1		2
<i>Chersina angulata</i>	1	1		2			1	1			6
<i>Jasus lalandii</i>							1	5	2		8
<i>Diomedea sp.</i>											0
<i>Phalacrocorax capensis</i>	1			1				1			3
<i>Spheniscus demersus</i>	1			2				2			5
Anatidae											0
<i>Meleagris gallopavo</i>	1	2		3			1	1	1	1	10
<i>Gallus gallus</i>											0
<b>TOTAL</b>	<b>16</b>	<b>16</b>	<b>12</b>	<b>55</b>	<b>14</b>	<b>15</b>	<b>18</b>	<b>32</b>	<b>8</b>	<b>4</b>	<b>180</b>

Table 2.4: Preliminary unpublished faunal list expressed in MNI for the various layers at House MAN (Amann n.d.: table 1).

HOUSE MAN	1L	2L	3L	4L	4AL	5L	6L	6AL	6BL	6B	7L	7AL	8L	8BL	TOTAL
<i>Ovis aries</i>	8	3	4	4	10	4	5	6	14	7	10	8	10	2	100
<i>Bos taurus</i>	1	1	3	1	2	1	2	2	2	1	2	2	2		23
<i>Sus scrofa</i>	1	1	1	1			1			1	1	1	1		10
<i>Raphicerus campestris</i>	1	1	1	1			1	1	1	1	2	1	1		13
<i>Homo sapiens</i>															0
<i>Equus caballus</i>													1		1
<i>Lepus capensis</i>						1									1
<i>Procapra capensis</i>		1													1
<i>Herpestes sp.</i>															0
<i>Felis domesticus</i>			1	1							1	1			4
<i>Canis familiaris</i>		1	1						1						3
<i>Small carnivore indet.</i>	1				1				1	1	1		1		6
<i>Small mammal indet.</i>			1								1				2
<i>Medium mammal indet.</i>															0
<i>Microfauna indet.</i>	5				2	2	1	1	1		1		3		16
<i>Cetacean</i>															0
<i>Crab</i>	1					2	3	2	1	3		2	7		21
<i>Chersina angulata</i>	1		1	1				1	1		1	2	2		10
<i>Jasus lalandii</i>			2	1	2	1	2			1		2	3		14
<i>Diomedea sp.</i>	1		2												3
<i>Phalacrocorax capensis</i>			2	1	1										6
<i>Spheniscus demersus</i>															1
<i>Anatidae</i>			3	1	1	2	1	1	3	1		1	1		15
<i>Meleagris gallopavo</i>			1										1		2
<i>Gallus gallus</i>	3		2	1	2	1	2	2	7	2	2	1	4		31
<b>TOTAL</b>	<b>24</b>	<b>7</b>	<b>24</b>	<b>13</b>	<b>18</b>	<b>15</b>	<b>16</b>	<b>17</b>	<b>33</b>	<b>18</b>	<b>22</b>	<b>21</b>	<b>37</b>	<b>2</b>	<b>285</b>

Table 2.5: Preliminary unpublished faunal list expressed in MNI for the various layers at House PRI (Amann n.d.: table 4).

HOUSE PRI	2L	3L	4/5L	5L	TOTAL
<i>Ovis aries</i>	6	8	2	11	27
<i>Bos taurus</i>	1	2	1	2	6
<i>Sus scrofa</i>	1	1		1	3
<i>Raphicerus campestris</i>	1	1	1	3	6
<i>Homo sapiens</i>					0
<i>Equus caballus</i>					0
<i>Lepus capensis</i>				3	3
<i>Procavia capensis</i>					0
<i>Herpestes sp.</i>				1	1
<i>Felis domesticus</i>		1		1	2
<i>Canis familiaris</i>					0
<i>Small carnivore indet.</i>	1	1	1	2	5
<i>Small mammal indet.</i>		1	1	1	3
<i>Medium mammal indet.</i>					0
<i>Microfauna indet.</i>	1	1	2		4
<i>Cetacean</i>		1			1
<i>Crab</i>				1	1
<i>Chersina angulata</i>	2	2	1	3	8
<i>Jasus lalandii</i>					0
<i>Diomedea sp.</i>					0
<i>Phalacrocorax capensis</i>		2			2
<i>Spheniscus demersus</i>					0
<i>Anatidae</i>				1	1
<i>Meleagris gallopovo</i>					0
<i>Gallus gallus</i>	1	2	1	2	6
<b>TOTAL</b>	<b>14</b>	<b>23</b>	<b>10</b>	<b>32</b>	<b>79</b>

<i>House</i>	JAM 4L	=	708 <sup>1</sup>
	JAM 7L	=	243
	JAM 8L	=	251
<i>House</i>	MAN 3AL	=	175
	MAN 4L	=	102
	MAN 4AL	=	138
	MAN 7L	=	400

and when combined the NISP totals for the comparative phases were:

<i>House</i>	JAM Phase 3	=	708
	JAM Phase 2	=	494
<i>House</i>	MAN Phase 3	=	415
	MAN Phase 2	=	400

### The Material Culture.

Hall's (1991) original interpretation was that each of the phases reflected different temporal occupations at the site; that Phases 2 and 3 respectively reflected early 19th century and post-1830 occupation of the excavated backyards after the construction of the houses in that area. More recently, multivariate analysis and Duncan groupings<sup>2</sup> of the clay tobacco pipe stem material from each of the four houses in Sea Street by Royden Yates *et al.* (*in press*) provisionally showed that the selection of the units for Phase 3 between JAM and MAN (JAM 4L, MAN 3AL, MAN 4L and MAN 4AL) are not significantly different; similarly with the pipe stem material for Phase 2 between the two houses (JAM 7L, JAM 8L and MAN 7L). The same study by Yates *et al.* (*in press*) also confirmed the amalgamation of the various units into their respective phases, with the material from both houses for Phase 3 being significantly different from that of Phase 2.

<sup>1</sup> These NISP values are only of skeletal elements or segments which could be diagnosed on some particular attribute, and includes no adiagnostic material.

<sup>2</sup> In this chapter ANOVA, Duncan multiple range test and correspondance analysis are discussed. "Analysis of variance (AVOVA) is really a set of analytical procedures based on a comparison of two estimates of variance. One estimate comes from differences among scores within each group [...]. The second estimate comes from differences in group means and is considered a reflection of group differences [...]. If these two estimates of variance do not differ appreciably, one concludes that all of the group means comes from the same sampling distribution of means and that the slight differences among them are due to sampling error. If on the other hand, the group means differ more than expected, it is concluded that they were drawn from different sampling distribution means and the null hypothesis that they are the same is rejected" (Tabachnick and Fidell 1994: 37-38). Duncan multiple range test looks at the distribution of the plotted data and the resulting means. The similarity or dissimilarity between the resulting means of different assemblages will result in the attribution of individual letters or a combination of letters, which best describes the relationship between two samples or a series of samples (after Yates *et al.* *in press*; see also Zolman 1993: 148). While in correspondance analysis "the relationship between cases, those between variables, and those between variables and cases, may all be analysed together and represented in the same scattergram or series of scattergrams produced by plotting a pair of orthogonal axes" (Shennan 1988: 284).

The table below illustrates that the units that form part of Duncan group A are significantly different from those of group B in House JAM, and between Duncan group A and B or BC in House MAN. It is precisely from these groupings that the layers or units were chosen for analysis.

Table 2.6: Multivariate analysis of the pipe stem data from Sea Street, taken from Yates *et al.* (*in press*).

Units	mean diameter	sample size	Duncan Group	Phase
JAM 4-5	2.03	95	A	3
JAM 6-7	2.09	424	B	2
JAM 8-9	2.11	355	B	2
JAM 1-3	2.15	108	C	3/4
MAN 3-5	2.01	67	A	3
MAN 6-6b	2.05	171	B	2
MAN 7-7a	2.09	221	BC	2
MAN 8-8b	2.11	176	C	1

It is now believed that the Sea Street material predates the occupation of the houses built on the site, i.e. between the last half of the 18th century and the first quarter of the 19th century (*c.* 1760 to *c.* 1830).

As the Sea Street cultural material, which dates to between *c.* 1760 and *c.* 1830, was deposited prior to the construction on the houses on the block, it provided an excellent opportunity to explore new methods for dealing with dump site material. This can be seen in the recent re-analysis of clay tobacco pipes from Sea Street and other sites. Yates *et al.* (*in press*) attempt to establish a relative chronology of colonial sites at the Cape on the basis of the clay tobacco pipes. As clay tobacco pipes are items that underwent a high turnover rate, they provide a mechanism by which the site can be dated on a relative scale and enable one to place the site within a broader chronology on the basis of comparative material from other sites. Before discussing their conclusions, it is necessary to understand their methodology.

Yates *et al.* (*in press*), as part of their statistical analyses, made use of one way analysis of variance (ANOVA) and the Duncan multiple range test (see footnote no. 2 above) at a significance level of 95%. In addition they also used Correspondence Analysis, which allows “a multi-variate evaluation of similarities and differences between samples, giving an ability to compare assemblages simultaneously on the basis of the distribution of pipe bore sizes” (Yates *et al.* *in press*: 11, emphasis added). In all cases, significantly different samples were indicated by unique letters A, B, C, etc. Assemblages sharing the same letters are not significantly different and combinations of letters are employed where samples are attributed to more than one Duncan group (Yates *et al.* *in press*: 10). Despite their use of these statistical procedures, there are major reservations about these tests as ANOVA is a multi-sample test for equal means and the Duncan test also works with means (Zar 1984). They remind us that one of the objections

to Binford's "pipe stem formula" (see Binford 1962) was that it emphasized the mean of a sample rather than its distributional qualities, and that James Deetz has himself stressed the importance of comparing the distribution of a sample across pipe stem size categories in establishing a relative chronology for a site (Deetz 1993). Despite these reservations the statistical procedures have provided some useful results. Their results are shown in Table 2.7 below.

Table 2.7: Summary of Results for Sea Street from Yates *et al.* (*in press*).

ADA			JAM			MAN			PRI		
LAYER	DGS	DGAL	LAYER	DGS	DGAL	LAYER	DGS	DGAL	LAYER	DGS	DGAL
			1-3	C	I						
5	A	DEF	4-5	A	CD	3-5	A	C	2-3	A	DE
6-8	A	GH									
			6-8	B	FGH	6b	B	DE	4-5	B	HI
			8-10	B	GH	7-7a	BC	EFG			HERE
						8-8b	D	GH			

(Key: DGS = Duncan Groups for the Site Assemblage, DGAL = Duncan Groupings for all sites at the Cape) (data collected from Yates *et al.* *in press*: tables 2 and 3).

The assemblages from three of the four Sea Street sites are seriated in correct stratigraphic order (ADA, MAN and PRI) as the Duncan groupings are in ascending order. In the case of ADA, whilst the means do shrink with time, the Duncan test reveals that the two samples are essentially identical (see Table 2.7). The one exception to this pattern is Sea Street House JAM. In this excavation, layers 4 to 10 have pipestem bores that correspond with the stratigraphic sequence. However, the upper three layers at the site (JAM 1-3) appear to contain pipes that are substantially out of place. The second column indicates the chronology of the pipe stem bore material on the basis of the material from that site assemblage alone. On this basis SS JAM 1-3 is older than any of the other material in House JAM, and should be placed below Layers 8 to 10. The third column in Table 2.7 indicates the relative pipe stem bore chronology for all sites selected in the sample, of which Sea Street is but one. On this basis the pipe stem material from SS JAM 1-3 is even older than any of the material at the site, and fits below SS PRI 4-5. SS JAM 1-3's "out of place" is borne out in the original site report, which noted that this layer consisted of a "dark brown coloured deposit with large amounts of rubble (including bricks, rocks and stone) and sticky clay patches. This material had been badly disturbed by recent renovation, floor levelling and service laying. Two fractured sewage pipes that lay about 25 cm below the surface of Layer 1 had saturated the deposit" (Hall 1991: 36, *emphasis added*). Yates *et al.* (*in press*: 12) therefore conclude that the most likely explanation for this anomaly is that fill for use in this comparatively recent construction work was brought onto the site from elsewhere.

They nevertheless do not provide any supplementary information to support their logical conclusion. In contrast to other sites or assemblages, the presence of indigenous material would not be expected in the uppermost layers of a site. Contrary to this, the uppermost layers of SS JAM resulted in

the recovery of a number of unexpected artefacts. Four stone artefacts were recovered from Layers 1 and 2. The inclusion of a retouched piece of silcrete, and quartz and silcrete waste, may in some way be taken as evidence of a degree of inversion of the uppermost deposits. In addition, the presence of tortoise (*Chersina angulata*) fragments in Layers 1, 2 and 4, but absent in the lower layers is also revealing. The frequency of stone artefacts and ostrich eggshell fragments also drastically increased in the lower layers (cf. Hall 1991). Although the indigenous cultural material may not have been of prehistoric age, it is more readily acceptable to assume that the stone age artefacts are older and not necessarily co-eval with the later 19th century historical cultural material. If the above assumption is acceptable, then it may lend support to the interpretation that the material from SS JAM 1-3 was not only gained from elsewhere as fill material, but was also older in nature to the levels then filled in. This is in contrast to the cultural material in House MAN where no stone artefacts other than European gunflints or flint fragments were found in the upper sampled layers (MAN Layers 3a to 4a), with only one later stone age bi-polar core in Layer 5 and a single stone artefact in Layer 7 (cf. Hall 1991).

Although mention has been made of the natural stratigraphy, the choice of layers for faunal analysis and the rationale behind the grouping of certain layers, other cultural material from the site have as yet to be discussed. Let us consider the historical evidence to date.

It is known that the original land grants were given by the 'Raad der Gemeente' to Gerrit Hendrik Meyer and Jan Marthinus Horak, two influential members of Cape Town's *haute bourgeoisie*, upper middle class. Horak was the first owner of the Sea Street properties. He was the grandson of Jan Andries Horak of Hanover, who from 1750 was landdrost of Swellendam, and later a junior merchant with the VOC. Horak later married the daughter of Sir John Truter, who became Chief Justice of the Cape. Meyer was a prosperous wine merchant (Hall 1991), who profited from the flourishing period in the wine industry which lasted from 1822 to 1840 (Durden *et al.* 1992). Horak and Meyer were granted their Sea Street/Loop Street plots in 1816 and 1814 respectively: before this, the area was considered 'waste land', standing between the grid of the 18th century city and the nearby sea shore. As a member of the commercial middle class, one might have assumed that Horak would have begun building immediately, however, it seems that he kept his Sea Street land undeveloped for some twenty years. With slave emancipation in 1834, the shortage of living space in growing metropolitan Cape Town became critical. It is no surprise that he built small houses on his plots, and sold them off between 1836 and 1845 (Hall 1991: 31). Although Houses ADA, JAM and PRI were built some twenty years later, Hall (1991) provides some information to suggest that House MAN was built between 1816 and 1836. Whenever the houses were built, the dates of their estimated construction provide a rough *terminus-post-quem* for the deposit below the house foundations, which effectively sealed the deposit, except for minor disturbances by later building work in the uppermost layers in Houses PRI (Layer 1), ADA (Layers 1 and 2), JAM (Layer 1) and MAN (Layers 1 and 2), with MAN most recently being used as a parking lot.

The archaeological material pre-dating the construction of the houses on the lots given to Horak and Meyer has been interpreted as a generalized dump, from the presence of water worn pebbles and shell in the deposit. The material was made up of the household rubbish abandoned on waste land along Cape Town's original foreshore, as well as from domestic refuse from houses built in the vicinity of the Sea Street block (cf. Hall 1991: 53) and from elsewhere before the deposit was "sealed-off" by the construction of the houses between 1836 and 1845 (Hall 1991).

Despite the presence of a number of artefacts that could narrowly be dated, such as clay tobacco pipes that were only manufactured between 1750 and 1775, or a Constantia wine bottle that was manufactured after 1830 (see Graf 1992; and Hall 1991), it is difficult to tie down specific layers or phases to a certain time range. Instead some patterns are evident from the original site report (Hall 1991), which can be summarized as follows: (i) the varying percentage relationship between oriental porcelain and refined earthenware in each of the assemblages across both houses; and (ii) the wide range of dates for the ceramics, clay pipes and glass fragments. A third pattern can be identified from the site report, viz. the consistent presence of "indigenous" artefacts in the lower portions of the assemblages, including the small but consistent numbers of tortoise in the assemblages from both JAM and MAN.

#### **Ceramics: Oriental Porcelains and Refined Earthenwares.**

Let us firstly consider the relationship between the oriental porcelain and the refined earthenware. The data presented below indicates *the relative proportion of oriental porcelain to refined earthenware* for Houses JAM and MAN - the two sites analyzed in this study. The more detailed lists of ceramics for these two houses are provided in Tables 2.9 and 2.10 below. The tables show that there are greater percentages of oriental porcelains to refined earthenware pieces in the lower stratigraphic layers, while the pattern reverses itself as one moves into the upper layers. This pattern is influenced by the fact that refined earthenwares were only manufactured after a certain date and within a short period of time they gradually took over the world market. Thus even though this site is comprised of dump material, there is nevertheless a relative temporal chronology with the older material nearer the bottom of the deposit and younger material towards the top of the deposit. Based on the date range for the site, one is tempted to

Table 2.8: Relative percentages (%MNVs) of ceramics at Houses JAM and MAN.

<i>Site SEA STREET JAM</i>											
LAYER	1L	2L	3L	3aL	4L	5L	6L	7L	8L	9L	10L
<i>OP</i>	22	18	18	0	23	33	58	54	53	83	91
<i>REW</i>	66	71	68	73	65	47	25	27	27	0	0
<i>Other</i>	12	11	14	27	12	20	17	19	20	17	9
<b>TOTAL</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>
	(137)	(49)	(77)	(11)	(192)	(100)	(310)	(170)	(280)	(24)	(11)

*Site SEA STREET MAN*

LAYER	1L	2L	3L	3aL	4L	5L	6L	6aL	6bL	7L	7aL	8L	8bL
OP	36	32	22	24	35	31	22	29	37	50	63	55	62
REW	53	58	69	59	54	57	62	59	44	31	20	28	13
Other	11	10	9	17	11	12	16	12	19	19	17	17	25
<b>TOTAL</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>
	(217)	(74)	(93)	(54)	(46)	(104)	(81)	(87)	(24)	(132)	(123)	(116)	(16)

(Key: MNV = Minimum Number of Vessels; OP = Oriental Porcelain, REW = Refined Earthenware, Other = Other Ceramics which are not included in the above categories. The figures in brackets below the totals are the MNV counts for each of the layers taken from Tables 2.9 and 2.10. Data from original data sheets, courtesy of Jane Klose).

suggest that oriental porcelains provide a mid-late 18th century component, while refined earthenwares provide a late 18th century-early 19th century component to the site, based on the relative proportions of MNV counts for each of these groups. Although one might attempt to put date ranges on both oriental porcelains at the Cape and refined earthenwares, it proves to be more difficult to do so. A short extract from the site report for House JAM Layer 4, which was selected for faunal analysis, is given below to illustrate the difficulty of assigning date ranges to particular items or categories of ceramics.

“Layer 4 contained a large assemblage [...] and a wide range of oriental porcelain [...]. All pieces which have been identified were probably manufactured in the late 18th or early 19th centuries. [...] The assemblage from the underlying Layer 5 included many similar pieces, notable amongst which were a Japanese enamelled saucer, a fragment of black basalt stoneware, an interesting collection of coarse earthenware and blue shell edged plates, probably manufactured between 1780 and 1830. As with the overlying layers, *ceramics in this assemblage included pieces that could have been manufactured across the late 18th century to early 19th century periods as well as pieces that were only made after the 1820s [...]*” (Hall 1991: 45, emphasis added).

In addition, as oriental porcelains have a longer period of manufacture, they may have also been curated, and displayed in the top of cupboards in the *voorkamer* or elsewhere (see Woodward 1983). Thus the presence of older early 18th century porcelains with later material at the site should not be seen as an anomaly.

Some refined earthenwares are easier to date. From the original site report (Hall 1991: 44-52, appendix 2) on the presence of certain ceramic categories for House JAM and MAN, it was noted that although undecorated creamwares constituted the largest single category of refined earthenwares, that hand-painted blue/white vessels also constituted a significant minor category, particularly in the upper layers of the sites. Jane Klose and Antonia Malan (1993) provide some rough date ranges for these two dominant groups of refined earthenwares in these assemblages. Undecorated cream coloured wares were in the Cape between c. 1790 and 1840, while hand-painted blue/white pearlwares date to between c. 1790 and the 1830s (Klose and Malan 1993: 9).

The other two categories that consistently come up among the refined earthenwares, although at lower frequencies, are transfer-printed blue-and-white pearlware and annular ware in House JAM and

Table 2.9: Breakdown of Ceramics from SSSJAM, given as the Minimum Number of Vessels, their relative percentages and sherd count per layer.

Site SEA STREET JAM															
YOUNGEST LAYER															
LAYER	MNV	%MNV	(#Shd)	MNV	%MNV	(#Shd)	MNV	%MNV	(#Shd)	MNV	%MNV	(#Shd)	MNV	%MNV	(#Shd)
	1L	2L	3L	3aL	4L	5L									
Porcelain Oriental	28	9	14	-	0	0	23	44	(-)	33	33	(125)	33	33	(72)
Porcelain European	3	-	-	-	0	-	0	-	(-)	-	0	(-)	-	0	(-)
Stoneware Oriental	-	-	-	-	0	-	0	1	(-)	1	1	(1)	1	1	(2)
Stoneware European	8	2	3	1	9	9	5	9	(1)	9	3	(24)	3	3	(11)
Coarse E/W Unprovenanced	6	3	7	1	9	9	6	11	(1)	6	14	(42)	14	14	(52)
Tin Glazed E/W European	1	-	1	1	9	9	2	3	(4)	2	2	(8)	2	2	(2)
Refined E/W Staffordshire type	91	35	52	8	73	73	65	124	(22)	65	47	(629)	47	47	(202)
<b>TOTAL</b>	<b>137</b>	<b>49</b>	<b>77</b>	<b>11</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>192</b>	<b>(28)</b>	<b>100</b>	<b>100</b>	<b>(829)</b>	<b>100</b>	<b>100</b>	<b>(341)</b>

Site SEA STREET JAM															
OLDEST LAYER															
LAYER	MNV	%MNV	(#Shd)	MNV	%MNV	(#Shd)	MNV	%MNV	(#Shd)	MNV	%MNV	(#Shd)	MNV	%MNV	(#Shd)
	6L	7L	8L	9L	10L										
Porcelain Oriental	179	92	147	20	10	53	83	20	(447)	83	91	(34)	91	91	(22)
Porcelain European	-	-	-	-	-	0	0	-	(-)	0	0	(-)	0	0	(-)
Stoneware Oriental	3	2	5	-	-	2	0	-	(7)	0	0	(-)	0	0	(-)
Stoneware European	13	10	8	-	-	3	0	-	(26)	0	0	(-)	0	0	(-)
Coarse E/W Unprovenanced	25	15	36	4	1	13	17	4	(142)	17	9	(11)	9	9	(1)
Tin Glazed E/W European	14	5	8	-	-	3	0	-	(25)	0	0	(-)	0	0	(-)
Refined E/W Staffordshire type	76	46	76	-	-	27	0	-	(265)	0	0	(-)	0	0	(-)
<b>TOTAL</b>	<b>310</b>	<b>170</b>	<b>280</b>	<b>24</b>	<b>11</b>	<b>100</b>	<b>100</b>	<b>24</b>	<b>(912)</b>	<b>100</b>	<b>100</b>	<b>(45)</b>	<b>100</b>	<b>100</b>	<b>(23)</b>

Abbreviation: (#Shd) = #Sherd or number of sherds. (Data recalculated from the original data sheets, courtesy of Jane Klose).

Table 2.10: Breakdown of Ceramics from SSMAN, given as the Minimum Number of Vessels, their relative percentages and sherd count per layer.

LAYER	YOUNGEST LAYER									
	1L	2L	3L	3aL	4L	5L	MNV	%MNV	(#Shd)	(#Shd)
Porcelain Oriental	75	24	20	13	16	32	104	31	(98)	
Porcelain European	3	-	0	-	-	1	0	0	(1)	
Stoneware Oriental	1	-	0	1	1	-	0	0	(-)	
Stoneware European	7	3	5	3	1	3	3	3	(14)	
Coarse E/W Unprovenanced	12	3	4	3	2	7	7	7	(23)	
Tin Glazed E/W European	3	1	0	2	1	2	2	2	(2)	
Refined E/W Staffordshire type	116	43	64	32	25	59	104	57	(238)	
<b>TOTAL</b>	<b>217</b>	<b>74</b>	<b>93</b>	<b>54</b>	<b>46</b>	<b>104</b>	<b>100</b>	<b>100</b>	<b>(376)</b>	

LAYER	YOUNGEST LAYER										OLDEST LAYER		
	6L	6aL	6bL	7L	7aL	8L	8bL	MNV	%MNV	(#Shd)	MNV	%MNV	(#Shd)
Porcelain Oriental	18	23	79	66	77	64	9	56	(20)				
Porcelain European	1	-	2	1	-	-	1	6	(1)				
Stoneware Oriental	1	1	2	2	3	3	-	0	(-)				
Stoneware European	3	4	7	5	2	2	-	0	(-)				
Coarse E/W Unprov.	7	5	19	11	10	12	3	19	(4)				
Tin Glazed E/W European	1	1	9	6	6	3	1	6	(4)				
Refined E/W Staffordshire	50	51	93	41	25	32	2	13	(5)				
<b>TOTAL</b>	<b>81</b>	<b>87</b>	<b>211</b>	<b>132</b>	<b>123</b>	<b>116</b>	<b>16</b>	<b>100</b>	<b>(34)</b>				<b>(34)</b>

Abbreviation: (#Shd) = #Sherd or number of sherds. (Data recalculated from the original data sheets, courtesy of Jane Klose).

transfer-printed blue-and-white pearlware and annular ware again, as well as hand-painted polychrome pearlwares and shell-edged pearlware in House MAN. Transfer-printed blue-and-white pearlware dates to between 1780 and the 1840s; annular ware dates to between the 1790s and the late-middle 19th century; hand-painted polychrome pearlwares dates to between the late 18th century and the 1840s; and shell-edged pearlware dates to between the 1780s and the 1840s (Klose and Malan 1993). Thus the site contains a significant late 18th century-early 19th century component, although there is an earlier porcelain component. More recently, Jane Klose (*pers. comm.*) has suggested that the bulk of the site material from Sea Street can be grouped to between 1780 and 1830.

This change - the changing proportions of porcelain to refined earthenwares (see Klose and Malan 1993: 37-38; and Malan 1993: 157, 159, 163 for an explanation hereof) - can also be seen at another site in Cape Town, Barrack Street, which dates from the late 18th century to the late 19th century. Layer Four from the site contained both oriental porcelain and refined Staffordshire manufactured earthenwares; while Layer Three contained far more European manufactured ceramics, including blue shell-edged plates which were popular between 1780 and 1830 (Hall *et al.* 1990: 76-77). As at Sea Street, Barrack Street similarly showed a marked change in the predominance of oriental manufactured porcelains in Layer Four (59% of vessels) to the predominance of European manufactured refined earthenware in the overlying layers (72% to 80% of vessels) (see Table 2.11; Hall *et al.* 1990: 81).

Table 2.11: Minimum number of vessels (MNV) and percentage of vessels from Barrack Street.

Site <i>BARRACK STREET</i>	YOUNGEST LAYER		⇔TIME⇔				OLDEST LAYER	
	MNV	%MNV	MNV	%MNV	MNV	%MNV	MNV	%MNV
LAYER	1L	%	2L	%	3L	%	4L	%
<i>Porcelain Oriental</i>	6	8	-	-	13	10	27	59
<i>Porcelain European</i>	3	4	4	9	3	2	-	-
<i>Stoneware Oriental</i>	-	-	-	-	-	-	-	-
<i>Stoneware European</i>	10	13	4	9	12	9	5	11
<i>Coarse E/W Local</i>	-	-	-	-	-	-	-	-
<i>Tin Glazed brown faience</i>	-	-	-	-	-	-	1	2
<i>Tin Glazed other</i>	-	-	-	-	2	1	1	2
<i>Refined E/W Staffordshire type</i>	53	72	35	80	103	79	8	20
<b>TOTAL</b>	<b>74</b>	<b>100</b>	<b>44</b>	<b>100</b>	<b>133</b>	<b>100</b>	<b>44</b>	<b>100</b>

(Hall *et al.* 1990: 80, table 1).

### The Dutch and British Clay Tobacco Pipes.

Recently, the clay tobacco pipes from Sea Street were analyzed (Graf 1992). As with the ceramics, they too provide insights into the age of the deposit. The majority of artefacts were made up of Dutch clay tobacco pipes with a limited amount of British material. One of the analyses carried out was the altered bowl range analysis which provides a date range for all the possible clay pipe material from the site. According to this method, the material dates to between 1734 and 1830. In addition, 95.9% of the sidemarks have either the Gouda shield or letter 'S' on them, or both. Furthermore, most of the bowls

(92.3%) are either of type G or H (Duco 1982: 111) and therefore similarly post-date 1740. Bowl type G was manufactured between 1750 and 1775 and bowl type H was only manufactured between 1775 and 1815. The range of dates from the Friederich HBO method (Friederich 1975) also suggests a post-1740 date. The overall impression from the Dutch material is that one is mostly dealing with post-1750 material. Let us now turn to the British material.

Of all the material found at the site, only four bowl fragments or decorated pipe stems with spurs or heels could definitely be said to be British. Three of these have the initials TD on the bowl or spur, with another specimen having the initials I/J on either side of the spur. A number of English pipes from north-east England with the initials I/J are listed by Parsons (1964: 252). These were all in business during the first half of the 19th century. Oswald (1960; 1975) also lists a number of early 19th century pipemakers from London, Chester, Liverpool and elsewhere with these initials. In the first half of the 19th century it was exactly these three above mentioned cities which were capturing the world market (see Oswald 1960: 46, fig. 19). The TD pipes (see Walker 1966) at the site can be attributed to Thomas Dormer, for whom Oswald (1975:135) gives a date of 1748-1770, although various plagiarized forms were manufactured into the 20th century (Walker 1966). Indeed, Iain Walker (1966) states that the TD initials do not signify any specific marker in the 19th century. A number of these pipes have been found in contexts which date to the early or mid-19th century (see Dawson 1967; Reid 1976; Smith 1986; Walker 1971; Woolworth *et al.* 1960:273). Thus their presence at the site may date to either the late Dutch or British period of occupation at the Cape.

The only question that remains to be asked is: Why is there such a low frequency of diagnostic British material at the site? The fact that much of the site remained undeveloped until the mid/late-1830s would have provided an opportunity for at least some British material to be dumped. The fact that fewer than 10 diagnostic fragments were found is puzzling. There are only two possible scenarios to explain this anomaly. With the granting of freehold titles to Horak and Meyer early in the 19th century, the opportunity for dumping material there may have ceased; or, alternatively, building alterations at the site after the initial construction, resulted not only in the disturbance of the upper deposits, but also in the removal of dump site material to areas away from the site.

### **Conclusion.**

On the basis of the site's stratigraphy and considerations of faunal sample size, a selection of various layers and phases for faunal analysis was made. As the cultural material from Sea Street predominantly pre-dates the building of the houses on that block, the site is considered to be a dump site. Although the faunal and other cultural material from the site may span a whole century, it is more likely that it covers slightly more than half-a-century prior to the construction of the houses on the block, with a significant late 18th century-early 19th century component to the site material.

## CHAPTER 3.

### A REVIEW OF FAUNAL ANALYTICAL TECHNIQUES.

#### 3.1. INTRODUCTION.

This chapter aims to discuss a selection of the techniques concerned with faunal analysis and that have been applied to the historical zooarchaeology more often than not. Besides looking at the various counting units that can be used to establish the general faunal profile of the site or questions relating to the age of individuals or the contributions of individual species to the overall diet, the chapter also concentrates on what the "correct unit of analysis" should be in historical zooarchaeology and looks at the various taphonomic influences that impact on the faunal sample under study.

#### 3.2. MINIMUM NUMBER OF INDIVIDUALS or MNI.

MNI, or the minimum number of individuals, is one of the two analytical tools used most often by faunal analysts. MNI can be defined as the "minimum number of (complete) individual animals necessary to account for (to have contributed) the specimens observed" (Lyman 1994c: 510). MNI is produced when the site is analyzed as a single unit. MNI is calculated when like individual elements are summed. For example, if there are four left and five right radii, then the minimum number of individuals that this assemblage can represent is five. In addition, MNI can be calculated at various levels. For example, it can be calculated when the faunal material from the site is considered a single entity, or for each of the units or spits which make up the stratigraphy, or for phases which consist of either grouped units or spits. The level at which MNI is done will result in varying figures for the site, or for each of the units or phases. The resulting figures indicate the relative abundances of different species to each other (Crabtree 1985: 76-77), i.e. they reflect which species are more or less prevalent within a particular faunal assemblage. This answers at least one question which each faunal analyst asks himself or herself: What is there? What species are present, what are not?

Despite the usefulness of MNI in establishing relative abundances of species, it does face a number of serious and less serious problems. In 1972, S. Payne (in Grayson 1978: 53) suggested that the use of MNI tended to exaggerate the importance of rarer animals or "rare" species (see also Klein and Cruz-Uribe 1984). The relationship between MNI and NISP is hyperbolic (Grayson 1978: 55), MNI tends to exaggerate the importance of the rarer animals as reflected in the rapid decrease of the value of MNI/NISP as sample size increases (Grayson 1978), and as the amount of bone remains recovered for a taxon increases as well (Kuhn 1938 in Casteel 1977: 142).

Richard Klein and Kathy Cruz-Uribe (1984: 26) state that there is a strong possibility of calculation error when MNI is computed. More seriously, they (Klein and Cruz-Uribe 1984) note that MNI estimates may not be comparable among samples, because there is no consensus on how they should

be calculated and how it should be applied. Some have applied it to the whole site (cf. White 1953), while others to separate stratigraphic areas of the site.

Fragments play an important role in influencing the effectiveness of MNI. One can either ignore them, treat them as complete bones or record them as fragments. If they are ignored, then MNI figures will be artificially depressed. Similarly if they are treated as whole bones, then MNI will be inflated. For these reasons, it may be impossible to compare samples between assemblages or between species (Klein and Cruz-Urbe 1984: 27-28). In addition, MNI are not additive like NISP, so that if lumping does occur between old and new samples, then not only will MNI have to be computed again, but it would also most likely result in a smaller MNI number (see Klein and Cruz-Urbe 1984: 28 for a further discussion on this).

The various ways in which MNI are calculated have an effect upon the contributions made by single elements to the MNI (Grayson 1978: 62). This may tie up with Grayson's objection, cited by Horton (1984), that MNI will vary according to the nature of the sampling procedure. Bones from a single individual are likely to be spread across a site, so that excavation of a small area will sample only some of the bones of a given individual. Bones from a single individual do not necessarily remain at the level at which they are deposited. There can be some movement downwards or upwards stratigraphically. Even if some mixing does not occur, the excavation of arbitrary units will invariably separate bones of single individuals since the floors on which they are deposited are rarely flat or horizontal (Horton 1984: 268). The best method is to calculate MNI, for whatever division is chosen, from the element which is most numerous in the site as a whole (Horton 1984: 269).

Grayson (1979) has pointed out that an unfortunate characteristic of minimum numbers is that they vary according to the excavation unit which is selected for analysis. For example, whether the excavation units are combined to calculate MNI (cf. Reitz and Scarry 1985: 17) or not. The minimum distinction approach to MNI occurs when the site is dealt as a whole, while in the maximum distinction approach occurs when both the horizontal and vertical units are taken into consideration (Grayson 1978: 60, 62). An example of utilizing the maximum distinction ( $M_x$ ) and minimum distinction ( $M_i$ ) approaches to calculate MNI was done at the site of Cerro Brujo by Grayson (1973 in Casteel 1977: 142). The resulting MNI figures varied significantly; they were 466 and 75 respectively. Thus the level of aggregation or the application of MNI to the site stratigraphy may result in differing MNI figures which may not be comparable across sites.

Other than concerns regarding the manner in which the MNI index behaves at varying sample sizes or its behavioral relationship to aggregation of sampling units, a technical problem is the varying operational definitions of the measure among different investigators (Casteel 1977: 141).

One of the applications of MNI is to calculate the biomass of a particular species. To do this the MNI for a given taxon is simply multiplied by the average weight of a modern individual of that taxon (Grayson 1984) or by a constant or estimate of usable meat per individual. Various archaeologists have adopted this methodology. At Puerto Real, Old World domestic mammals made up 35.5% of the total MNI identified at the site; but when this figure was converted into the actual biomass, i.e. the amount of kilograms of meat, the same category provided 94.6% of all the categories listed (Reitz 1991). This seems an overestimate. Similarly at Puerto Real, McEwan's (1986: 46-47) data shows this also to be the case. Although pig was the most abundant species in terms of MNI, it did not constitute the largest proportion of biomass, which cow did. Guilday (1970 in Grayson 1984: 105) also had similar views where he concluded that the calculations of meat weights from the minimum numbers of individuals represented at Fort Ligonier was "patently ridiculous" (see also Barber 1976). Thus although two domestic species may have the same MNI, their contributions to the diets of the site occupants may vary significantly. For example, even though the MNI for *Bos taurus* and *Ovis aries* were both two, their biomass contributions were different.

Difficulties also arise by choosing a factor by which to multiply the MNI estimates to establish biomass. What do we choose, as the situation in South Africa and the Cape is all the more complicated, as we do not know which species we are dealing with. Are we dealing with strains of wild sheep that have been domesticated? Are we dealing with imported sheep? Or are we dealing with hybrids of imported sheep strains, local sheep strains or hybrids between local and imported sheep? These are questions which cannot be fully answered at the moment. Suffice is to say that we are most likely dealing with hybrid species of sheep (see Van Reenen 1937; and Ainsworth-Davis 1924).

In using MNI to calculate biomass, a very valid point has been cited by Reitz and Scarry (1985). In MNI the underlying assumption is that the entire animal was consumed at the site: that is, 5 humeri equal five cows, pigs or whatever. To the contrary, unless the animal was butchered at the site, the entire carcass was probably last together as a unit at the kill site or slaughter house. It is also important to remember that other factors like exchange through reciprocity, redistribution, or market affects how much and what portions of an animal are used by a household (Reitz and Scarry 1985: 17). Other authors, like Lyman (1979) and Huelsbeck (1991), have noted that the correct unit of analysis should be the consumed item, i.e. that portion or skeletal element that is found in the assemblage and not the entire carcass.

Grayson (1984) noticed that when MNI as a counting unit was first introduced by White in 1953, he himself had two objections to the use of species counts. Firstly, he noted that butchering techniques would probably result in the differential deposition of body parts on sites (see previous paragraph). Secondly, differences in the sizes of (acquired) species meant that each species did not contribute equally to the diet of the people involved, and that specimen counts did not directly address this issue (White 1953 in Grayson 1984: 27).

The emphasis over the years has, however, been lost. White's method of MNI multiplied by the butchered yield/weight of the total carcass was a straight forward method. "This total meat yield figure is

not an estimate of the amount of [...] meat obtained during the total occupation of the site, but rather indicates the *relative* importance of [a species] in the diet *in relation to the other animals species exploited*" (Smith 1975: 104). In other words, despite the shortcomings of MNI, it was never seen as an absolute quantification of species exploited or consumed, but rather a relative notion of the importance of one species to another in the diet of the occupants of the site.

### 3.3. NUMBER OF IDENTIFIED SPECIMENS or NISP.

NISP or the number of identified specimens, is the other main archaeological technique used in faunal studies. NISP can be defined as the "number of identified specimens in a collection, where identified usually means identified to skeletal element represented" (Lyman 1994c: 510), where specimen is seen as either an archaeological or paleontological part of a skeleton that consists of a complete bone or fragment thereof, a complete tooth or fragment thereof, or a bone (such as a mandible) with teeth in it (Lyman 1994c: 514). It can be used both to evaluate the degree of diversity in the faunal assemblage, as well as indirectly establishing the relative abundance of different species or MNI. NISP allows each individual faunal fragment to be acknowledged as part of the total retrieved sample. In addition, NISP calculation is accumulative. For example, if there are two radii, two ulna, two humerii and two scapula, irrespective of whether they are left or right specimens, the NISP total for that collection would be eight, while MNI would be two, if all the elements came from one side of an animal.

The structure of this section has been deliberately arranged so that the views of zooarchaeologists who prefer MNI are contrasted with those who put more weight behind NISP. This will allow one to see some discrepancies in the attitude of the zooarchaeologists to their preferred system of counting. We firstly turn to the work of Richard Klein and Kathy Cruz-Urbe (1984) who prefer MNI as their basic counting unit.

Despite their bias, they do admit that NISP has two advantages over MNI. Firstly, it may be calculated at the same time that the basic bone identifications are done, with no need for any subsequent numerical manipulation. Secondly, NISP values are additive; i.e. it is easy to update species abundance when excavations at a site are renewed - the new NISP for each species can simply be added to the old one (Klein and Cruz-Urbe 1984: 25). Despite these advantages, it does have some serious disadvantages: (i) it ignores the fact that the skeletons of some species have more parts than the skeletons of others; (ii) it will overemphasize the importance of a species that tended to reach a site intact versus a species that was dismembered before transport; and (iii) it is very sensitive to bone fragmentation (Klein and Cruz-Urbe 1984: 25). Therefore, disadvantages of NISP make it unsuitable as the sole index of species abundance. However if NISP is used in combination with MNI, then the ratio of the two (NISP/MNI) between species may indicate that the bones of the one are more fragmented than the bones of the other, or that one is represented by a much wider range of skeletal elements than the other (Klein and Cruz-Urbe 1984: 25), which in turn will have implications when the material is interpreted.

In contrast to Klein and Cruz-Urbe, Grayson (1984) sets store more with NISP than MNI, but he is at least equally critical of both methods. Despite each method's shortcomings he prefers NISP as the basic building block of faunal analysis. He noted that NISP can be "transformed into minimum numbers of individuals (MNI), they can be weighed, they can be used to estimate the size of the death population, they can be transformed into animal weights, and so on" (Grayson 1984: 17). As NISPs can be computed into MNIs, they will allow for between- and within-site comparisons (Reitz and Scarry 1985: 16-17) even if they are not converted into MNIs.

Criticisms of the use of NISP as a method of counting has been leveled by other critics. Grayson (1984: 20-24) cites 11 objections to NISP:

1. NISP are affected by butchering patterns, e.g. the Schlepp Effect.
2. NISP varies from species to species, so that differences in numbers of specimens per taxon may simply reflect the excavators ability or disability to identify various animals to the same taxonomic level.
3. The use of NISP assumes that all specimens are equally affected by chance or by deliberate breakage.
4. Differential preservation affects the number of identifiable specimens per taxon,<sup>1</sup> so that the numbers identified by an analyst today may bear an unknown relationship to the numbers originally deposited.
5. NISP can give misleading results when one or more taxa are represented by entire individuals, while other taxa are represented by disarticulated and fragmented bones and teeth.
6. For the reasons noted above, a number of authors have concluded that the use of NISP leads to difficulties in statistical treatment caused by sample inflation.
7. The unit may be affected by collection techniques.
8. NISP cannot, by itself, address questions of biomass, and meat weights are often of far greater importance in examining (pre-)historic economies than is the number of bones by which a given taxon is represented.
9. Again for the reasons listed above, it has been suggested that NISP does not allow valid comparisons to be drawn between faunas.
10. As specimen counts simply do not support as many analytical techniques as MNI, it should be abandoned.
11. Lastly, NISP has been criticized because of the potential interdependence of the units that are being counted.

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<sup>1</sup> A number of studies have been done on the percentage survival of skeletal parts. The classic and most valuable set has been by Brain (1969, 1981 in Grayson 1984: 45). The easiest way to establish percentage survival is where the number of elements on the basis of minimum number values are compared to the number of elements actually observed. For example, in a sample where the highest NISP value for the right mandible is 10, the expected NISP value for left and rights is 20. In the aforementioned hypothetical study, lets say there were 10 right mandibles and 8 left mandibles, i.e. the observed value for all mandibles is 18, while the expected value is 20. Therefore the percentage survival rate for mandibles as a category is 90%.

In defense of these criticisms Grayson (1984: 25) stated that many of these criticism can be avoided by either the application of statistical methods or correct excavation procedures to ensure valid comparability. In addition, bones are not only affected by differential preservation, but also bone density. Therefore, differential preservation will affect the bones of all taxa in all faunas, and this will affect all specimen counts, whether NISP or MNI (see detailed discussion on taphonomy, which discusses pre- and post-depositional factors affecting recovered faunal remains). However, two problems remain. The first is the assumption that the items being counted are not mechanically interdependent, i.e. how can one be sure that one is not counting the same thing more than once (Grayson 1984: 26). The second relates to differential element identifiability and preservation.

### 3.4. SOME ADDITIONAL COMMENTS ON NISP AND MNI.

Apart from the practical aspects of MNI and NISP, there are also conceptual weaknesses in both methods. Firstly, on a mathematical level, MNI increases more slowly than NISP. Secondly, conceptually MNI is minimum number of individuals that ended up in the archaeological deposit, while NISP is the maximum number that could ever have entered the sample, while in actual fact the real number of individuals lies between the calculated MNI and the NISP figures. In other words, MNI and NISP will attempt to establish the parameter "abundance" by providing the lower and upper limits to the possible distribution of abundance variables, but fails to inform one as to the actual distribution between these two limits (see Grayson 1984: 96). Lastly, although both are a form of measuring species abundance, they ignore the specific skeletal parts that make up a sample. Thus, two samples may have identical NISP and MNI numbers, but nevertheless contrast strongly in patterns of skeletal part representation (see Klein and Cruz-Urbe 1984: 29-31).

Another issue relates to reading both counting units. The problems of reading MNI and NISP figures from a report can be best explained from the published faunal list from the Plaza II Site. The following five species provided the following NISP and MNI figures: cow (*Bos taurus*) provided 99 NISP and 2 MNI, goat (*Capra hircus*) provided 2 NISP and 2 MNI, sheep or goat (*Ovis sp. or Capra sp.*) provided 75 NISP and 4 MNI, pig (*Sus scrofa*) provided 9 NISP and 3 MNI, and domestic dog (*Canis familiaris*) provided 35 NISP and 3 MNI (Bostwick 1980: 78). The NISPs for cow and sheep or goat are both high, while their respective MNIs are low. On the opposite end of the scale are goat which has a MNI and NISP of 2; with pig having a slightly larger NISP of 9, but a MNI of 3. The value of NISP and MNI are both skewed by the fact that the reader does not know from which body parts the NISP arise. For example if the cow had four left and right first phalanges, it will still have an MNI of one, although eight individual recovered specimens had been retrieved.

A further problem which affects both MNI and NISP is fragmentation and adiagnostic fragments. It is a greater problem for MNI than for NISP. A theoretical problem is that "as bone specimens become smaller and less identifiable, progressively more of them become analytical absent; that is proximal

humeri may present in a collection but some of the pieces of proximal humeri are so small or modified by attrition that they are unidentifiable, and thus they are, for analytical (quantification) purposes, absent. The frequency of such analytically absent pieces should increase through time as taphonomic processes continue to affect a bone assemblage. This underscores the time-transgressive or cumulative nature of taphonomic processes; it also implies that there is a threshold at which a particular skeletal part will cease to be analytically present (identifiable)" (Lyman 1994c: 277).

Lastly, problems in faunal analyses are complicated by terminological problems. The presentation of (new or old) terms are often vague. The abbreviations and the terms they reflect are ambiguous (see Casteel and Grayson 1977: 236-7). For example, Binford established his own form of MNI, which he later renamed MAU (Minimum Number of Animal Units); however, for a time both his original MAU abbreviation conflicted with the 'conventional' understanding for MNI. Even when explicitly defined, different concepts may often be referred to by the same symbol and the same concepts are often referred to by different symbols (Casteel and Grayson 1977: 238; see Lyman 1994a, for an updated discussion on the issue).

### 3.5. AGEING AND SEXING OF INDIVIDUAL SPECIMENS.

Once the faunal analyst has established the "original" size of the faunal assemblage (MNI) and is aware of what skeletal elements are present (NISP), he or she may wish to go a step further and establish age and sex profiles for the collection under study.

As skeletal parts differ in morphology between sexes, the sex ratio can be established. Problems immediately arise as many parts that are useful in sexing are more fragile than others and therefore subject to selective removal by post-depositional leaching, profile compaction and other processes (Klein and Cruz-Urbe 1984: 39-40). Similarly, unless bone preservation is excellent, it is probably not safe to assume that the sex ratio in the faunal assemblage closely reflects the ratio in the original deposited assemblage. Sex ratios are also biased by incomplete growth patterns of bones, the possible existence of castrates in domestic species; as well as the assumption of a degree of sexual dimorphism between male and female specimens (see Klein and Cruz-Urbe 1984: 41).

Other than the determination of sex, faunal analysts also place some emphasis on age profiles. Age profiles are not limited to mammalian species (see Casteel 1974; Singer 1985; 1987). Age profiles can be done by analyzing epipheseal fusion or tooth eruption. Epipheseal fusion allows one to establish the time of death in broad terms, i.e. age classes can be drawn up. This method has a number of shortcomings however (see Klein and Cruz-Urbe 1984: 43) which includes the level of bone preservation in the sample (see Klein and Cruz-Urbe 1984: 83-86; Uerpmann 1973: 313). Reitz and Honerkamp (1983) illustrative the difficulty in determining age by epipheseal fusion. For example, an element that fuses before or at 18 months and is found fused archaeologically, could be from an animal which died immediately after fusion was completed or from an aged beast (Reitz and Honerkamp 1983: 14-16, 19).

Many of the problems relating to epiphyseal fusion can be overcome through analysis of dental wear and tooth eruption. Teeth do not only monitor the age of an individual through life, but they are species identifiable and also more durable, allowing for less bias. There are two ways of establishing dental age. The first involves the counting of the growth increments or annuli frequently visible in dentine or cementum (see Klein and Cruz-Urbe 1984: 44-45). More recently, Landon (1993) has attempted to establish a historic seasonal slaughter model using tooth cementum incremental analysis. The alternative in accessing age is the use of tooth eruption and tooth wear, where archaeological dentitions are compared with dentitions of known-age individuals of the same species. This method of analysis is subjective and requires complete tooth rows. The assumption in crown wear is that the maximum possible individual age is the age at which the crowns of permanent teeth are completely worn away (Klein and Cruz-Urbe 1984: 46). Problems underlie both methods (see Klein and Cruz-Urbe 1984: 44-55), with large sample size and a clear understanding of the species life history prerequisites in constructing accurate age profiles (Klein and Cruz-Urbe 1984).

### 3.6. OTHER COUNTING UNITS.

Under this section we briefly touch on other applications faunal analysts use. Aggregation used by the faunal analyst affects the resulting MNI figures. Matching helps to establish the "original" MNI contribution by comparing all the skeletal elements with each other. Allometry and the "Weigemethode" are used by both historical and prehistorical archaeologists to establish individual weights or biomass contributions of species.

#### 3.6.1. AGGREGATION.

As mentioned above, aggregation can be used to manipulate MNI figures. If all the faunal material from the site is treated as a single large aggregate - the minimum distinction method - then the smallest possible MNI values will result. Conversely, the largest possible yield of MNI values will result when the spatial boundaries of each aggregate are broken up further into smaller defined analytical units - the maximum distinction method - down to spit and feature level (Grayson 1973: 433; 1984: 29-30). Variation in the way the concept of minimum numbers is applied to the way in which the archaeological material is grouped, will also affect the variation in the values of the resultant MNI from which it was determined (see Grayson 1973: 434). A problem with aggregation is that one never knows whether or not the units being manipulated are independent of one another (Grayson 1973: 432). This applies to whether MNI or NISP has been chosen as the source of faunal measurement. Therefore final MNI/NISP values are dependent on the aggregation method chosen (see Casteel 1977: 126). By extension "differing aggregation methods on minimum numbers may greatly alter the outcome of any significance test applied to minimum number data" (Grayson 1984: 40). Chi-squared analysis of the two analytical methods - the minimum and maximum distinction approach - has shown that the two are indeed significantly different (Grayson 1973: 435). The immediate implications of this analysis seems clear: MNI when calculated according to different methods of grouping data are not necessarily comparable (Grayson 1973: 438).

### 3.6.2. MATCHING.

Various faunal analysts have attempted to by-pass the problems of MNI or alleviate them. A number of indices have been put forward to establish the original number of individuals in the archaeological sample. Of all of these, "matching" has met with the most success (see Casteel 1977; Grayson 1984; Turner and Fieller 1985; and see Allen and Guy 1984 for a further discussion on pairing to establish the original population). In short, "matching" has been used whereby size, age or sex criteria are used to determine whether two bones come from the same individual or not. The faunal sample from the Drostdy in Stellenbosch, an early 18th century site, was analyzed by refitting each of the specimens (Woodborne 1994). Matching or refitting results in decreasing MNI numbers<sup>2</sup> and has its own problems. It is particularly impractical when one is working with large samples (see Grayson 1984: 88; Klein and Cruz-Urbe 1984: 26-27), which is often the case in historical archaeology.

### 3.6.3. "DIE WEIGEMETHODE".

"Archaeologists have frequently calculated the weight of meat represented per taxon in a faunal assemblage in order to assess the relative importance of those taxa in human subsistence" (Grayson 1984: 172). Biomass determinates are made from MNI values, through the "Weigemethode" or by derivatives of establishing meat weight estimates. The "Weigemethode" multiplies the total weight of the bones assigned to a species by a factor that is presumed to reflect the ratio between bone weight and meat weight in live animals (Casteel 1978: 71; Klein and Cruz-Urbe 1984: 35). This factor is between 7 and 7.7% (Lyman 1979). The assumption that there is a linear relationship between meat weight and bone weight is incorrect (Casteel 1978: 72), as the proportion of body mass to skeletal mass increases with increasing size (Reitz and Scarry 1985: 18), i.e. the relationship is in actual fact curvilinear (see Casteel 1978; and Grayson 1984: 172-173 for further implications hereof).

An unavoidable problem with bone weight allometry is that different skeletal elements support very different amounts of meat. Uneven element representation, characteristic of the majority of faunal assemblages, and the differential economic value of different animal parts, poses a dilemma for all methods of zooarchaeological quantification (Binford 1978; Lyman 1979). Bone weight allometry implicitly avoids confronting the problem by treating all bone fragments of a given weight as if they supported a similar amount of tissue regardless of the element from which they originated (Jackson 1989: 604). Despite this the method is undermined by assumptions regarding the death assemblage, by factors that affect the meat weight of individuals including environmental considerations, and post-depositional and other factors which directly affect bone weight (see Blumenschine and Caro 1986: 281; Casteel 1978: 73-74, 77; Huelsbeck 1991; Jolley 1983: 67; Klein and Cruz-Urbe 1984: 34-35; Landon 1992; Smith 1975: 101 in Lyman 1979: 537; Lyman 1979: 536-7; 1994b; 1994c: 231; Lyman and Fox 1989: 295; Metcalfe and Jones 1988: 499; Uerpmann 1973: 311).

<sup>2</sup> Although matching will generally result in a revision of MNI numbers, it can also be manipulated to increase MNI figures. In the case of larger samples this will not be the case, as there is a greater possibility for more matches within the sample. Smaller samples have greater possibilities of resulting in an increased MNI number. For example, if NISP consists of only four specimens, two left radii and two left ulna, and if it can be shown that none of these came from the same individual, then total MNI will be four, instead of two.

#### 3.6.4. ALLOMETRY.

"Archaeologists have frequently calculated the weight of meat represented per taxon in a faunal assemblage in order to assess the relative importance of those taxa in human subsistence" (Grayson 1984: 172). When the weight of bone per taxon is used to derive meat weights, the analyst assumes that is a fixed percentage of meat weight. This assumption is ill-founded (see Lyman 1979) and it makes no allowance for individual variation (Stewart and Stahl 1977; Lyman 1982: 363). Problems relating to bone weight have been by-passed by attempts to calculate animal biomass or meat weight from bone measurements through the use of an allometric equation(s), whereby equations are established that relate a measure of bone size (for instance, astragalus length) to meat weight for each taxon involved (cf. Ewen 1986: 19). The method is both biologically sound (Grayson 1984: 173; Reitz *et al.* 1987), and also statistically reliable (Reitz and Honerkamp 1983: 14-16, 19; Reitz *et al.* 1987: 305, 306-308 for an in-depth discussion of residuals). The advantage of this technique is that it yields a calculation that is based upon archaeological data (Jolley 1983) and results in more accurate individual meat weight estimates, and eliminates the need to determine an average size for each taxon. This method has not been limited to mammalian fauna, but extends to shellfish (Reitz *et al.* 1987) and fish (Casteel 1974) as well. Despite this it should be remembered that there are a number of associated problems (see Grayson 1984: 173; Reitz and Honerkamp 1983: 19; Reitz *et al.* 1987: 310-312), as well as the possibility of negative allometry in certain species (see Prange, Anderson, and Rahn 1979: 107; and Casteel 1978: 74).

#### 3.6.5. MINIMUM ANIMAL UNITS or MAU.

An in-built assumption of MNI when biomass determinates are calculated, is that one assumes that the entire individual is the unit of analysis. Binford (1978) objected to this, noting that meat is not utilized by people in units of single animals, but instead in units of animal segments (see also Lyman 1979). He correctly observed that minimum numbers obscure the existence of such segmental units, and therefore devised his own form of MNI, where "MNIs will be calculated by dividing the observed bone count for a given identification unit by the number of bones in the anatomy of a complete animal for that unit" (Binford 1978: 70). Later Binford changed the name to "minimal animal units" (MAU). As with all counting units it also has its problems (see Lyman 1985). In addition, various other indices have been constructed to measure particular factors often in conjunction with MAU figures. These include the general meat utility index (MGUI), meat utility index (MUI), the adjusted food utility index (FUI), bone marrow index (MI) and the bone grease index (WGUI) (see Grayson 1989; Lyman 1985; Metcalfe and Jones 1988: 487, 492-493; O'Connell *et al.* 1988; 1990). These indices are of less value to historical archaeology, although a few of these have been used (see Rothschild 1990; Rothschild and Balkwill 1993).

#### 3.7. THE INTER-RELATIONSHIP BETWEEN MNI AND NISP.

In understanding the inter-relationship rather than relationship between MNI and NISP, the critique of a French zooarchaeologist best explains the original methodology behind the relationship.

P. Ducos (1975) was critical of minimum numbers as a counting unit because of the great reduction in sample size that occurs when specimen counts are transformed into minimum numbers. He also noted that minimum number values depend on the particular element chosen to define them. He also pointed out that, while large samples were important for statistical reasons, the absolute numbers themselves are rarely the target of interest, but were instead used to determine that target: relative abundances. In order to demonstrate the general relationship between specimen counts and minimum numbers, Ducos plotted the logarithms of the NISP against the logarithms of the MNI. The relationship between the one and the other was linear.<sup>3</sup> As minimum number values increased at decreasing rates as specimen counts increased, Ducos argued that the abundance of rare species would be overestimated where MNI was used to calculate taxonomic frequencies (Grayson 1984: 50). In other words there is a predictable relationship between MNI and NISP in any given fauna, with MNI values being predicated from NISP counts (Grayson 1984: 62-63). By extension any measure derived from the NISP/MNI ratio is dependent on the number of identified specimens per taxon, unless the effects of NISP values can be removed (cf. Grayson 1984: 77-79). It has even been suggested by one analyst, that MNI values can be calculated from NISP values within a reasonable degree of accuracy for large and small samples (see Casteel 1977).

Although we may think that the statistical methods are fruitful, we must not forget that both MNI/NISP and NISP/MNI are sensitive to sample size. It is true that very little is known about how large a sample must be to represent adequately a population; but what is known is that, as NISP increases, values of NISP/MNI will increase as a function of sample size, and the only way to overcome this is to remove the effects of sample size (Grayson 1984). If the samples under study are not representative, variation in sample size may become the source of variation in derived measures, rather than variation in the population under study, i.e. changing sample sizes might be determining abundance values (Grayson 1981: 78, 81).

### 3.8. SAMPLE SIZE AND RELATIVE ABUNDANCE.

From the outset it should be stated that very little is known about how large a sample must be to represent adequately a population.

"Because we have so little control over the relationship between the retrieved sample and the target population, faunal analysts generally, and understandably, make the facilitating assumption that if samples are large enough, relative abundances may be extracted and manipulated without serious concern over sample size effects. In practice, samples that intuitively appear to be 'too small' are rejected as the basis for statistical manipulation, while those that appear 'too large' are so used. This is very true for the simple reason that very little is known about how large a sample must be to adequately represent a population in any given instance" (Grayson 1984: 117).

<sup>3</sup> It has now been shown in vertebrate faunas that the relationship between MNI/NISP and NISP is indeed hyperbolic (Grayson 1978: 55) and not linear, as NISP per taxon increases, the value of MNI/NISP decreases at a decreasing rate; while the relationship between NISP/MNI and NISP is parabolic (Grayson 1984: 67-71).

As has been demonstrated above, in many cases there is a significant correlation between the relative abundances of taxa and the size of the samples from which those relative abundances are defined. There are two possible reasons for this. Firstly, it is possible that no causal relationship exists between sample size and relative abundance in these instances, and that some third factor may be causing both sets of change (Grayson 1984: 121, 129; and Reitz 1986). Secondly, analysis of actual applications of certain measures, suggests that what is at times detected are not differing values of the parameter of interest, but instead differing sizes of the samples from which the measures are derived (Grayson 1981: 78; see also Grayson 1984). In many cases the cause for the correlations can be attributed to the effects of assemblages with very small numbers of identified specimens. However, the utility of small samples should not be ignored. In an analysis of three sites from New York, Salwen *et al.* (1981) showed the value of small samples in response to demands of urban archaeology placed on them and their research questions. In addition, the lack of correlation between different samples may result from the difficulty of isolating domestic from commercial deposits, as there may be no distinction between these deposits since both activities may have occurred in the same structure (Reitz 1986: 50). This is particularly relevant to historical sites.

However, we have not as yet solved the issue of how large a sample should be. Reitz *et al.* (1987: 308-309) rather authoritatively stated: "It is also agreed that as a random sample approaches 30, the sample size begins to resemble the overall population. As sample size increases to about 100 the deviation from the regression is more reliable". This agrees with Grayson who argued for sample sizes larger than 30 to 50 elements per taxon (in Casteel 1977: 144). Faunal analysts would however not disagree with the fact that larger sample sizes are desired to evaluate the degree of variation of the population from which the sample has been chosen. Quoting Reitz *et al.* (1987: 310) again, she correctly states that, "One mustn't forget that all taxa theoretically have a degree of inherent variability. One of the reasons that it is important to have [a] sample with a wide range and variability is that these factors are inherent in life".

In contrast other analysts believe, that samples containing fewer than 200 individuals may produce incomplete species lists and be biased in species importance (cf. Grayson 1973; 1981: 82-85; Casteel 1976/1977; Wing and Brown 1979: 118-121). For example, it has been shown above, that MNI will tend to exaggerate the importance of the rarer animals in relationship to others, as there is a rapid decrease in the value of MNI/NISP as sample size increases (see Grayson 1978: 58-59), i.e. the MNI index varies as a function of the amount of bone remains recovered for a taxon.

### **3.9. TAXONOMIC RICHNESS, DIVERSITY, EQUITABILITY AND SAMPLE SIZE.**

Richness refers to the number of the taxa that have contributed to a faunal assemblage (Cruz-Uribe 1988: 180). At Oudepost this index has been used, as has the diversity index (Cruz-Uribe and Schrire 1991: 97). The index is particularly useful in comparing urban and rural assemblages. Faunal assemblage richness, however, is tightly correlated with the size of retrieved sample (NISP) and this fact

must be taken into account whenever richness is analyzed. The general nature of the relationship between sample size and taxonomic richness is easy to establish. On the one hand, one can conceive of faunal assemblages in which all identifiable specimens belong to a single taxon; or on the other, one can conceive of a faunal assemblage in which every identified specimen belonged to a different taxon (Grayson 1984: 132-133). Archaeologists are often interested not simply in the number of species present in given sets of assemblages, but in both the numbers of species present and in the distributions of abundance across those species (Grayson 1984: 152). Species abundance distributions based on ordinal MNI/NISP data (Grayson 1984: 152-153) can be directly compared using the two-sided Smirnov test in order to determine whether or not they are of the same form.<sup>4</sup>

One method by which variety and degree of specialization can be compared is to measure the diversity and equitability of the species identified at each site. These measures have arisen from ecologists, who have constructed indices to measure taxonomic diversity, indices that consider both the number of taxa in a sample and the distribution of individuals across those taxa (Grayson 1984). Diversity in short is a measure of the number of species exploited, while equitability is a measure of the degree of dependence upon an utilized species. Both of these indices have also been applied archaeologically (see Cruz-Urbe 1988; Reitz and Scarry 1985), but are influenced by the environment in which the sample was accumulated and the behaviour of the bone collector, as well as sample size and the degree of bone fragmentation (see Cruz-Urbe 1988: 183; Grayson 1984: 138-149, 158-159; 164; Jolley 1983; Reitz and Scarry 1985: 20; Leonard and Jones 1989 in Rothschild 1990: 162). As more and more samples are analyzed from both urban and rural contexts, these indices will have greater interpretive value.

### 3.10. WHAT SHOULD BE THE CORRECT UNIT OF ANALYSIS?

In the foregoing sections one noted that there were various techniques used to establish the general contribution of various species. These are not very precise, remembering Binford's critique of MNI, and invariably overestimate the contributions of larger animals. This section tries to get nearer to an exact unit of analysis, which will more clearly reflect what was consumed.

One of the earliest analysts who attempted to establish an "index" to measure that which was eaten, was Tim White. He utilized his "meat poundage" figures, which attempted to establish the percentage of edible meat on a carcass. These figures, however, came under scrutiny as it was noted that there seems to be no consistent pattern for the establishment of edible meat percentages. White's

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<sup>4</sup> The fact that NISP must be used in applications of the two-sided Smirnov test to archaeological vertebrate faunas introduces interpretive difficulties. As the test assumes the variables to be continuous, the test is conservative when applied to discrete variables, increasing the chances of concluding that two cumulative distribution functions are statistically identical when, in fact, they are not. In addition, two samples of very different size can have very different species-abundance distributions even though drawn from the same population, increasing the chances of concluding that cumulative distribution functions are significantly different when, in fact, they are not. The Smirnov test also assumes that the samples involved are random. In addition, when the number of species involved in comparison is small, the test is not powerful, but this is not confined to Smirnov test (Grayson 1984: 157-8). Other forms of statistical analysis may be necessary.

percentages were consistently high, suggesting that meat poundage figures should be used with caution (Stewart and Stahl 1977: 367, 369).

In the later 1970s, Binford's creation of "Minimum Animal Units" (MAU) could be seen as the second attempt at correcting MNI as the counting unit. This, however, also had its shortcomings. In 1979, Lyman<sup>5</sup> suggested focusing on known weights of butchered units of meat remains from historic sites rather than on total body weight or edible meat weight. He indicated that a single bone such as a cattle femur, indicates that only one particular butchering unit of the cow was consumed and not the whole animal. This point was later clearly put across by Huelsbeck (1991: 62), when he stated that: *"It is necessary to focus on the units of meat actually acquired or the resulting analysis may be skewed"*. In contrast, others such as Crabtree (1985: 78) suggest that a meat index is best applied to establish the relative importance of different meats in the diet.

Lyman's 1979 paper could be seen as a watershed in historical zooarchaeological analysis. In discussing the nature of the carcass, he correctly differentiated between live weight, available meat and consumed meat. Live weight is the weight of the animal when alive. Available meat is defined as all parts of an animal minus the bone and hide weight. Consumed or consumerable meat is defined as those portions of the available meat of a species that were consumed by a group of people under study. Available meat also includes muscle tissue, fat, viscera, brains, marrow, eyes, blood, etc. (Lyman 1979: 536). On the basis of this he suggested that an attempt must be made to distinguish consumed meat from available meat. One could look at the butchering units which result from the act of butchering. Consumption is of butchering units and not of complete animals in many cases (Lyman 1979: 539), i.e. the correct unit of analysis should be the unit of meat acquired by the consumer (cf. Huelsbeck 1991: 66). Before dismissing the "butchering unit", he embarked on a criticism of this unit to evaluate its validity. Paraphrasing, he noted that the bones representing a particular type of butchering unit or skeletal portion may be weighed, but differential weathering and mineralization may still skew results. A minimum number of butchering units or skeletal portions may be determined, but sample size and computation techniques will affect resulting figures. The butchering unit meat weights are therefore the most accurate estimates of the amount of consumed meat (Lyman 1979: 539).

To establish differences between consumed meat from available meat, one needs to consider what may happen to a carcass, and what parts of edible meat remains in relationship to the total weight of the animal. Clemen (1923: 349) provides an insight into edible versus non-edible meat for beef.

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<sup>5</sup>. The exact date is not certain, as it is noted that in 1977, Lee Lyman already considered that the butchering units defined from the recovered bone can be an informative way to estimate the amount of meat consumed.

Table 3.1: A Breakdown of the Total Beef Carcass.

<b>Beef</b>	<b>lbs</b>	<b>Per Cent</b>
<i>Edible Products</i>		
<i>Beef</i>	588.80	54.4
<i>Other Meats</i>	39.17	3.6
<i>Oleo Oil and Stearin</i>	22.94	2.1
<i>Non-Edible Products</i>		
<i>Hide</i>	63.80	5.9
<i>Blood and Tankage</i>	16.46	1.5
<i>Bones, Horns and Hoofs</i>	14.15	1.3
<i>Castings</i>	6.40	0.6
<i>Tallow</i>	5.35	0.5
<i>Misc.</i>	5.52	0.5
<i>Shrinkage</i>		
<i>Evaporation, etc.</i>	210.51	19.6
<i>Valueless Material</i>	108.90	10.0
	<b>1080.00</b>	<b>100.0</b>
<i>Edible Products</i>	648.91	60.1
<i>Non-Edible Products</i>	111.68	10.3
<i>Shrinkage</i>	319.41	29.6
	<b>1080.00</b>	<b>100.0</b>

One can note from the above table that, when non-edible products and shrinkage are taken into account, only 60.1% of the total weight is consumable.

Lyman (1979) used the available evidence that he had at his disposal to calculate MTWT (which equals MNI multiplied by the percentage of live weight representing meat by the average live weight per individual). To calculate MTWT, a number of steps had to be taken. Firstly, carcass weights had to be established from live weight for the various domesticated species found at historical archaeological sites (see Table 3.2).

Table 3.2: Original Live Weight and Carcass Weight Figures.

	Live weight	% live weight = carcass weight	Carcass weight
<i>Cow</i>	1,000-1,400	55-60	550-840
<i>Pig</i>	245-260	75	184-195
<i>Spring Lamb</i> (3-4 months old)	40	65	26
<i>Winter lamb</i> (5-7 months old)	60	65	42
<i>Yearling lamb</i> (12 months old)	75	65	49
<i>Mutton</i> (over 12 months old)	95	65	62

(Lyman 1979: 540, table 1).

Secondly, the carcass had to be divided up mentally into broad categories which formed part of the total carcass, and, thereafter, had to be further divided up into butchering portions for the various domesticates, as beef could either have been acquired whole, halved, quartered or in specific cuts, such as steaks, legs, etc. (see Tables 3.3 and 3.4). By extension, this can also be done for sheep (see below).

Table 3.3: Skeletal Portions Defined Skeletally.

Skeletal portion	Skeletal definition
<i>Forequarters</i>	Radius-ulna, humerus, scapula, carpals
<i>Rib-vertebrae</i>	Thoracic, lumbar, and cervical vertebrae, ribs
<i>Hindquarters</i>	Pelvis, sacrum, tibia, femur, patella, tarsals

(Lyman 1979: 540, table 2).

Table 3.4: Butchering Units Defined Skeletally.

	<b>Butchering Unit</b>	<b>Skeletal Definition</b>
<i>Cow</i>	<i>Hindshank</i>	Tibia, distal femur, patella
	<i>Round/Buttock</i>	Femur shaft
	<i>Rump</i>	Proximal femur, ischium, pubis, acetabulum
	<i>Loin</i>	Ilium, lumbar vertebrae, sacrum
	<i>Flank</i>	No bones (assume same number as loin)
	<i>Navel end/Plate</i>	Ventral rib
	<i>Brisket</i>	Rib cartilage, sternum, ventral rib
	<i>Ribs</i>	Dorsal rib 6-12, thoracic vertebrae 6-12
	<i>Front shank</i>	Radius-ulna, distal humerus
	<i>Neck</i>	Cervical vertebrae, proximal humerus, distal scapula
	<i>Chuck</i>	Dorsal rib 1-5, thoracic vertebrae 1-5, humerus shaft, scapula blade
<i>Pig</i>	<i>Jowl</i>	Mandible (cranium?)
	<i>Shoulder butt</i>	Cervical vertebrae, scapula blade
	<i>Picnic shoulder</i>	Distal scapula, humerus, radius-ulna
	<i>Rough back</i>	Thoracic and lumbar vertebrae, dorsal rib, ilium, sacrum
	<i>Rib belly</i>	Mid and ventral rib
	<i>Short cut ham</i>	Acetabulum, pubis, ischium, femur, proximal tibia and shaft
	<i>Feet</i>	Carpals, tarsals, metapodials, phalanges
<i>Sheep</i>	<i>Chuck</i>	Cervical vertebrae, scapula, thoracic vertebrae 1-5, rib 1-5, proximal humerus and shaft
	<i>Foreshank</i>	Distal humerus, radius-ulna, metacarpal
	<i>Brisket</i>	Sternum, ventral rib 6-12
	<i>Breast</i>	Rib cartilage, ventral rib 6-12
	<i>Short/Hotel rack</i>	Thoracic vertebrae 6-12, dorsal rib 6-12, lumbar vertebrae
	<i>Loin</i>	Lumbar vertebrae
	<i>Flank</i>	No bones (assume same number as loin)
	<i>Leg</i>	Pelvis, sacrum, femur, tibia, metatarsal, tarsal, patella

(Lyman 1979: 541, table 3).

Thereafter, each of the gross skeletal portions and specific skeletal elements defined earlier, had to be assessed in terms of consumable meat from possible available meat/carcass weight (see Table 3.5 and 3.6 respectively).

Table 3.5: MTWT by Skeletal Portion.

	Skeletal portion	Number of body parts	Carcass weight	Consumable meat %	MTWT skeletal portion	Total MTWT
<i>Cow</i>	<i>Forequarter</i>	8	73.5	85.4	62.8	502.4
	<i>Rib-vertebrae</i>	4	156.0	49.0	76.4	305.6
	<i>Hindquarter</i>	10	70.5	54.7	36.6	386.0
						<b>1194.0</b>
<i>Pig</i>	<i>Forequarter</i>	1	20.5	60.8	12.5	12.5
	<i>Rib-vertebrae</i>	1	65.0	68.0	44.2	44.2
	<i>Hindquarter</i>	1.5	14.5	750.9	7.4	11.1
						<b>67.8</b>
<i>Sheep</i>	<i>Forequarter</i>	2*	9.5	59.7	5.7	11.4
		2*	16.5		9.9	19.8
	<i>Rib-vertebrae</i>	1	8.5	68.3	5.8	5.8
		2	23.1		15.8	31.6
	<i>Hindquarter</i>	0	8.3	54.7	4.5	0.0
		5	18.2		10.0	50.0
						<b>118.6</b>

(Key: \* = the figures for sheep should be read above the line as those of 4 months of age, while the figures below the line are for sheep of 12 months of age or older; Lyman 1979: 542, table 5).

Table 3.6: MTWT by Butchering Unit.

	Skeletal portion	Number of body parts	Carcass weight	Consumable % of meat	MTWT skeletal portion	Total MTWT
<i>Cow</i>	<i>Hindshank</i>	12	18.3	42.9	7.9	94.8
	<i>Round/Buttock</i>	2	42.3	60.5	25.6	51.2
	<i>Rump</i>	12	9.9	52.0	5.1	61.2
	<i>Loin</i>	10	51.0	62.8	32.0	320.0
	<i>Flank</i>	10	10.5	53.8	5.6	56.0
	<i>Navel end</i>	7	24.0	76.2	18.3	128.1
	<i>Brisket</i>	7	12.0	41.2	4.9	34.3
	<i>Ribs</i>	8	27.0	75.6	20.4	163.2
	<i>Front shank</i>	9	12.0	57.1	6.9	62.1
	<i>Neck</i>	8	2.0	57.1	1.1	8.8
	<i>Chuck</i>	10	77.0	65.4	50.4	504.0
						<b>1483.7</b>
<i>Pig</i>	<i>Jowl</i>	1	4.0	80.0	3.2	3.2
	<i>Shoulder butt</i>	0	6.0	50.0	3.0	0.0
	<i>Picnic should.</i>	2	8.0	45.8	3.7	7.4
	<i>Rough back</i>	1	35.0	67.3	23.6	23.6
	<i>Rib belly</i>	1	30.0	69.6	20.9	20.9
	<i>Short cut ham</i>	1	12.0	55.3	6.6	6.6
	<i>Feet</i>	4	2.5	25.0	0.6	2.4
						<b>64.1</b>
<i>Sheep</i>	<i>Chuck</i>	0	2.5	65.0	1.6	0.0
		3	5.5		3.6	10.8
	<i>Foreshank</i>	3	0.2	57.0	0.1	0.3
		2	1.4		0.8	1.6
	<i>Brisket</i>	0	1.0	41.0	0.4	0.0
		2	1.4		0.6	1.2
	<i>Breast</i>	0	0.6	75.0	0.5	0.0
		2	2.2		1.7	3.4
	<i>Short rack</i>	1	1.5	75.0	1.1	1.1
		2	3.3		2.5	5.0
	<i>Loin</i>	1	2.1	62.8	1.3	1.3
		4	4.7		2.9	11.6
	<i>Flank</i>	0	0.6	55.0	0.3	0.0
		4	1.4		0.8	3.2
	<i>Leg</i>	0	4.1	54.7	2.3	0.0
		14	9.1		5.0	70.0
						<b>109.5</b>

(Lyman 1979: 543, table 6).

Lastly, on the basis of an assemblage consisting of 19 cows, 2 pigs and 14 sheep, the total MTWT values are compared between the possible units measuring "consumed meat" (see Table 3.7), i.e. MNI, skeletal portion and butchering unit.

Table 3.7: Comparisons of Total MTWT Figures Obtained by MNI, Skeletal Portion and Butchering Unit.

	MNI	% of total	Skeletal portion	% of total	Butchering Unit	% of total
<i>Cow</i>	9,500.0	91.3	1,194.0	86.5	1,483.7	89.5
<i>Pig</i>	343.0	3.3	67.8	4.9	64.1	3.9
<i>Sheep</i>	560.0	5.4	118.6	8.6	109.5	6.6
<b>Total</b>	<b>10,403.0</b>	<b>100.0</b>	<b>1,380.4</b>	<b>100.0</b>	<b>1,657.3</b>	<b>100.0</b>

(Lyman 1979: 544, table 7).

The results from Table 3.7 clearly show that when using MNI to establish the amount of meat actually consumed, the values gained from them overestimate the major contributing species, and underrepresent those that are less prevalent. When skeletal portion or butchery unit is used to measure the amount of consumed meat, more accurate and conservative figures are calculated, with an increase in proportional representation of those species which are found less often in the assemblage.

In the early 1980s, Schulz and Gust (1983a), went a step further, and added two components to Lyman's valuable contribution. They combined the ranking of body parts with the relative costs of each butchering unit. Ranking of animal body parts, according to their economic utility enabled them to investigate the economic decisions that resulted in the differential deposition of body parts, in the faunal assemblage (see Henry 1991 on factors influencing consumer behaviour; and Jones and Metcalfe 1988) and in turn, whether on the basis of their cost in the market place, the butchering unit reflects high, medium or low status (cf. Uerpmann 1973).

To test their hypothesis, Schulz and Gust (1983a), focused on archaeological remains from three 19th century Sacramento sites. Using historical information they established the relative market value of certain cuts of meat.<sup>6</sup> On this point, Huelsbeck (1989) has more recently criticized Schulz and Gust on their assumption that gross price per pound is a fair reflection of consumer preference, this it is rather a generalization, and cannot therefore be considered as universally true. Nevertheless, their historical data enabled them to organize the fauna in terms of economically ranked retail cuts, i.e. a sirloin cut from a beef carcass ranked far higher than either the fore- or hindshank (Schulz and Gust 1983a: 48).<sup>7</sup> The ranking can be seen in Table 3.8.

<sup>6</sup> Huelsbeck (1989) criticized Schulz and Gust, who rank the cuts according to cost based on historical sources, that they do not provide the cost data. This is an invalid criticism, as their data is provided elsewhere (see Schulz and Gust 1983b).

<sup>7</sup> The method of inferring socio-economic status has been extended by Singer (1985) to fish bones. His methodology consisted of two phases. Firstly an analysis of a number of historical newspapers in the late 19th

Table 3.8: Ranking of Various Beef Cuts with their corresponding number of elements (NISP) and skeletal definition of Euro-American beef cuts as given by Lyman (1987a).

Beef Cut	Skeletal Definition	NISP	Ranking
<i>short loin</i>	lumbar vertebrae	7	1
<i>rib</i>	dorsal robs 6-13; thoracic vertebrae 6-13	16	2
<i>sirloin</i>	ilium, sacrum	2	2
<i>round</i>	distal femur and diaphysis	1	3
<i>rump</i>	acetabulum, pubis, ischium, proximal femur	4	4
<i>chuck</i>	thoracic vertebrae 1-5, dorsal ribs 1-5, scapula	11	5
<i>arm</i>	proximal humerus and diaphysis	1	6
<i>cross/short rib</i>	ventral rib 1-13	13	6
<i>brisket</i>	sternabrae, coastal cartilage 1-5	12	7
<i>short plate</i>	costal cartilage 6-13	8	7
<i>flank</i>	none	0	-
<i>neck</i>	axis, cervical vertebrae 3-7	6	8
<i>foreshank</i>	distal humerus, radius-ulna	3	9
<i>hindshank</i>	tibia, astragalus, calcaneum, distal fibula, naviculo cuboid	5	9

(Lyman 1987a: 61, table 1).

On the basis of their ranking they postulated that: (i) since retail cuts from different sections of the carcass are differently ranked economically, the frequency of consumption of differently priced cuts will vary with the socio-economic status of the consumers, and that (ii) this will be discernible archaeologically (Schulz and Gust 1983a: 45). They then went on to demonstrate their methodology using a jail, two saloons and a hotel as their case studies. The city jail contracted local businessmen to get meat at the lowest prices. These meals were then prepared and brought to the prisoners. The other three sites produced food *en masse*, by catering for banquets and their daily number of customers which frequented their establishments with a limited selection of meals to choose from. As beef was the most abundant type of meat, it predominated on menu. No slaughtering waste, i.e. foot or cranial elements, were recovered, as commercial slaughtering was prohibited within the city's limits. At the Golden Eagle Hotel over 50% of the sample was made up of fine steak sections. Fewer roasts were made and more special variety was provided, as the patrons could specify what they wished. The assemblage from the city jail was dominated by soup bones with shoulder and neck pieces, as the jail had subcontracted out to feed its prisoners as cheaply as possible. The two saloons had a mixture of both low value cuts and middle value cuts with a greater proportion of roasts, as the attraction of a free meal brought customers to the bar where most of the income was generated (Schulz and Gust 1983a: 48-50). Incorporating data from Lyman (1977), they showed that at Fort Walla Walla, socio-economic or consumer choices were also evident. The age profiles of cow and sheep indicated that the quartermaster chose older beef and mutton instead of

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century to establish the relative values or importance of certain fish priced in these. Once the fish remains from a site have been analyzed, other than informing one of the most likely socio-economic status of the group or person who consumed the fish, he suggested one can go further and inform one about the various methods of fish preparation; and by implication, the various cuts of fish that may dictate how fish was cooked (Singer 1985).

lamb, as that was all the army could afford. In addition, the fact that pig foot bones comprised 65% of the pig sample, i.e. that pig's knuckles or pig's feet were eaten, suggest that the quartermaster had to look after his purse very well (Lyman 1977: 69, 71).

Schulz and Gust's (1983a) model was modified to clarify the cost-efficiency of beef purchases. Lyman (1987a) wanted to measure "cost-efficiency" of a consumer's beef purchasing behaviour. He used price information, but also looked at total pounds per cut, the percentage of edible meat per cut and the resulting meat yield of a cut. He then calculated the quantity of edible meat that could be purchased for \$10.00, which is a more direct measure of 'cost efficiency'<sup>8</sup>, which is the "degree to which a consumer maximizes the amount of meat purchased while minimizing the cost" (Huelsbeck 1989: 114). Lyman (1987a) criticized the term "socio-economic position" as an ambiguous term in zooarchaeological contexts. It is a rather broad concept and might connote different concepts (status, prestige, and/or income level) of a person's or group's position in a society to different analysts (Lyman 1987a: 58; see also Reitz 1987 for an extended discussion on this point). The data given by Schulz and Gust fits Lyman's earlier model. Although they have used NISP, Lyman (1987a) suggests the use of the minimum number of beef cuts (MNBC), identical to the minimum number of butchered units, as various beef cuts have different number of bones (see Table 3.8 above). MNBC can only be used on an ordinal scale.

Hereafter the debate becomes more technical. In their analyses, Lyman (1987a) noted that Schulz and Gust needed to control for interdependence. The use of ordinal rather than interval scale statistical tests, suggested to Lyman (1987a: 60) that they are aware of the potential problems of interdependence. Lyman (1987a) proposed the use of MNBC to eliminate the problems of NISP. Schulz and Gust use NISP to obtain interval scale measures (percentages) of beef cut frequencies, but interpreted these frequencies from an ordinal scale when they employ the Kolmogorov-Smirnov two-sample test to compare different bone assemblages (Lyman 1987a: 60). Although economic rank may be a measure of purchasing power and may reflect income level, it may reflect the relative cost per pound of different meat cuts and not the cost-efficiency of purchasing one kind of beef cut over another. *As economic rank does not take into account the yield of a beef cut*, it is difficult to understand how the economic rank could be a measure of cost. While it is not possible to demonstrate empirically that cost-efficiency of beef-purchases as reflected by meat yield is tightly correlated with purchasing power, income level, or economic class, there are theoretical reasons to believe such a correlation exists (Lyman 1987a: 62). Lyman's (1987a) concept of cost-efficiency focused on the net cost of edible meat (i.e. price/lb. divided by the proportion of edible meat) and that people would purchase those cuts that provide the most meat.

The interpretive value of ranking meat cuts (NISP vs economic rank) can easily be plotted to establish whether the "socio-economic" curve is indicative of low or high status (see Lyman 1987a: figure

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<sup>8</sup> Huelsbeck (1991) provides additional information on cost-efficiency, noting that modern garbage projects have shown that people with limited purchasing power often cannot afford to purchase efficiently. Therefore he suggests that Lyman's method be refined (Huelsbeck 1991: 68).

1 and 2)<sup>9</sup>. This was done with the City Jail and Golden Eagle Hotel assemblages from Schulz and Gust. Most meat at the City Jail was provided by the arm or chuck beef cuts, two high-yield but relatively inexpensive cuts. At the Golden Eagle Hotel, most meat was provided by the short loin, a relatively low yield but expensive cut. These values conform to the conclusions reached by Schulz and Gust regarding socio-economic differences between the two features. At Fort Walla Walla neither NISP per beef cut nor the derived MNBC can be explained by the economic rank model of Schulz and Gust (Lyman 1987a: 63-64). MNBC could provide a more accurate reflection of consumed meat, while MNI would provide an estimate of available meat. It was proposed that MNBC as related to cost per beef cut provided an accurate measure of cost-efficiency of beef purchases, which might conceivably be related to status (and thus more or less directly to socio-economic position) by other, non-faunal lines of evidence (Lyman 1987a: 64-65).

Table 3.9: Calculation of Meat Yield and Meat Rank from MNBC. Note the contrast in Meat Yield Rank from Edible Rank based on data on relative prices noted by Schulz and Gust (1983b).

Beef Cut	Edible Rank	Pounds	Edible Percent	Edible Rank	Meat Yield (lbs)	Meat Yield Rank
<i>short loin</i>	1	30	67	3.0	20	3.5
<i>rib</i>	2	27	76	1.5	20	3.5
<i>sirloin</i>	2	21	57	8.5	12	7.0
<i>round</i>	3	42	60	6.0	25	2.0
<i>rump</i>	4	10	52	10.0	5	11.5
<i>chuck</i>	5	43	65	4.5	28	1
<i>arm</i>	6	23	65	4.5	15	6
<i>cross/short rib</i>	6	12	50	11.0	6	10
<i>brisket</i>	7	12	41	13.0	5	11.5
<i>short plate</i>	7	24	76	1.5	18	5.0
<i>neck</i>	8	2	58	7.0	1	13.0
<i>foreshank</i>	9	12	57	8.5	7	9.0
<i>hindshank</i>	9	18	43	12.0	8	8.0

(Lyman 1987a: 62, table 2).

<sup>9</sup>. Binford's (1978: 81) bulk utility and gourmet curve are very similar or identical to the curves created by Lyman (1987) and Huelsbeck (1989) based on high and low status, and cost efficient and inefficient strategies.

Table 3.10: Quantification of Data from the Fort Walla Walla Dump on the pounds of meat actually provided.

Beef Cut	NISP	MNBC	Pounds of Meat Provided	Rank of Pounds of Meat Provided
<i>short loin</i>	48	10	200	2.5
<i>rib</i>	66	8	160	4.0
<i>sirloin</i>	13	10	120	6.5
<i>round</i>	16	8	200	2.5
<i>rump</i>	29	12	60	10.0
<i>chuck</i>	96	10	280	1.0
<i>arm</i>	18	8	120	6.5
<i>cross/short rib</i>	20	4	48	11.0
<i>brisket</i>	35	7	35	12.0
<i>short plate</i>	34	7	126	5.0
<i>neck</i>	35	8	8	13.0
<i>foreshank</i>	35	9	63	9.0
<i>hindshank</i>	34	12	96	8.0

(Lyman 1987a: 65, table 5).

In "Zoological Measures Revisited" Huelsbeck (1989) applied this methodology to Lyman's data (1987a) and concludes that the consumer behaviour at the Golden Eagle Hotel was cost-inefficient, while at the Sacramento City Jail, the jailer was concerned with cost per inmate's meals, and the black regiment with high purchasing power at Fort Walla Dump was not overly concerned with cost-efficiency.

Thus, the distinction made here between Schulz and Gust (1983a; 1983b) and Lyman (1987a) is particularly relevant to historical archaeological studies. Schulz and Gust (1983a) are saying that consumer choice is a function of economic ability to acquire certain cuts of meat over others, and those with greater purchasing power will be able to acquire more expensive cuts, while those with limited purchasing power may be forced to acquire cheaper cuts of meat. In contrast, Lyman (1987a) stated that it may not be a function of cost, but rather a function of cost-efficiency, whereby meat yield per butchering unit may mediate the cost of it, thereby allowing certain consumers to purchase cuts with less consideration of price, but more concern with the total amount of meat that they will be able to put on the table.

More recently, Schmitt and Zeier (1993) have used another unit of analysis - the Euroamerican beef cut unit or ENU. On the basis of their data, they elected to calculate ENU meat weight estimates in order to examine the cost-efficiency of beef purchases. To calculate available meat weights for each skeleton element, the pounds of edible meat for Euroamerican beef cut unit were divided by true number of bones in each cut (Schmitt and Zeier 1993: 32). In conclusion, they note that although various bones in a butcher unit (and various portions of bone have different amounts of meat), the adjusted ENU estimates

clearly represent a more accurate measure of available meat, particularly when analyzing single-serving cuts purchased from retail markets (cf. Huelsbeck 1991).

Despite these inroads made into the debate about the correct unit of analysis to establish the amount of meat actually consumed, a number of problems still remain. Huelsbeck (1991) suggested that more data is needed on the size of steaks, roasts, chops and other bones to establish the average amount of attached meat to a cut. Butchering units (wholesale cuts) are much larger than units of acquisition (retail cuts), and consequently, more meat is 'represented' when this unit of acquisition is used. It appears that meat amount per butchering unit rather than meat amount per purchased item skewed the represented beef total - i.e. the unit selected for analysis does affect the interpretation of the data (Huelsbeck 1991: 69, 70). The question still remains: how was meat acquired? As whole animals, wholesale cuts, or as retail portions? (Huelsbeck 1991: 72).

### 3.11. TAPHONOMY.

Despite knowing which methods or analyses are more or less applicable to one's site or faunal material, *the problem of taphonomy cannot be ignored.*

"The difference between the structure of the killed population and that of the excavated assemblage, represents the behaviour of the accumulating agent, together with the action of any other taphonomic agencies" (Turner and Fieller 1985: 478).

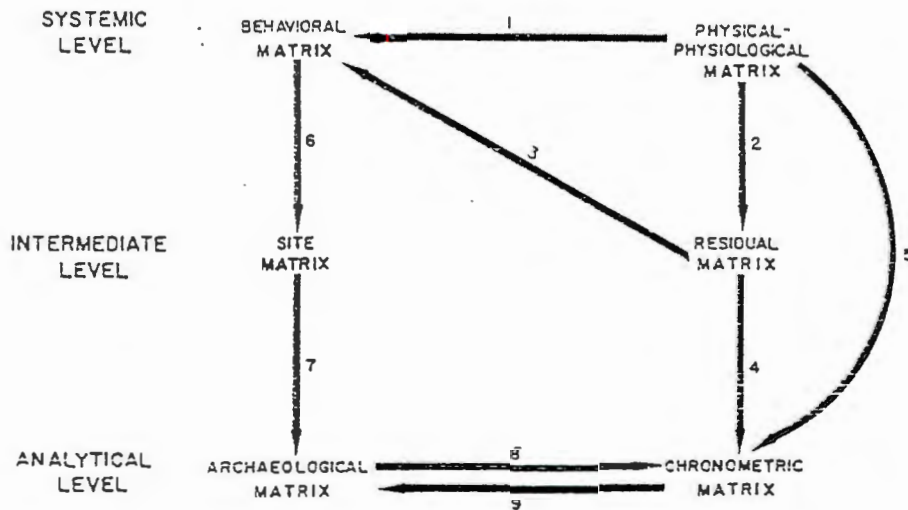
Taphonomy has a considerable impact on conclusions drawn by the archaeologist, and on the interpretation and analysis of the faunal material by the zooarchaeologist. However, the exact extent of taphonomic pressures or the degree to which the original death assemblage has been altered by cultural and non-cultural agencies has to be inferred or established by the zooarchaeologist when analyzing the faunal material and by the archaeologist who considers his or her site notes prior to writing up the report.

The approach taken here is to discuss both general and specific factors which may affect the resulting faunal analysis. Firstly, a general systems model is presented and explained. It will provide a basic background to further discussions in this section. Thereafter discussion will turn to specific agents or agencies which may individually or concurrently affect the original assemblage.

### 3.12. GENERAL SYSTEMS MODEL

This model, although called the general archaeological dating model by Jeffery S. Dean (1978), is indeed a helpful tool in tracing the life of an artefact, whether a bone specimen, ceramic form or clay pipe. It discusses how the artefact is firstly incorporated into the archaeological matrix; what processes occurred prior to its incorporation and subsequent inclusion in the archaeological matrix and briefly about its extraction from the archaeological record. The model is provided in the figure below (see Figure 3.1; see also Lyman 1982: 344; 1987a; 1987b: 95; 1994c: 24, figure 2.3 on the taphonomic histories of bone).

Figure 3.1: "General Systems Model".



- Arrow 1 = the material is removed from the physical-physiological matrix when it is procured for some use by a group of people
- Arrow 2 = potentially datable materials can also pass directly into the residual matrix and can be
- Arrow 3 = extracted from the matrix for use in the behavioural matrix or for
- Arrow 4 = study in the chronometric matrix
- Arrow 5 = materials can also pass directly from the physical-physiological matrix into the chronometric matrix
- Arrow 6 = once the site is abandoned, the materials will pass from the behavioural to the site matrix
- Arrow 7 = further transformations whether cultural or natural are halted when the site is excavated, and the elements and their relationship are fixed in the archaeological record
- Arrow 8 = the recovered objects are transferred to the appropriate chronometricians for analysis
- Arrow 9 = chronometricians in return provide archaeologists with additional information that can be derived from the specimens.

Dean (1978) sees the model as a system of interrelationships between matrices (see also Lyman 1994c: 54-55 for a discussion on the various assemblages that exist). Each of the matrices are networks of conditions, forces, and relationships that encompass the material elements. The systematic level consists of the physical-physiological and the behavioural matrix. The former produces the properties that permit the 'dating' of objects by various chronometric means, while the latter through behavioural processes and relationships imparts behavioural information onto the objects. The imbuing of particular behavioural and chronometric information is structured by the prevailing conceptions of the conditions and relationships that surround them in the systematic milieu (Dean 1978: 232, 234), e.g. objects are continually refashioned by current trends and styles around us, whether local or global - the same goes for archaeologically recovered artefacts as well. However, the behavioural context of the site and its interpretation by the archaeologist can be affected by secondary additions or subtractions of materials, as understood in the widest sense. Factors which affect the behavioural context include the stockpiling of material; the reuse of material, with or without modification, either for its original purpose or for a different one; recycling of material from the site matrix; the addition of younger materials to extant features; or the 'total' consumption of material as food or fuel, entirely eliminates the consumed material as a potential source of information (Dean 1978: 241).

Processes that modify or destroy the behavioural and/or chronometric information operate on the intermediate level, i.e. here one is concerned with what happens to the materials between the time of their entry into the site matrix and the eventual excavation of the site. Here the site matrix reflects the structure and relationships of the material products of human behaviour after those products have been removed from participation in human behavioural systems (Dean 1978: 232-233). The re-utilization of the site locus not only disturbs the site matrix but often leads to the transferal of site matrix materials into totally different behavioural systems (Dean 1978: 242). The re-utilization of the site locus can be seen in both pre- and historical archaeology. The classic prehistoric example in southern Africa could be the removal of rich archaeological deposit by farmers for use as fertilizer. In historical archaeology, both in the New World and elsewhere, it is not unknown that during the period of colonial urban expansion and decreasing urban space for all forms of refuse to be removed from household and other lots and dumped near the sea shore or into the sea as part of landfilling practices (see Huey 1984).

The residual matrix deals with dead organisms whose remains have not been used by human beings or succumbed to weathering or decay. The material remains of an organism pass into the residual matrix upon the death of the organism (Dean 1978). The situation is complicated by the fact there are many ways for "members of a biotic community to die, and many ways exist for dead organisms to become a fossil assemblage. Different taphonomic histories may result in similar fossil records regardless of the initial biotic community or set of dead organisms, the phenomenon of *equivifinality*" (after Gifford 1981 in Lyman 1987b: 99, original emphasis).

The archaeological matrix at the analytical level is made up of two components. Firstly, the archaeological record which is made up of those site materials, element attributes and relationships that are perceived and recorded by archaeologists. Secondly, the behavioural systems within which archaeologists manipulate and interact with the elements in the archaeological record to produce

information on the behavioural matrix in which the materials and relationships originated (Dean 1978: 232-233).

The systems model, represented in the flow chart above, adequately explains the relationship between artefacts and the matrices of which they are part. Artefacts are constantly moving around and can at any time pass from one matrix into another, or re-enter the behavioural matrix in certain cases. An understanding of these processes is vital to "deconstruct" possible patterns and to acknowledge the process through which bone can undergo. At Sea Street, for example, a degree of faunal re-use was noted. There was clear evidence of bone blanks that had been cut from the proximal tibia to make bone buttons.

### 3.13. DIFFERENTIAL SURVIVABILITY.

The classic study on bone survivability was done by Bob Brain (1967; 1969) in the late 1960s. He analyzed the faunal material from a number of Khoikhoi villages along the Kuiseb River in Namibia. The domestic refuse, consisting mostly of goats (which are very similar to sheep), was collected from these villages to ascertain how human and carnivore - in this case dogs - behaviour affected the differential survivability of skeletal elements in general.

Among these villages goats are the only mammals normally used for meat, with their remains predominating the faunal assemblage. Once the meat is eaten off the bone (and simple marrow extraction has occurred), the bones are discarded. They are further gnawed by dogs, after which they are left to bleach in the sun.

Survival of part of a long-bone can be related to the times at which each epiphysis fuses to the shaft (see Table 3.12). In the case of the goat, the distal epiphysis fuses when the animal is four months old; fusion of the proximal end is not complete until 17 months. This means that when a year-old goat is eaten, the distal end of the humerus will be fully ossified and unchewable, while the proximal end remains cartilaginous (Brain 1969: 18-19).

In addition to fusion times, the structural considerations are very important. "The proximal end of the humerus is wide, thin walled and filled with spongy bone; the distal end is comparatively narrow and compact" (Brain 1969: 18-19). Cattle bones are a clear example of "structural considerations". Not only are they larger, but they are also more dense, therefore surviving more often than other smaller sized domestic species bones, resulting in skewed meat estimates in favour of larger bovids.

In 1984, R. Lee Lyman noted that what appeared as selection might represent differential destruction, associated with depositional circumstances and bone density. Taphonomists now agree that the ability of the bone part to withstand destructive forces is a function of bone density (see Grayson 1989: 647; Lyman 1984; 1994c: 235; Lyman, Houghton and Chambers 1992) and structure. Lyman suggests that bulk density (the ratio of the weight of a volume of substance to the volume of that substance including the pore space volume) is causally related to the potential of a bone to survive destructive forces (compare Table 3.11 with Table 3.13) (Lyman 1985: 227). Therefore, bulk utility strategy or selection may actually result in bone parts of high bulk density having low meat utility and low

MGUI values, and the bone parts of low bulk density having high meat utility and high MGUI values (Lyman 1985: 230; 1994c: 258; see also Lyman 1994c: 270, for discussion on density-mediated destruction between low-density long bone ends and the high-density long bone shafts). The loss of body parts of certain density may in turn be a function of human cultural activities, as the disarticulation of a skeleton is no doubt largely a function of the soft tissue anatomy associated with particular joints and elements (Lyman 1984: 279). Additional information, provided by a later case study by Donald Grayson (1988: 73) on bone density of sheep, concluded that "the absence of high utility but low density sheep parts may be better explained as the result of carnivore chewing of bone", which in turn is a function of human behaviour and food preparation or human bone processing activities (see Grayson 1989: 648).

Table 3.11: Data on Bone Density and MUI figures for domestic sheep. Data from Rothschild and Balkwill (1993: 88, table 8).

	Bone density	MUI
<i>astragalus</i>	0.47	6.37
<i>atlas</i>	0.13	18.65
<i>axis</i>	0.16	18.65
<i>calcaneum</i>	0.64	6.37
<i>carpals</i>		4.74
<i>cervical vertebrae</i>	0.19	55.32
<i>femur, distal</i>	0.28	78.24
<i>femur, proximal</i>	0.36	78.24
<i>humerus, distal</i>	0.39	28.24
<i>humerus, proximal</i>	0.24	28.24
<i>innominate</i>	0.27	81.30
<i>lumbar vertebrae</i>	0.29	38.88
<i>mandible</i>	0.57	14.12
<i>metacarpal, distal</i>	0.49	4.74
<i>metacarpal, proximal</i>	0.56	4.74
<i>metatarsal, distal</i>	0.46	6.37
<i>metatarsal, proximal</i>	0.55	6.37
<i>phalanx 1</i>	0.42	3.37
<i>phalanx 2</i>	0.25	3.37
<i>phalanx 3</i>	0.25	3.37
<i>radius, distal</i>	0.43	14.01
<i>radius, proximal</i>	0.42	14.01
<i>ribs</i>	0.25	100.00
<i>sacrum</i>	0.19	81.30
<i>scapula</i>	0.36	44.89
<i>skull</i>		12.86
<i>sternum</i>	0.22	90.52
<i>tarsals</i>	0.39	6.37
<i>thoracic vertebrae</i>	0.24	46.47
<i>tibia, distal</i>	0.50	20.76
<i>tibia, proximal</i>	0.30	20.76
<i>ulna, distal</i>	0.44	14.01
<i>ulna, proximal</i>	0.30	14.01

The structural form may not only affect differential survivability, but also the sexing of animals. For example, in sheep and goats, the sex of the animals is clearly reflected in either the horn-cores or the frontal bones of hornless animals, but quantification is difficult because of differential preservation. Even if frontal bones were counted, *male sheep would be over-represented due to the heavy structure of their skull debris* (Uerpmann 1973: 313, emphasis added).

A tabulated chart (Table 3.12) of the differential survivability of long bones because of their fusion times can be seen below. One should note the differential survivability of proximal and distal elements of the same body part.

Table 3.12: Times at which epiphyses fuse in sheep. All figures are given in months.

		Lesbre (1897) <sup>10</sup>	Smith (1956) <sup>10</sup>	Smith (1956) <sup>11</sup>	Silver (1969) <sup>11</sup>	Tschirwinsky (1889, 1910) <sup>11</sup>
<i>humerus</i>	proximal	42	17	17	36-42	16-21
	distal	3-4	4	4	10	3
<i>radius</i>	proximal	3-4	4	4	10	3
	distal	40	21	21	36	16-21
<i>ulna</i>	proximal	-	21	21	30	
	distal	-	26	26	30	
<i>femur</i>	proximal	36-42	17-20	17	30-36	16
	distal	42	18-22	18-20	36-42	16-21
<i>tibia</i>	proximal	42	25	25	36-42	16-21
	distal	15-20	15	15	18-24	10
<i>metacarpal</i>	proximal	before birth	-		before birth	
	distal	20-24	16	16	24	15-16
<i>metatarsal</i>	proximal	before birth	-		before birth	
	distal	20-24	16	15	20-28	15-16
<i>scapula</i>	bicipital				6-8	
	tuberosity					
<i>1st phalanx</i>	proximal			5	-	
	distal			9/10	before birth	
<i>2nd phalanx</i>	proximal			6/8	before birth	
	distal				13-16	
<i>3rd phalanx</i>	no true				partly ossified	
	epiphesis				at birth	
<i>calcaneum</i>				15	30-36	
<i>pelvis</i>	main bones				6-10	
	ilium				42	
	ischium				42	
	pubis				42	

The discrepancies in the data given by the different researchers relates probably to the different sample populations that were studied. Lesbre's (1897 in Silver 1969) and Tschirwinsky's (1889, 1910 in Silver 1969) data comes from French and German journals respectively. The sample that Smith drew his data from was based on "Clun Forest Sheep". In all cases the samples seem to be of European origin and

<sup>10</sup>. Data from Brain (1967: 5, table 2).

<sup>11</sup>. Data from Silver (1969: 285-288).

European climatic conditions. For these reasons the data may not be comparable with domesticated sheep in the southern hemisphere. Nevertheless, the data is an indication of the differential fusion times within different sections of the same skeletal element.

In Brain's (1969) original study, he also measured the "Specific Gravity" of the bones, which is a measure of the amount of water displaced when either the proximal or distal portions of a long bone are submerged in water. He conclusively showed that "percentage survival is related to Specific Gravity of the part concerned, but inversely to the fusion time expressed in months" (Brain 1969: 19). Therefore, all three factors - fusion times, bone structure and "Specific Gravity" - play a role in the bone's survivability. Recent research confirms Brain's original conclusions (see Lyman 1994c: 236).

Table 3.13: Percentage survival of skeletal elements as listed by Brain (1969: 20, table V).

<b>Skeletal Element</b>	<b>Number found</b>	<b>Original Number</b>	<b>% Survival</b>
<i>half mandibles</i>	369	586	62.9
<i>humerus, distal</i>	336	586	57.3
<i>radius &amp; ulna, proximal</i>	279	586	47.6
<i>metacarpal, distal</i>	161	586	27.4
<i>metacarpal, proximal</i>	129	586	22.0
<i>scapula</i>	126	586	21.5
<i>tibia, distal</i>	119	586	20.3
<i>radius &amp; ulna, distal</i>	114	586	19.5
<i>metatarsal, distal</i>	110	586	18.8
<i>metatarsal, proximal</i>	107	586	18.3
<i>pelvis, half</i>	107	586	18.3
<i>calcaneum</i>	75	586	12.8
<i>tibia, proximal</i>	64	586	10.9
<i>astragalus</i>	61	586	10.4
<i>femur distal</i>	56	586	9.6
<i>axis</i>	25	293	8.5
<i>atlas</i>	20	293	6.8
<i>humerus, proximal</i>	33	586	5.6
<i>sacrum</i>	16	293	5.5
<i>femur, proximal</i>	28	586	4.8
<i>cervical 3-7 vertebrae</i>	47	1465	3.2
<i>lumbar vertebrae</i>	30	1758	1.7
<i>phalanges</i>	47	3516	1.3
<i>ribs</i>	66	7618	0.9
<i>thoracic vertebrae</i>	24	3809	0.6
<i>caudal vertebrae</i>	1	4688	0.0

### 3.14. FOOD PREPARATION.

When discussing taphonomic issues one often fails to consider the possible pre-depositional factors which may affect the faunal (or floral) data. General biases introduced before deposition include disproportionate representation of certain taxa in relation to others, skewed relative frequency of skeletal elements or plant parts, and incidental inclusion of non-cultural remains in the archaeological record.

Faunal pre-depositional factors relate mainly to the process(es) that bones are subjected to prior to deposition. This is usually in the form of cooking, but would also relate to how the carcass/animal is processed into smaller pieces (see below). Without being aware of the "general historic butchery pattern" at present, let us consider the ethnographic case study mentioned above, of the Khoikhoi villages along the Kuiseb River. Here the animal is butchered in a certain fashion, whereafter it is cooked separately.

"Once dead, the goat was suspended by its hind feet from an overhanging branch and the skin removed complete[ly], being split along the mid-ventral line, along the insides of the limbs and round the neck just behind the horns. It was salted and pegged out in the shade. The abdominal cavity was opened next and the viscera removed; the stomach was split open, its contents emptied out and its lining washed. This, together with the liver and kidneys, was said to be a delicacy. The intestines, once the contents (sic) had been squeezed out, was kept for the making of sausage. Other abdominal organs were fed to the dogs.

"Turning again to the carcass, the front legs were removed complete with the scapulae; hind limbs were taken off with the innominate bones attached, by cutting through both the pelvic symphysis and the sacro-iliac joints. The feet were severed from the legs at their metapodial/phalangeal joints; these were taken by the children who cooked them themselves over a fire.

"Ribs on one side of the carcass were separated at their vertebral articulations. Finally the head was removed, a knife being used to sever the axis from the third cervical vertebra. The atlas and axis vertebrae remained attached to the occiput.

"All meat is normally cooked before it is eaten, either by boiling in large metal pots or by direct roasting over the fire. [...] The complete head was then boiled for several hours in a pot standing over the fire. All edible meat was picked from it and eaten, after which the brain-case was smashed in the occipital region with a hammer-stone for removal of the brain. The skull and mandibles were then passed on to the dogs" (Brain 1969:15).

From ethnographic studies such as this one, or butchers' diary accounts, one can gain appreciable knowledge of carcass utilization. Ethnographically one would expect the faunal material to indicate a certain butchery pattern, with the bones either being boiled or roasted over the fire, with subsequent fragmentation and carnivore "damage".

Moving away from ethnographic studies to urban archaeology, similar pre-depositional factors affect the faunal record. These include selecting, butchering, preparing and disposal activities. These activities may have occurred at either the site locus or some distance away. At Oudepost, for example, it was suggested that the sheep probably arrived alive or as whole carcasses, and that selective destruction was subsequently important in shaping the body part distributions (Cruz-Urbe and Schrire 1991: 99), i.e. pre-depositional activities affected the profile of the death assemblage. Biases may also exist because different portions of the carcass were discarded where the animal was killed (slaughter house),

dismembered (slaughter house, meat market, kitchen), or consumed (house). Different preparation procedures similarly affect the survivability of the bone or the degree of fragmentation within the faunal assemblage. Preparing meat with a cleaver is likely to leave numerous bone slivers that cannot be identified, while sawing may leave larger, more identifiable fragments (Reitz and Scarry 1985). The increased incidence of small fragments may in turn suggest a practice of smashing joints with a cleaver and stripping meat from bones to make stew-like chunks (Reitz and Scarry 1985: 86). Bone fragmentation may be the result of butchery and pounding of bones in order to liberate the marrow; but also from unintentional trampling or unintentional breakage resulting from excavation. If the former, *deliberate percussion* for marrow extraction would naturally leave very little of the diaphysis intact and of course produces debris of numerous bone chips and splinters (Davis 1987). The degree of fragmentation can be established by the following equation:  $\text{Fragmentation} = \text{NISP}/\text{grams}$ , where the total NISP value is divided by the weight for the same NISP taxon. One must also note that since processes of bone destruction are so diverse, it is wiser to assume that bone fragmentation resulted from differential destruction rather than a single cause (see Grayson 1989: 651).

Roasts, for example, might be reflected in the skeletal collection by large, generally unmodified, bones from upper leg portions items (Reitz and Scarry 1985: 84). Another butchering method is to cut meat off the bone, leaving small cuts along the shaft face. Such portions could be served either to individuals or to groups (Reitz and Scarry 1985: 85).

In addition, there may be no evidence for some meat consumed at the site. Preserved meat would probably have no characteristics that could be used, in contrast to bones from meat which has been consumed fresh. Prolonged boiling is more destructive to bone than roasting. Bones in cured meat may be discarded before the meat is brought to the site, or the curing process may so weaken the bones that they do not survive. Meat consumed from salted pork, for example, was most probably eaten off the bone (Davis 1987: 27). Bones from salted fish were probably discarded where the fish were processed, so that imported salted fish will leave little evidence (cf. Cumbaa 1981 in Reitz and Scarry 1985: 9).

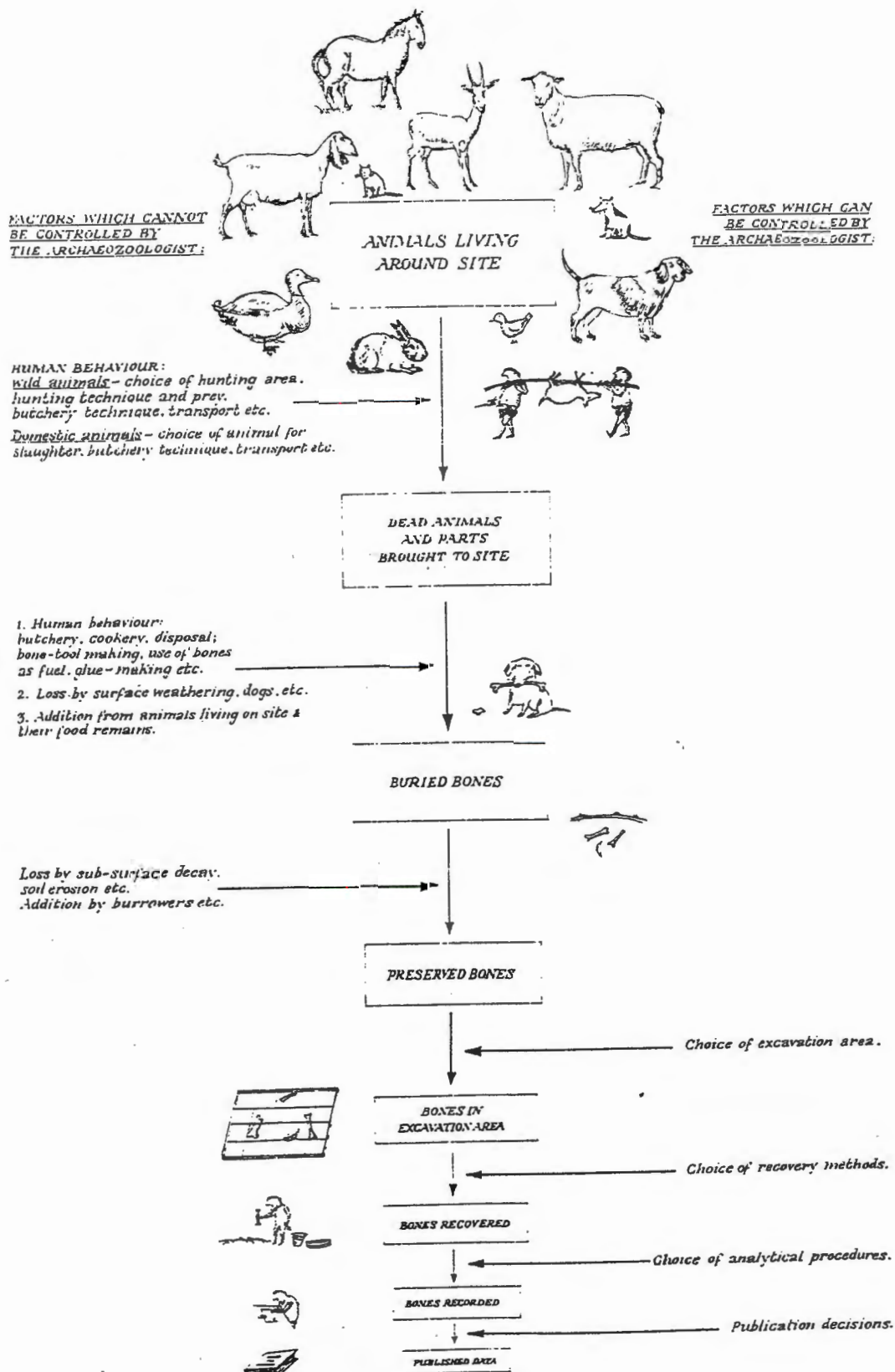
As with faunal material, pre-depositional biases also exist for plants. Thus if botanical analysis is made, one should be aware that there is a bias towards those plants that produce by-products. In addition, one should note that food preparation activities will also affect the plant's character as to whether a particular resource will be represented in the deposit or not. For example, grinding grains will destroy their identifiable characteristics (Reitz and Scarry 1985).

Irrespective of whether one is dealing with prehistoric or historic faunal or floral material, the survivability of both is influenced by the processing activities, subsequent food preparation techniques and selective discard. These in turn affect the archaeological conclusions drawn from the material.

### 3.15. DOGS.

Simon Davis (1987) placed dogs mid-way in the chain of events that could alter the original death assemblage (see Figure 3.2). One cannot deny the fact that dogs may have played and play a role in

Figure 3.2: Some of the factors which may have affected zooarchaeological data. On the left are factors over which the archaeologist has no control, and on the right are those which can be controlled (Davis 1987: 23, figure 1.1.).



altering, rearranging or subtracting faunal material (either non-cultural bone or cultural food bone) from the site matrix (see Lyman 1982: 351). Nineteenth century Cape Town was no exception, and the citizens of this colonial bastion decided to voice their dissatisfaction by writing letters to the Editor of local newspapers. Not only were dogs noticed near the Fish Market, but also near the Shambles, as a colonist noted:

"[...] I took a walk to the shambles, determined to find fault with the butchers [...] [T]he shambles being as clean as could be expected; but when I walked round, I must say I was surprised that, as yet, proper attention had not been paid to the space between those buildings and the sea, [...] Only think - they had actually been burying putrid meat, heads, &c., in the sand, and my astonishment increased, when I was told that it had been done by order of the municipality. [...] bury these things two or three feet deep, to be dug up again, or scratched out by the dogs; [...]"<sup>12</sup>

The local newspaper articles on dogs paint a bleak picture of Cape Town overrun by strays, attacking prominent citizens, leading to their possible violent removal from society by police action. However biased these views may be, they nevertheless indicate that dogs were coexisting in the same environment as the human inhabitants and may have played a role in providing a bias in the faunal analysis.

The practical problems of dog activity can be seen in the faunal material analyzed by James Kelly (1975), where much of the collection was in a fragmentary and extremely chewed condition, making identifications of artiodactyl material difficult. In 1970, Patricia Lyon had already observed that domestic dogs may play a significant role in distorting the archaeological record as is reflected in unmodified bones. She indicated that medium-sized dogs may totally devour the bone of small animals and destroy identifiable portions of the bone of medium-sized animals, leaving only the remains of large animals in condition for identification. In contrast, Richard Casteel (1971: 467) has remarked that if an animal devours an item, it does not mean that the item is therefore destroyed. Where medium-sized animals were concerned, the dogs chewed off all the articulations and occasionally consumed long bones, while bones from large animals were left relatively intact (Lyon 1970: 214-215; see also Casteel 1971: 467). The preference for certain body parts by dogs is known from the analysis of faunal material from Antelope House, where bone scraps were apparently given to dogs. The preferred areas of chewing were the articular ends, those areas possessing larger amounts of cartilage and therefore, the sections with the most nutritive value (Kelly 1975: 83). Patricia Lyon (1970) suggested that this would lead to an underestimation of protein intake from smaller animals, i.e. smaller animals are underrepresented.

Two interesting experimental studies were done on the effects of dogs' behaviour on the food remains thrown away by humans. The 1981 study by Susan Kent evaluated two issues: firstly, how would human utilization of food remains affect the selection choices made by dogs; and, secondly, the length of actual devouring that would be required to present an identifiable pattern.

At the outset, Kent (1981: 368) stated very positively that "at every Navajo, Spanish-American and Euro-American residence with pets, dogs were more influential in the spatial distribution of faunal remains than were humans". Ethnographic observations indicated that the dogs owned by Navajos merely

<sup>12</sup>. *Cape Town Mail*. Vol. 8, No. 385, July 15, 1848, *PUBLIC IMPROVEMENTS*, pp.3-4.

A number of specimens from Sea Street showed evidence of various degrees of etching. One bone had a clear puncture mark, and other bones showed evidence of gnawing and non-human behaviour. Gnawing could mostly be attributed to rodents, with a lower incidence of carnivore (dog) damage, with some porcupine gnawing also evident. The fact that carnivore (dog) damage is not extensive at Sea Street does not mean that they did not play a role. Carnivore tooth marks, however, may not always be present on bones even if carnivores had unhindered access to them. Kent (1981) showed in her study that *Canis familiaris* can gnaw bones and yet leave no visible gnawing marks (see also Haynes 1983 in Lyman 1994c: 277). Two mediating factors in the extent of carnivore damage may lie in the nature of the deposit. With a much larger accumulation of bone, such as at a dump site, one might expect a lower incidence of carnivore activity. Similarly the method of dumping - open dumping, dumping by burial or partial burial - would have influenced the degree of non-human damage noted on the collection of bones.

Alternatively, their partial invisibility may be the result of sampling procedure on my part, and the exclusion of two of the houses (ADA and PRI) and a selection of units from the other two houses (JAM and MAN); or alternatively the selection of medium sized bovids as the unit of analysis to the exclusion of smaller and larger sized animals; or alternatively that the smaller sized material is simply absent from the site due to both the destructive nature of dogs, the consumption and removal of bones from the site by dogs, and the choice of screen size with the resulting diagnostic material being excluded from either preliminary or secondary analysis. It has been noted elsewhere that the type of sieve used in one's study may effect both the particular role in the material and percentage of material recovered at a site (see Reitz 1982: 56; see Davis 1987: 28-29). In addition, as the aim of the microscopic analysis and as the questions that I posed had no direct bearing on the quantification and qualification of gnaw damage, whether rodent or carnivore, far less acknowledgment of this form of damage was taken. When damage was noted that did not relate to human behaviour, it was often ignored, unless it was far less common, like puncture marks. At another site, the Drostdy, the incidence of carnivore damage was far higher, as part of the analysis included the quantification of gnaw damage. At this site gnaw damage accounted for 21.4% of the total frequency of butchery evidence (Woodborne 1994: table 1). Despite the superficial examination of butchery marks on the faunal sample from the Paradise Main House, the analyst noted that the "possibility of damage by domestic dogs, and even post-depositional processes, needs to be considered" (Avery 1989: 115), while at Oudepost I, an isolated outpost 120km from the Castle, Cruz-Urbe and Schrire (1991: 99) state that the virtual absence of gnaw marks suggest that "carnivores were not important in affecting the body part frequencies and distribution patterns" at the site - although no data is given to this respect. Alternatively they suggest pre-depositional cooking of meat until the bones had no nutritional value, may have accounted for the disinterest shown by the carnivores for the left-over waste (Cruz-Urbe and Schrire 1991).

In addition, in light of the experimental archaeology on carnivore damage above, simply because there is no or little evidence for a certain behaviour, does not mean that it did not occur. As Michael Schiffer stated: "The major flaw in inferential arguments based on excavated data is the assumption, always implicit, that the absence of evidence is evidence for absence" (after Schiffer 1987: 356 in Lyman

1994c: 231). Therefore, the likely incidence of gnawing and chewing were probably far higher than was noted.

### 3.16. POST-DEPOSITIONAL FACTORS.

Post-depositional factors can result in the physical or chemical alteration of the bone, resulting in subsequent analyses being skewed. Some of the more frequently cited post-depositional factors are listed below:

- differential disposal;
- erosion;
- fire;
- the weathering of exposed bone debris;
- adverse soil chemistry depending upon burial conditions, i.e. pH level within the soil reflecting the alkalinity or acidity of the soil;
- mechanical disturbances;
- differential destruction or disturbance of body parts by carnivores/dogs or burrowing animals;
- depositional bias(es), whether one is dealing with feature, sheet or landfill deposit<sup>13</sup>;
- durability (and density) of elements;
- re-use of material, e.g. the use of bone as raw materials in button making, tool production, or other industrial uses, such as glue making;
- re-cycling of material;
- the addition of younger materials to extant features;
- consumption of material as food or fuel;
- trampling;
- excavation methodology, including bulldozers;
- collection techniques;
- screen size selection;
- mixed deposits;
- sample size;
- degree of identifiability; and
- analytical biases (see Davis 1987; Dean 1978; Reitz and Scarry 1985; Rothschild and Balkwill 1993; Uerpmann 1973).

Post-depositional factors can either affect the weight of the bone, the degree of fragmentation of the faunal assemblage, or influence the survivability of skeletal elements in relation to others, as well as the eventual "archaeological pattern" that emerges, as both MNI and NISP are influenced by taphonomic agencies.

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<sup>13</sup>. Landfill practices, for example, can change the habitat or econiche of species, resulting in either the introduction or disappearance of new or old species (see Rothschild and Balkwill 1993: 72-3).

When using MNI or NISP as the basic counting unit, the main bias(es) that one needs to consider is interdependence, differential fragmentation of bones and differential representation of taxa (Lyman 1979; 1994b). Additional quantification biases are compounded by the fact that some species have either more elements or more identifiable/diagnostic elements than others (Davis 1987), which may inflate or skew results. Lastly, bone counts may, or do, also reflect post-mortem activities, such as redistribution of bones throughout or beyond the site, as in a market system; or food preparation practices that will fragment bones (see Reitz and Scarry 1985: 16-17).

Other than using MNI or NISP as counting units, bone weight or derivatives of the "Weigemethode" can be used. The basic assumption underlying the weight method involves the multiplication by a factor that is presumed to reflect the index relationship or percentage of bone weight to meat weight for that taxon (Casteel 1978: 71). As the resulting meat weight figures are dependent upon the "correct" bone weight measurements, the former can be skewed as the latter is influenced by taphonomic agencies. Bone weights are subject to agencies which result in either over- or underestimation of meat weights as a result of an increase or decrease in the measured bone weight. The biases that either increase or decrease bone weights as the unit of measure are differential mineralization, leaching, weathering and preservation (see Casteel 1978: 77; see Lyman 1979: 536).

Organic remains other than fauna - botanical remains or carbonized material - are also not without their post-depositional biases from chemical or organic decomposition or from the mechanical forces. For example, post-depositional chemical and physical processes can result in the dissolution or disorganization of floral materials (see Reitz and Scarry 1985: 11).

### 3.16.1. *Excavation Procedures.*

Excavation and recovery procedures can also damage and bias biological samples. Excavation is, firstly, destructive in nature. Trowel damage from excavation procedures or the handling of samples may result in additional fragmentation. These, however, may be influenced more by the state of the bone - its fragility - than the excavator's competence. Recovery techniques and sampling strategies can substantially bias biological data. The selection of the screen size and the decision to employ flotation procedures may critically affect results of subsistence analyses. To ensure all faunal and floral remains are well represented, they must be treated in an uniform fashion. The use of rested screens and chemical flotation are but two useful methods (Reitz and Scarry 1985: 11-12).

The screen size choice can have a tremendous impact of the recovered fauna. For example, the type of sieve used at the various sites in Reitz's (1982: 56) study played a particular role in the material and percentage of material recovered at each site. It has been shown through David Hurst Thomas' (1969 in Grayson 1984) research back in the 1960s that different results will be gained where  $\frac{1}{4}$ ",  $\frac{1}{8}$ " or  $\frac{1}{16}$ " mesh size has been chosen. The mammalian species that he analyzed were divided into five arbitrary size classes, viz. Class I: live weight less than 100g; Class II: live weight between 100 and 700g; Class III: live weight between 700g and 5kg; Class IV: live weight between 5 and 25kg; and Class V: live weight greater than 25kg. The results of his work showed the following patterns:-

Body-size classes	Screen size (inches)		
	1/4"	1/8"	1/16"
I	141	910	1930
II	626	1478	2450
III	1069	1358	1275
IV	85	4	0
V	1308	1	0

(from Thomas 1969: 394 in Grayson 1984: 169).

The above data clearly shows that recovery rate depending on screen size has dramatic effects (Grayson 1984: 169-170). As a result of this data, it is not inconceivable that studies in the past have been badly biased by collection techniques.

Despite care, there is an operational bias that favours the recovery of easily recognizable elements such as long bones and mandibles. Simon Davis (1987: 35) has suggested that in faunal analysis there is an inherent bias towards bones that are better preserved, easier to identify, and those that are more useful in providing age, sex and measurable information. The absence or lack of smaller bones in published faunal reports attests to the failure of adequate recovery (Davis 1987).

### 3.17. RECONSIDERATIONS ABOUT TAPHONOMY.

In re-evaluating the frequencies of preferred species and cuts, Huelsbeck (1991) provided an interesting damper on the whole taphonomic issue. He stated that: "When taphonomic, environmental, and temporal variables as well as recovery technique, analytical methods and sample size are taken into consideration, it is possible to question whether such differences exist or are real" (Huelsbeck 1991: 64). The work in historical archaeology by Rothschild (1990) and Rothschild and Balkwill (1993) may provide a solution to Huelsbeck's statement. Their aim was to establish whether bone density or bone utility are greater factors within the faunal sample(s) under study. Their work utilized three indices: Minimal Animal Units (MAU), Meat Utility Index (MUI) and bone density.

In 1978, Binford suggested in his book on *Nunamiut Ethnoarchaeology* that the frequency of various skeletal parts (MAU) in archaeological deposits may reflect their utility, measured in the MUI index based on available meat.

The MAU values are derived by dividing the number of recovered or observed specimens per anatomical part by the frequency of that part in a skeleton of the taxon involved (Lyman 1985). These MAU values were standardized by setting the highest MAU to 100 percent, with the others scaled accordingly. These relative frequencies were then expressed as ranks; in the case of ties, the average rank was used (Rothschild and Balkwill 1993: 87).

The MGUI index (of which MUI is a derivative) is designed to predict decisions about transport as well as consumption. In a historic site, with a market economy, a MUI seems more appropriate than a MGUI because bones were not usually rendered for grease and marrow, and transport from the "kill site" to the consumption site is not an important factor. Binford's (1978: 23) MUI data for domestic sheep was used; this study took the value for the mandible without tongue on the assumption that the tongue could be purchased separately at the meat market.

There were four underlying assumptions in their study. Firstly, that the bones analyzed represent domestic food refuse; secondly, residents would have selected the part of the animal that provided the greatest proportion of usable meat to non-usable bone; thirdly, pooling of domestics assumes that they were utilized in a similar fashion; and fourthly, that the rank orders of bulk density are similar for all artiodactyls (Rothschild and Balkwill 1993: 89).

The first comparison made in their study was between rank-ordered frequency of various body parts (in % MAU) and body part utility (MUI), is designed to show whether the number of different body parts present in an assemblage is related to the usefulness of those parts (see Rothschild 1990: 158).

Whether the observed correlation is positive or negative, if utility has the greatest impact on the frequency of body parts, the MAU density correlation should be non-significant. If destruction is the major agent, there should be a significant positive correlation between MAU and density, and non-significant correlation between MAU and MUI (Grayson 1988: 70 in Rothschild and Balkwill 1993: 78). A butcher's shop, for example, should show a strong negative correlation, resulting from a transport of the most useful parts of butchered animals out of the shop (Rothschild and Balkwill 1993: 78).

Rothschild and Balkwill (1993) have also added an interesting component to their data. They suggested that the deposit type may affect identifiability as well as their results; i.e. that faunal material from a feature, sheet refuse and landfill practices would provide different patterns (see also Huelsbeck 1988: 2). For example, features should reflect the eating habits of the residents of a specific building or lot most directly. Once discarded, the material is relatively protected, although features are known to have been cleaned out periodically and refilled. Landfill deposit cannot be tied directly to the occupants of a single piece of land, and may include non-residential matter. However, once deposited, they are not likely to have been subjected to post-depositional alteration, except perhaps from compression, movement, or from rodent or carnivore gnawing. Sheet refuse has greater potential for destruction. The assumption here is that the material discarded represents primary refuse, but the effects of trampling may have altered the relationship between what was originally discarded and what remains (Rothschild and Balkwill 1993: 75-76). At Sea Street we are dealing with any one of these, or a combination of any two. For these reasons, deposit type may be a direct factor in influencing what remains in the archaeological record!

removed the meat that humans had left on the bones, while Euro-American and Spanish-American family pets chewed on a bone after the meat had been removed (Kent 1981: 369). Other colleagues of hers suggested that an animal just removing meat from a bone would produce gnawing marks sufficient for an archaeologist to detect later. To test this hypothesis she provided dogs with both boiled and roasted bones. She noted that dogs had visibly more difficulty in removing the meat from roasted bones than boiled ones. The articular surfaces of both bones that had been gnawed on contained much evidence of chewing (after 24-48 hours), while those gnawed for less than 24 hours had fewer marks. The roasted and boiled bones chewed only until the meat was removed contained no evidence of gnawing, thus the experiment showed that dogs do not necessarily leave marks on bones from which they have chewed meat (Kent 1981: 370ff).

A more recent study evaluated the degree to which large, medium and small faunal remains may be affected by a taphonomic agency, namely dogs. Payne and Manson (1985 in Davis 1987) investigated the destructive effects dogs may have on different bones. They fed whole goat limbs - which are similar in size to sheep and extremely difficult to separate from sheep in faunal analysis - and several species of small animals to two large dogs, observed what they did and collected the resulting debris. The dogs were able to break and extensively chew most of the long bones. Most fragments smaller than 25 cm diameter were swallowed whole and subsequently either vomited or passed out with the faeces (Davis 1987: 26). In either case these smaller fragments became heavily attacked by stomach juices resulting in either their complete disappearance or varying degrees of etching. In one experiment, one of the dogs was fed the heads and feet of 37 squirrels, but when the surviving bone was examined only 14 individuals could be accounted for (Payne and Manson 1985 in Davis 1987: 26). Therefore there can be no doubt that dogs are potentially an important factor which may alter the death assemblage.

A more significant study was done in 1993, which assessed not only carnivore damage, but also human behaviour affecting carnivore selection of which Kent's study is an earlier example. Blumenshine and Marean (1993: 273) noted that differing feeding activities or opportunities will in turn alter the intensity and location of the gnawing damage and the types of skeletal parts and portions that are dispersed from or destroyed at sites. Their study aimed to remedy the fact that relatively little experimental attention has been given to carnivores scavenging from butchered assemblages. They were able to demonstrate *how human butchering could affect the nutritional attractiveness of parts to carnivores, thus influencing patterns of damage and deletion that are unique to carnivores having secondary access to bones* (Blumenshine and Marean 1993: 275, 288). The significance of this study, in light of the above evidence and discussions on bone density, food preparation techniques and other human pre-depositional factors above, is that human cultural activities in addition to carnivore selection - see Susan Kent's experimental study on dogs above - may influence the resulting faunal assemblage pattern!

### 3.18. CONCLUSION.

We can therefore clearly see that there are numerous taphonomic issues which play a role in the resulting faunal collections. These encompass both cultural and non-cultural factors. Some of these agencies can be controlled by the archaeologist, but most are beyond his or her control. What remains to be done is a careful evaluation to establish what factors have played a role. Various analytical data tests have been provided above which may provide insights into possible causes at historical sites. These are by no means clear cut, and one should be very cautious to accept a single model approach, as more than one agency is most likely responsible for taphonomic disturbance.

## CHAPTER 4.

### METHODOLOGY.

"Generally three stages are involved [in faunal analysis]: first classification, the manipulation ... of results to determine either patterns or glaring irregularities, and finally that interpretive leap of faith, in which an attempt is made to explain observed results most often in cultural terms" (after Yellen 1977: 276 in Lyman 1982: 372).

In Chapter 2 we took an in-depth look at each of the four house lots, with more emphasis being placed on the house lots from which the faunal material was selected for analysis. After looking at the site's stratigraphy and information gained from the preliminary faunal report, it was decided only to analyze the sheep remains (*Ovis aries*) from Phases 2 and 3 from Houses JAM and MAN at Sea Street. Although the other cultural material at the site may help in providing a basic time frame for the deposition of the faunal material, it cannot answer the questions that we have for the fauna. Questions that relate broadly to what happened between the butcher's shop and the household where the meat was consumed? To do this a clear and well thought out methodology is required. One that will not only record every detail of the specimen itself or the type of physical and/or chemical damage on it, but will also be a mechanism through which information in some form can be extracted. Integral to the workings of a clear methodology lay the conceptualization and formation of a data sheet. It is to this that we now turn.

To facilitate the later computerization of the data, a data sheet was constructed with the advice of Dr. Liora Horwitz, formerly of the University of Cape Town, now with the Jerusalem State Museum. Various computer programs have been put forward for faunal analyses. Klein and Cruz-Urbe's (1984) program helps to establish MNI totals. Their program seems to have some potential for underestimates, as their method does not account for overlapping fractions of bone portions. If three proximal femora pieces all include the greater trochanter, then the minimum number of elements (MNE) is not two, but in fact three. It is perhaps for this reason that the method mentioned by Marean and Spencer (1991: 652 in Lyman 1994c: 53) 'involves using the computer to count the number of portions with overlapping sections', but they do not describe this method in detail. The methodology that is utilized here seems to have some similarities with the aforementioned method of Marean and Spencer.

A sample of the data sheet is given in Table 4.1, with an extract of data taken from JAM 8L in Table 4.2. In the left hand column is a running number. As each individual specimen is analyzed, it is given a number, and any associated damage, whether cut, chop, sawn, etc., is recorded in detail. This number records all forms of butchery marks that are found on that one specimen, thereby allowing one to reconstruct the full extent of damage on that specimen once the analysis had been completed from the data sheet. If one had assigned a new number to each individual form of damage, then one would not necessarily know whether all the cut marks associated with the category left humerus, for example, came from one bone or from twenty specimens. In addition, the use of the running number in this way, will

Table 4.1: A sample of the Data Sheet used in executing the faunal analysis and compiling the faunal data.

No.	Ranking LAYC BOH Faunal Data Zones			TYPE		Profile		Other Arg. Comments	
	L.D.	Dist.	Zone	No.	Code	No.	Code	No.	Code
				1		1			
				2		2			
				3		3			
				4		4			
				5		5			
				6		6			
				7		7			
				8		8			
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				10		10			
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				98		98			
				99		99			
				100		100			

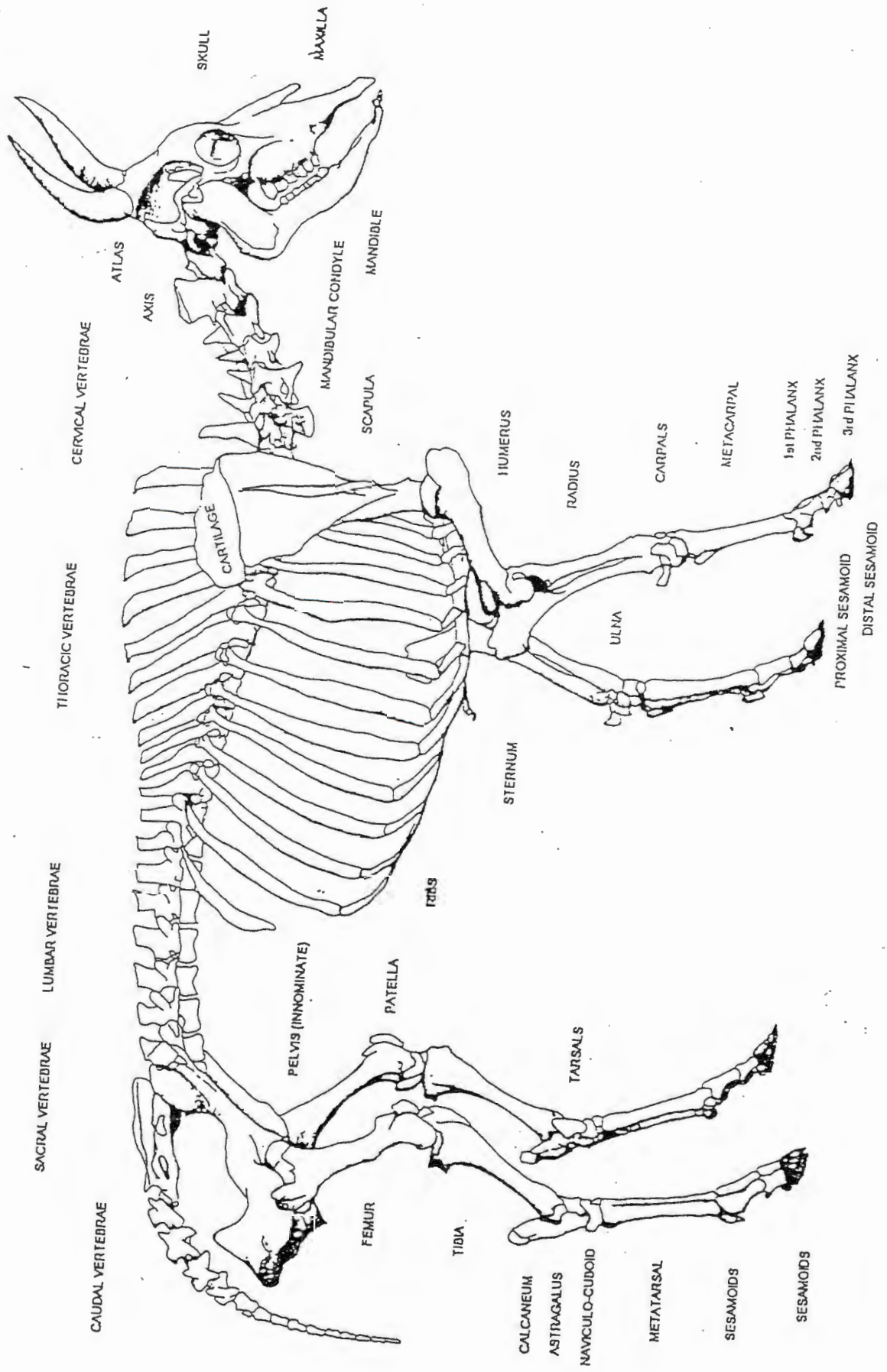


enable one to establish the size of one's total sample without calculating NISP, as the last specimen on one's list is also a total count for the NISP.

The second column lists the archaeological unit/layer from which each specimen originates. The site from which the layer/unit emanates is manually written in, as each site layer is calculated and analyzed individually; however, when the data is computerized, it can be included without a problem. The third column is used exclusively for bone identification, where each diagnostic element or part thereof is given an abbreviated code. Forty bone classes were identified within the bovid skeleton (see Figure 4.1). These included:-

AST	=	Astragulus
AT	=	Atlas
AX	=	Axis
CAL	=	Calcaneum
CAUV	=	Caudal Vertebrae
CV	=	Cervical Vertebrae
FEM	=	Femur
HUM	=	Humerus
HY	=	Hyoid
IND	=	Unidentified fragments
INN	=	Innominate/Pelvis
LV	=	Lumbar Vertebrae
MC	=	Metacarpal
MN	=	Mandible
MP	=	Metapodials
MT	=	Metatarsal
NAV	=	Naviculo-cuboid
PAT	=	Patella
PH1	=	First Phalanx
PH2	=	Second Phalanx
PH3	=	Third Phalanx
RAD	=	Radius
RIB	=	Ribs
SC	=	Scapula
SK	=	Skull
SS	=	Sesamoids
ST	=	Sternum
SV	=	Sacral Vertebrae
TIB	=	Tibia
TV	=	Thoracic Vertebrae
UL	=	Ulna
*	=	Lunate
*	=	Magnum
*	=	Unciform
*	=	Pisiform

Figure 4.1: Skeleton of a medium to large sized bovid with all the relevant body parts listed.



- \* = Scaphoid
- \* = Cuneiform
- \* = Lateral malleolus
- \* = External and middle cuneiform
- \* = Internal cuneiform
- \* = As these bones are either part of the tarsals or carpals, they were not individually abbreviated, but named as they were.

Once the bone has been identified, two other factors need to be considered. Firstly, whether the bone is fused or not; and secondly, whether the specimen comes from the left or right side of the individual, or where it cannot be determined - either on the absence of a particular characteristic or alternatively, where only a portion of the element remains, making it difficult or impossible to make an informed decision. Whether left, right, fused or unfused, they are coded as follows:

- 1 = Fused
- 2 = Unfused
  
- 1 = Left
- 2 = Right
- 3 = Indeterminate

Before any analysis had begun, all the material was resorted into groups of body parts, to correct any faunal misidentifications, especially in light of the fact that part of the material had been used by a student class involved in learning the basics of faunal analysis.

The procedure used during sorting was divided into three stages. The first level of identification relates to identifying diagnostic and non-diagnostic bones. The identification of diagnostic bone can be divided into three stages: The first is to divide bones into small, medium and large sized bovids, with a separate category for birds and fish. For example, using size as a criterion, the size of the first phalanx of a cow is distinctively larger than that of a sheep. The second stage would be to divide each group into like elements, i.e. all radii of medium sized bovids can be divided from all ulna, and those from other parts of the body. In addition these groups can be further sub-divided into proximal and distal ends of an element. For example, the distal and proximal elements can be bagged into smaller bags and these then placed within the category radii. The third stage would be to divide the bones within each group of elements into those that belong to different species using complete comparative collections at one's disposal or at a local institution. For example, the tooth from a suid looks different to that of a medium-sized carnivore and both look different to teeth from a goat/sheep. Stages two and three can be reversed.

During this process one comes to understand how complex each bone is, and how many possible facets or sections made up each specimen. This process helps one to gain a feeling of how to sub-divide each of the skeletal elements into zones which were to be analyzed for micro-wear.

Each of the skeletal elements have been zoned depending on the physical shape of each of the bones. In most long bones, zoning was split along the ventral, dorsal, anterior and posterior planes,

whereafter they were zoned on a distal and proximal basis, with a further division of the mid-shaft portion. Other elements of irregular shape were zoned according to either certain (diagnostic) facets or planes which were considered important. The exact zoning of each body part is given in the following diagrams (see Figures 4.2 to 4.13).

As each bone is analyzed, the zones that are present or absent are noted, or whether fractions of the specimens are present. These have been coded as follows:

1	=	Present
0	=	Absent
1/4, 1/2, 3/4	=	Partially Present

This answers the question: What is there? and What is not there?

The column following the zoning of skeletal elements records the type and frequency of various forms of damage that may be on them. Ten damage categories have been identified. These include:

1	=	Cut
2	=	Chop
3	=	Scrape
4	=	Saw
5	=	Percussion
6	=	Chop Snap
7	=	Cut Snap
8	=	Saw Snap
9	=	Indeterminate
10	=	Rodent/Carnivore damage

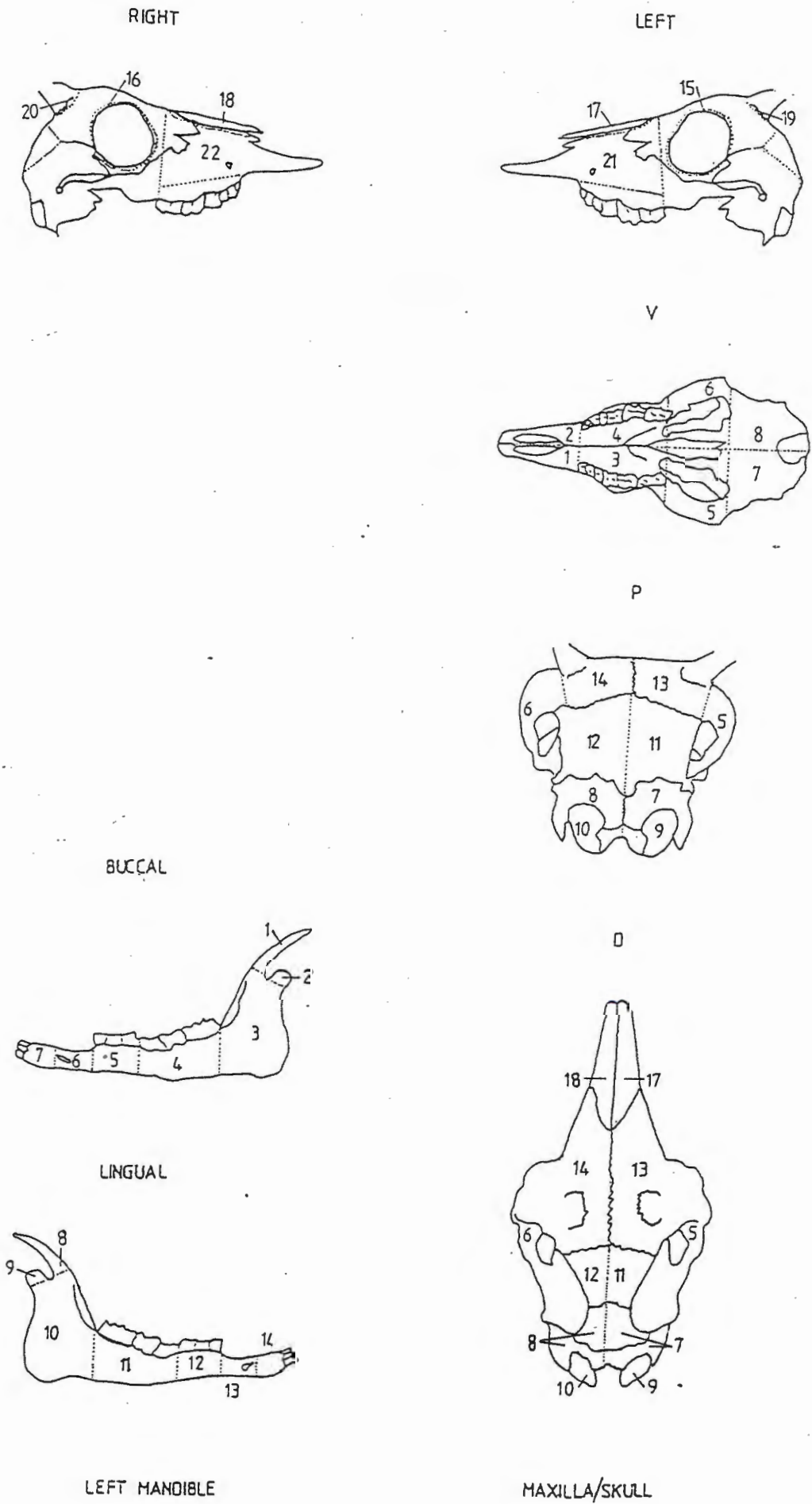
These categories were defined from the historical archaeological work of Crader (1990: 706-707) and Woodborne (1994: 2), with complementary data from Bunn (1981: 574) and Potts and Shipman (1981: 577).<sup>1</sup> One must, however, remember that some of the marks, especially cutmarks, are indistinguishable from other like butchery marks as seen with the naked eye. The methodology therefore used to analyze the faunal material included a 10x magnifying glass, an intense focused light, and either a 7-40x or a 10-70x dissecting microscope depending on the degree of magnification that was required. The various marks can be defined as follows:

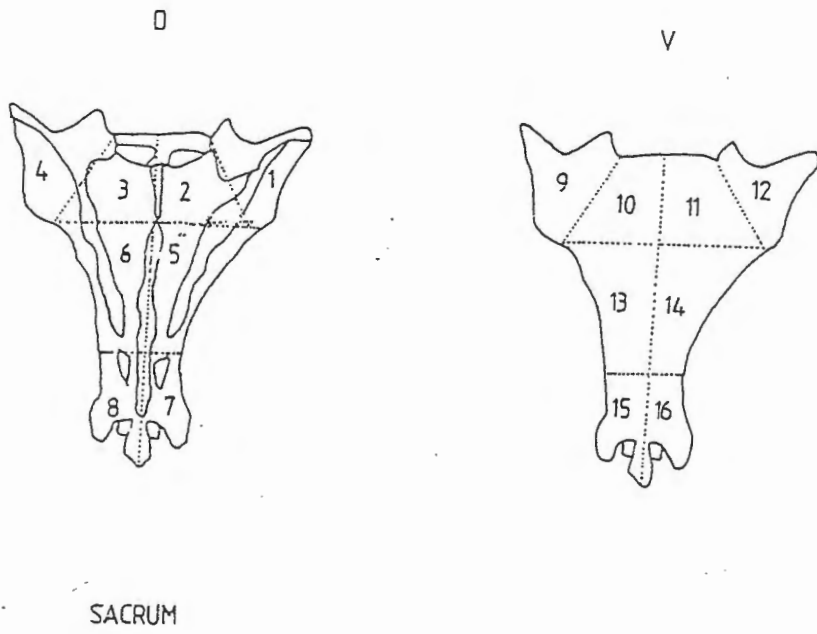
Cuts result when a blade is moved backwards and forwards along its length. They appear typically as straight, narrow, V-shaped, incised lines, probably made with a metal knife.<sup>2</sup>

<sup>1</sup> It has rather been from studies of prehistoric human behaviour on meat consumption, meat acquisition and wear patterns, that a clearer understanding of the various types of marks and issues around them were gained by researchers in the field, than from historical archaeology.

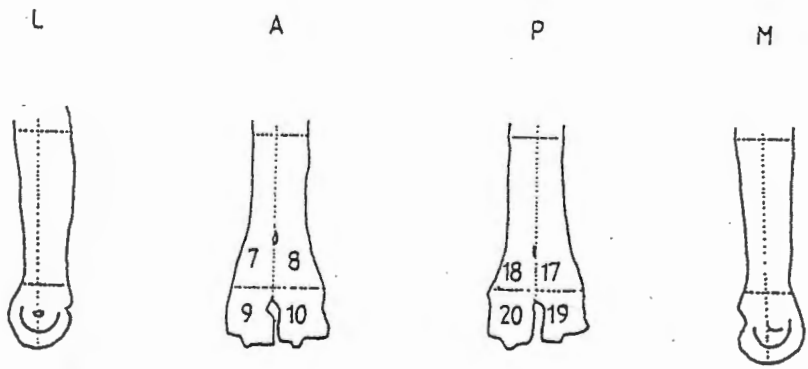
<sup>2</sup> It has been noted by Shipman (1986: 29) that the only taphonomic circumstance that produces marks microscopically identical to cut marks is trampling of bones in caves on top of sharp-edged rockfalls.

Figure 4.2: Zoning of the mandible and maxilla/skull.



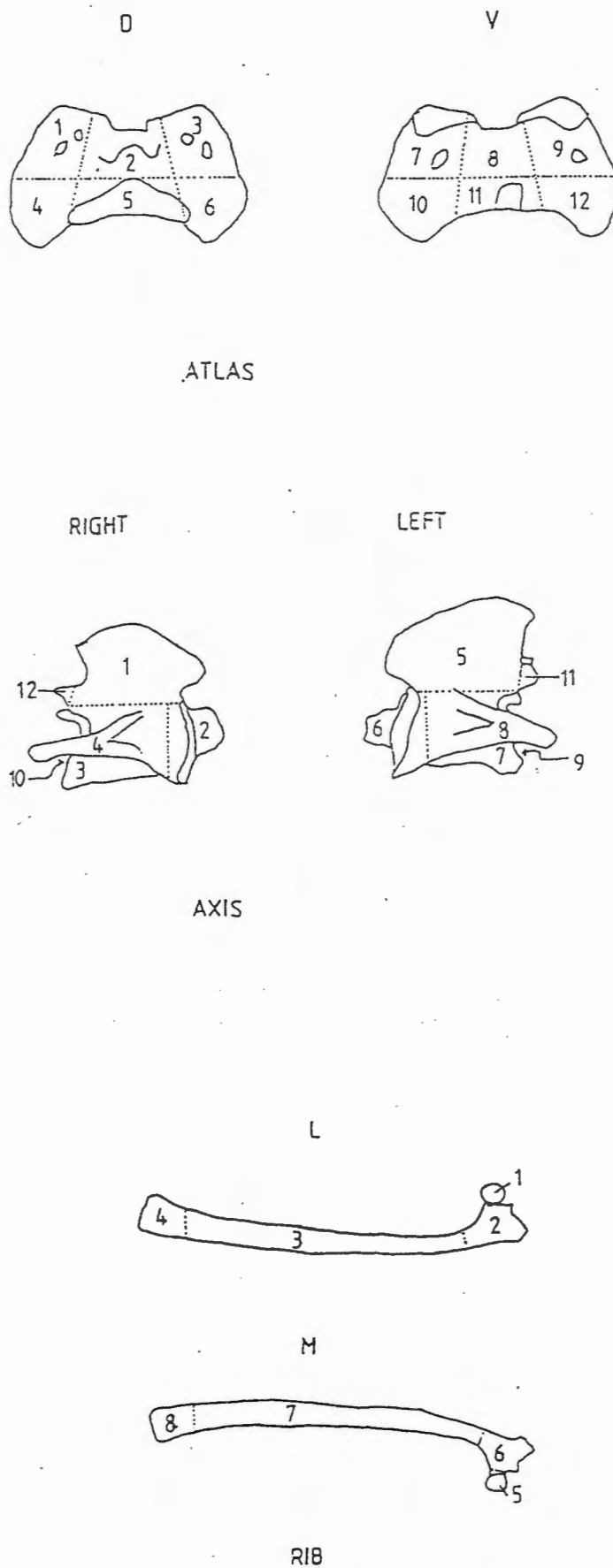


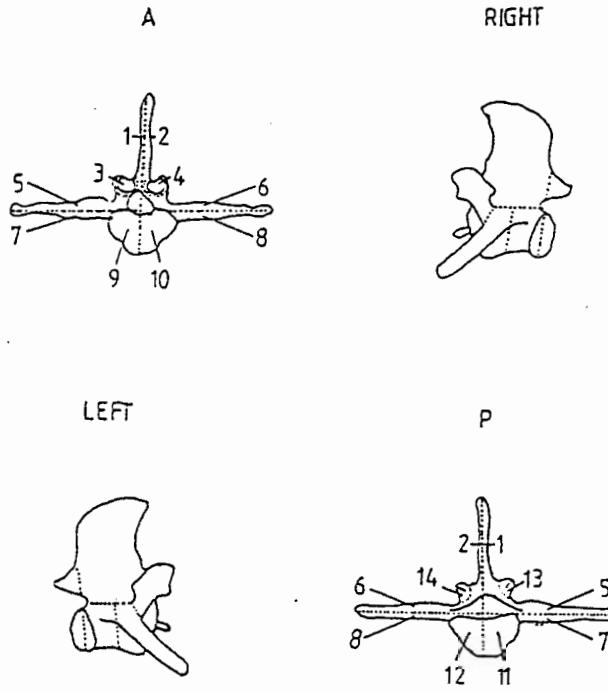
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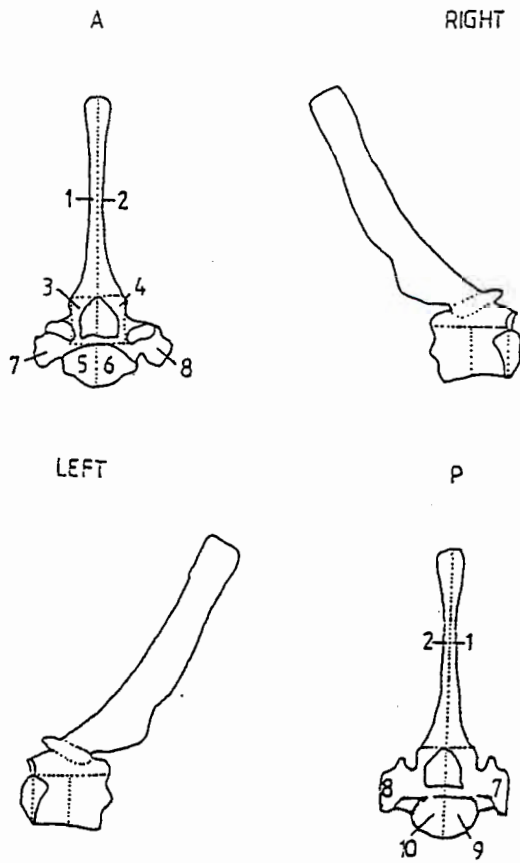
METAPODIAL

Figure 4.4: Zoning of the atlas, axis and ribs.





LUMBAR VERTEBRA



THORACIC VERTEBRA

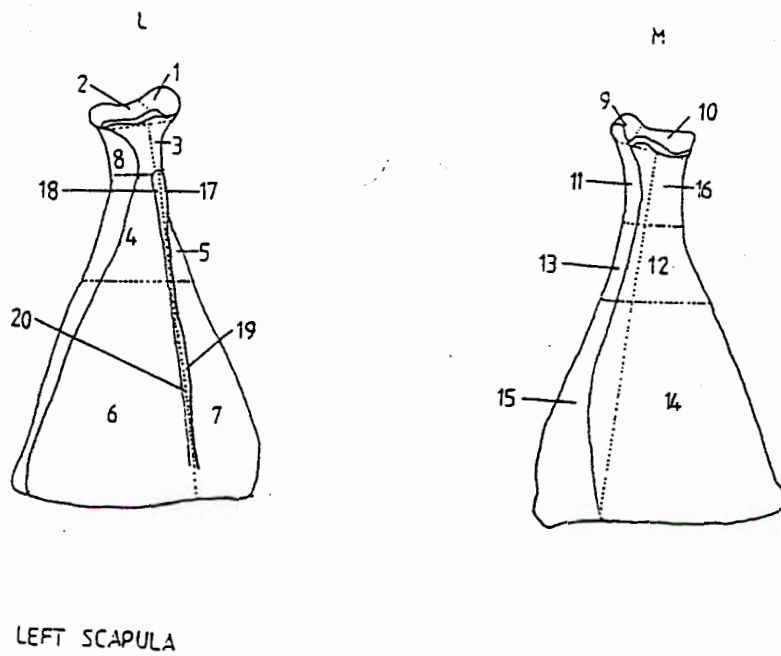
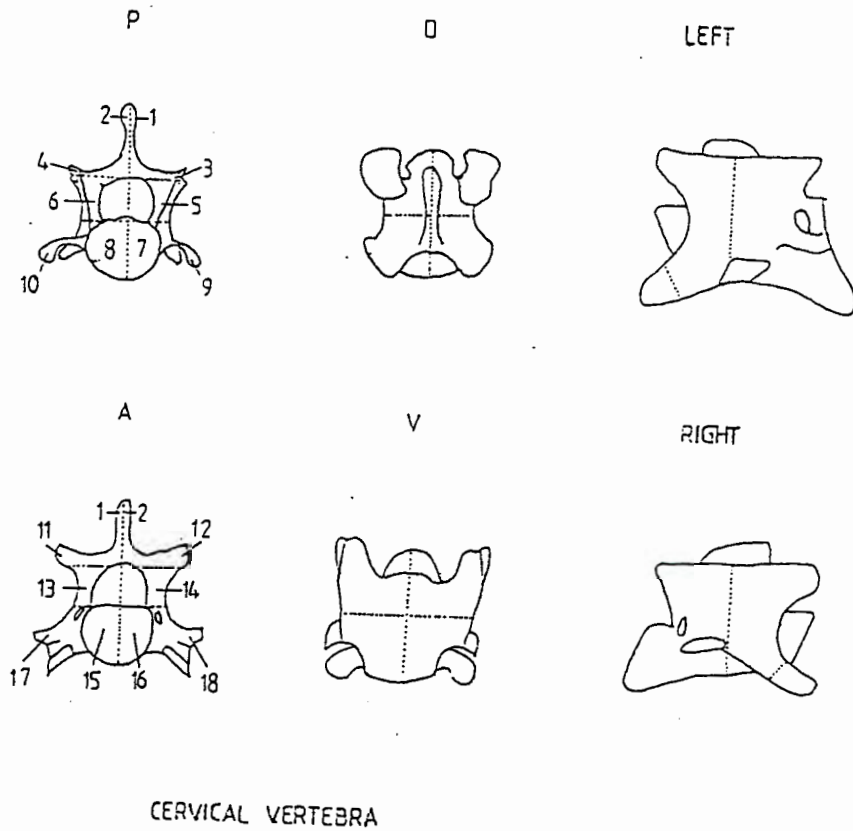


Figure 4.7: Zoning of the innominate/pelvis.

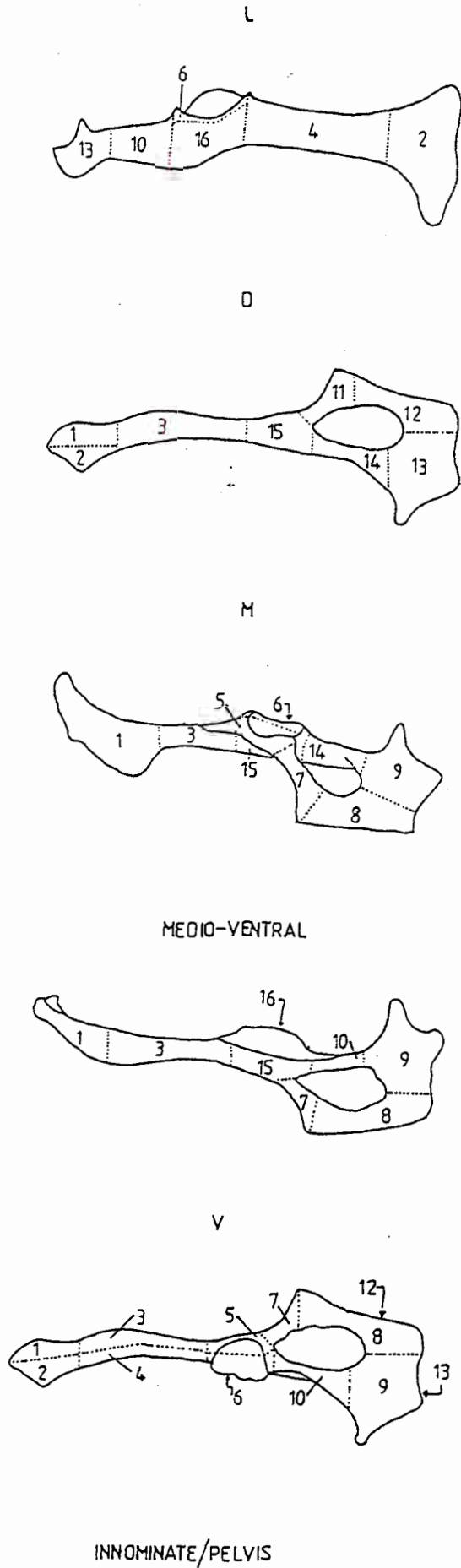
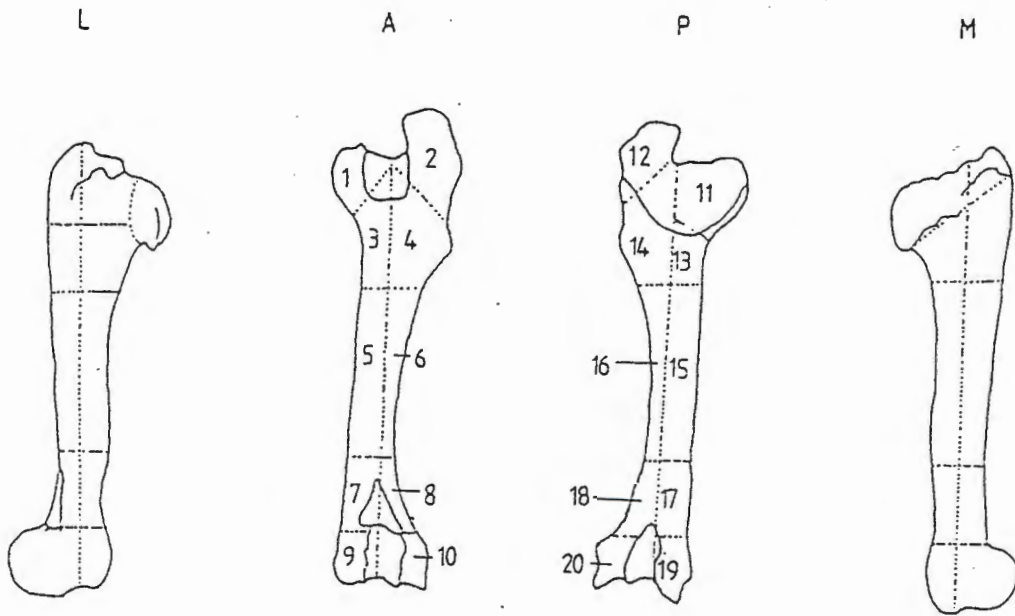
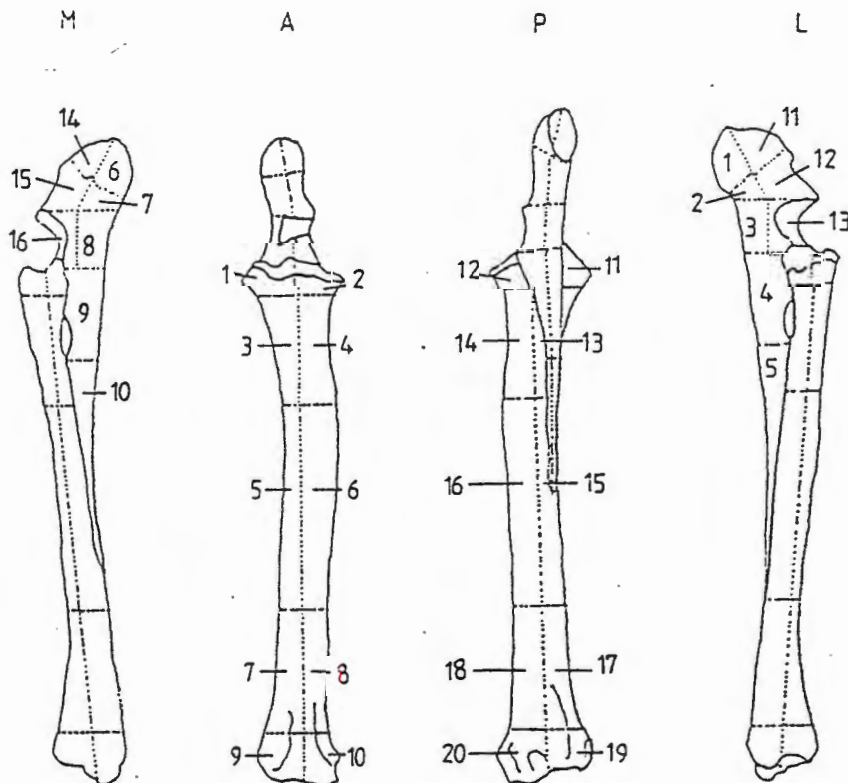


Figure 4.8: Zoning of the humerus, radius and ulna.

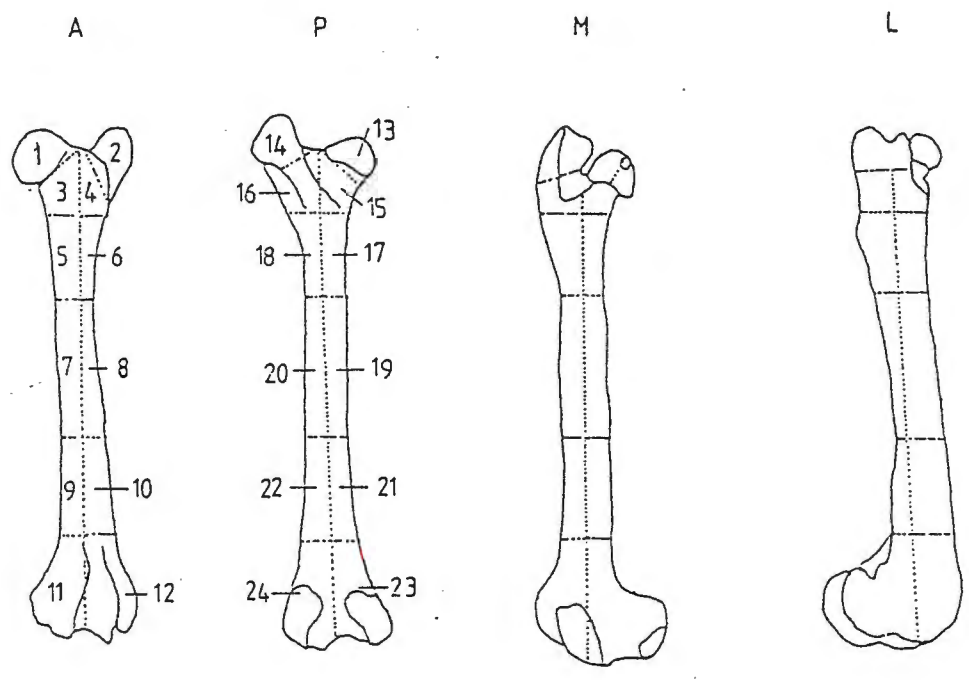


LEFT HUMERUS

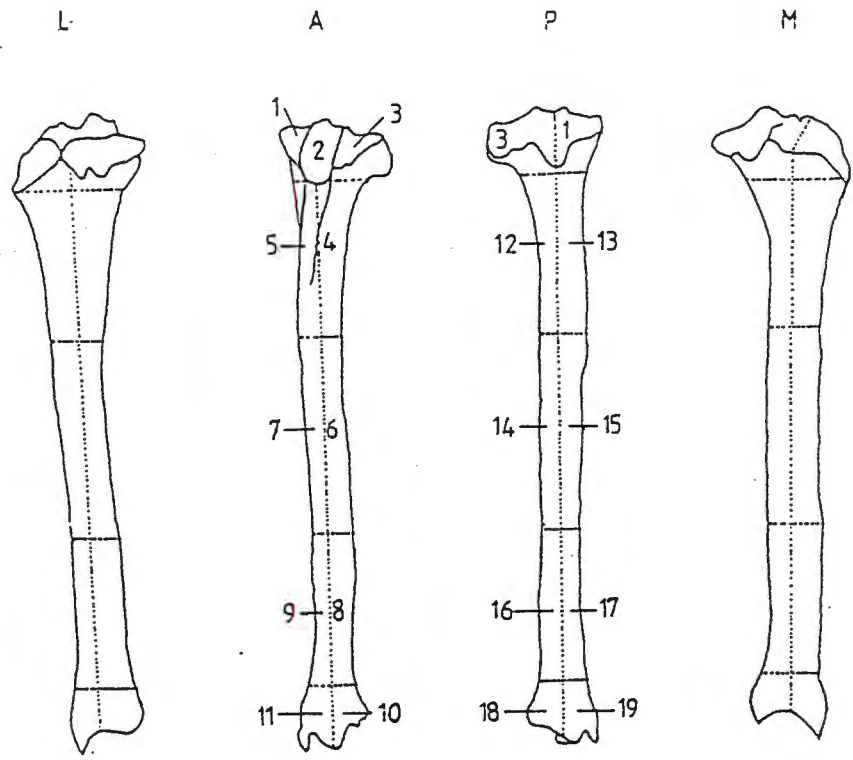


RIGHT RADIUS AND ULNA

Figure 4.9: Zoning of the femur and tibia.

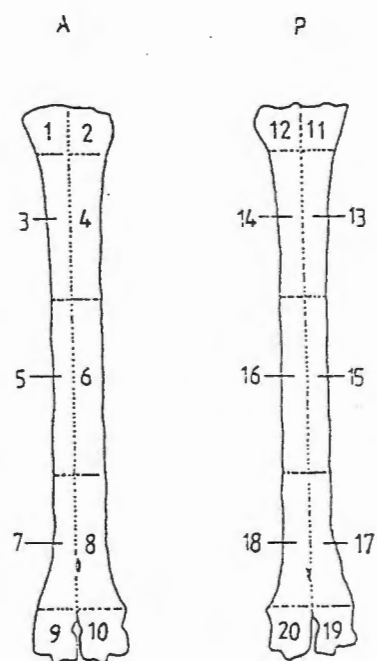


LEFT FEMUR

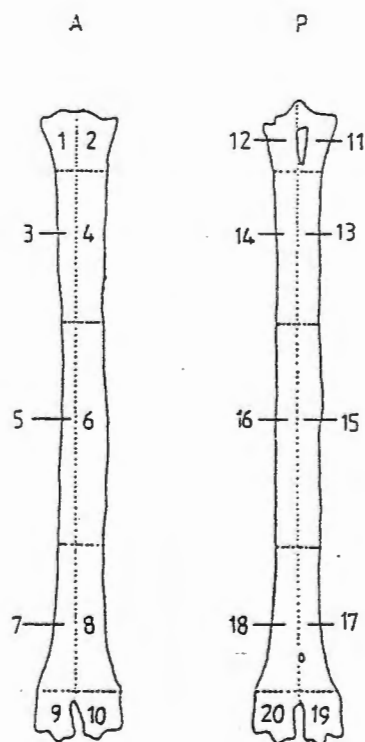


LEFT TIBIA

Figure 4.10: Zoning of the metacarpal and metatarsal.



LEFT METACARPAL



LEFT METATARSAL

Figure 4.11: Zoning of the calcaneum, astragalus, naviculo-cuboid and patella.

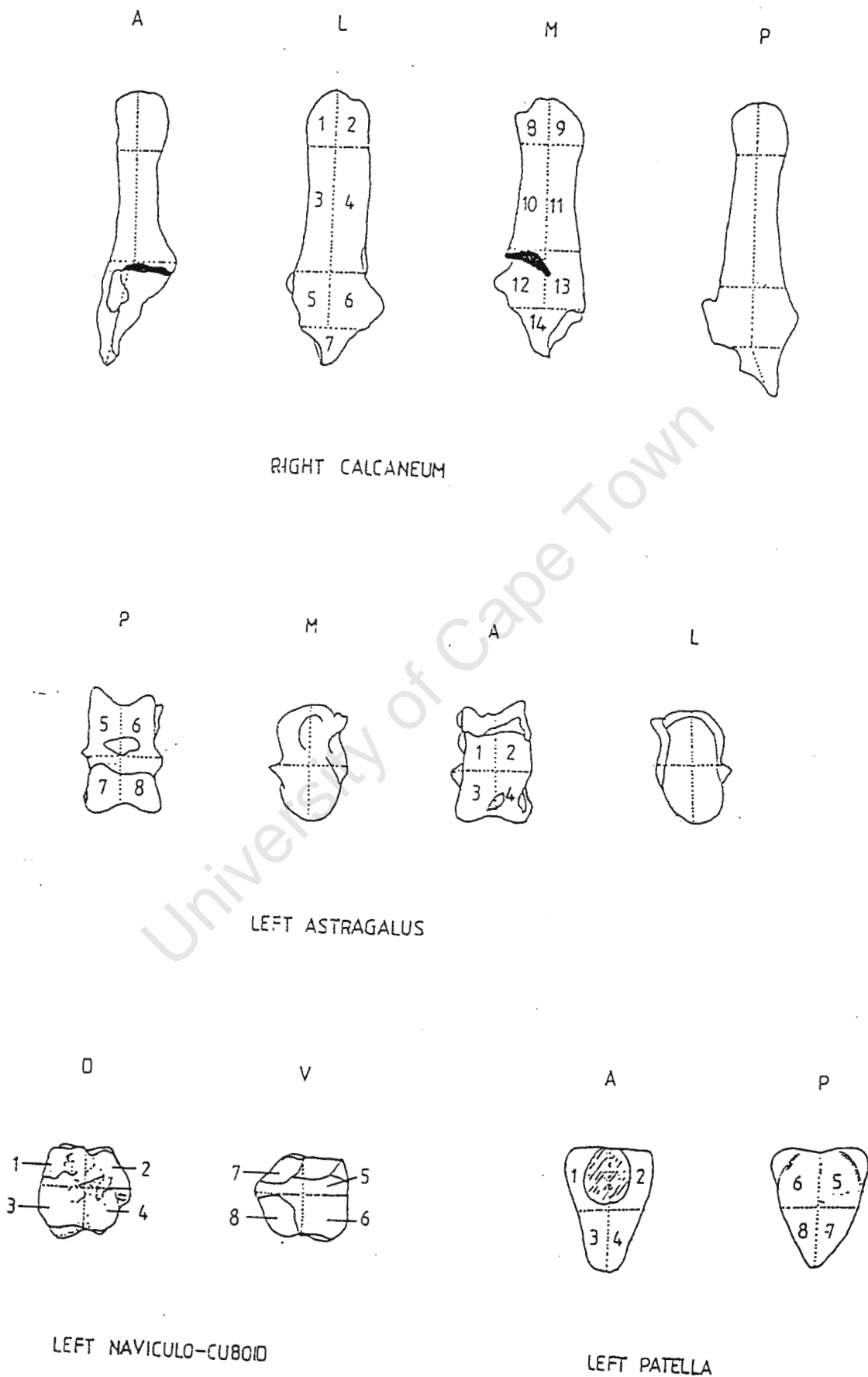
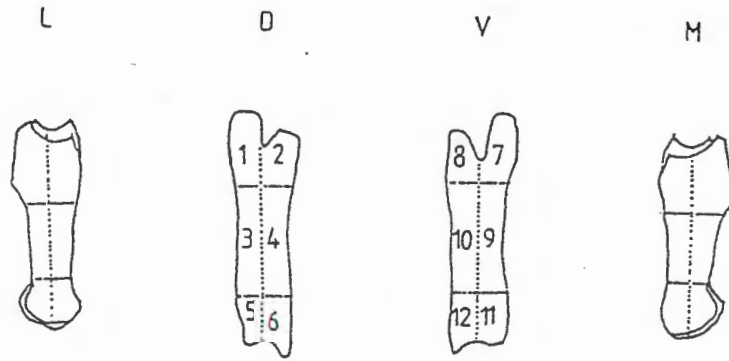
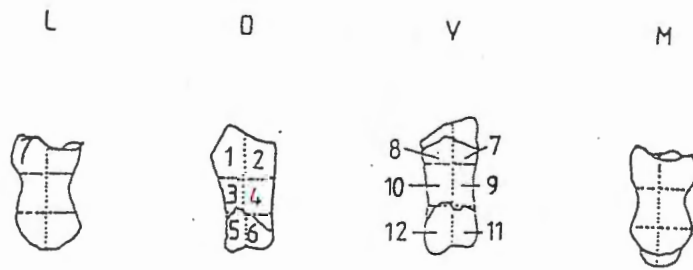


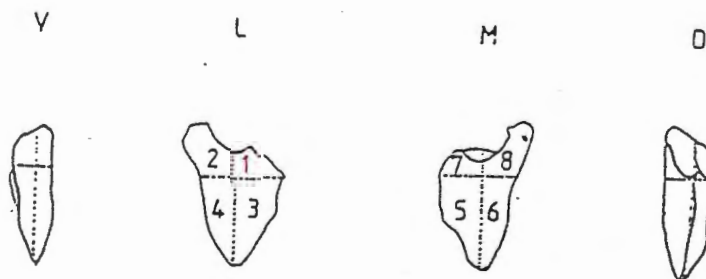
Figure 4.12: Zoning of the first, second and third phalanx.



1st PHALANX

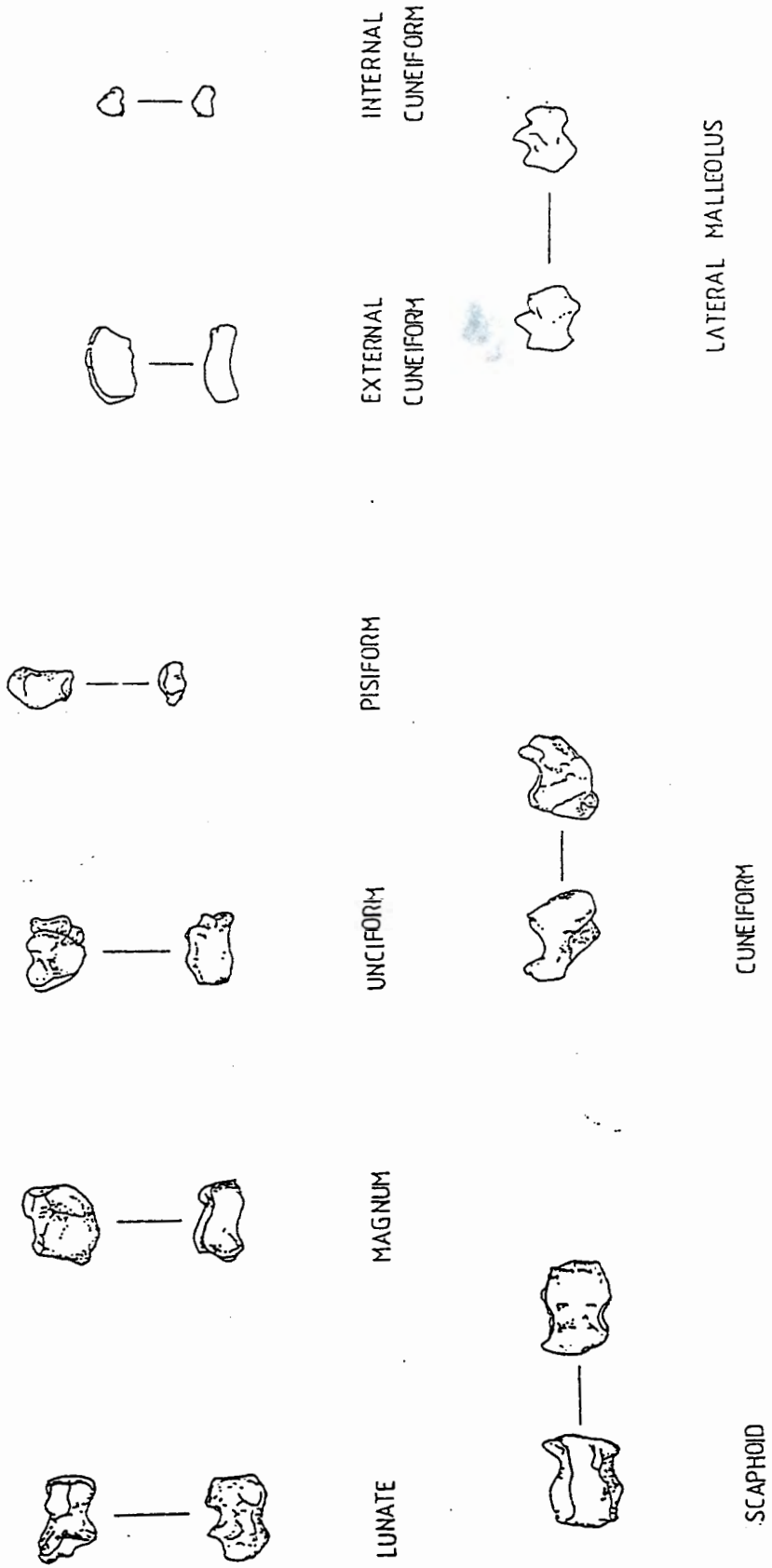


2nd PHALANX



3rd PHALANX

Figure 4.13: Zoning of various carpals and tarsals.



In chopping, the blade is moved up and down in the plane of the blade. Chopping marks are produced by striking the bone surface with an artefact at roughly a perpendicular angle, leaving V-shaped cross-sections and small fragments of bone crushed inwards at the bottom of the main groove. Chopping marks are similar to cuts except that they are wider where a cleaver or ax-like tool has removed a small wedge of bone.

Percussion is similar to chopping except that the implement is blunt and does not slice into the bone. This causes localized shattering which is distinctive.

Scrape marks occur when the blade is dragged sideways along the bone surface in a direction roughly perpendicular to the long-axis of the edge. Scrape marks appear where a shallow layer of surface bone has been removed leaving numerous irregular striations.<sup>3</sup>

Saw marks are the result of cutting with a specialized blade. They occur where a flat, planar surface of bone bears regular, parallel striations where a metal saw was repeatedly drawn back and forth through the bone tissue.

Diana Crader has suggested that each of these marks are more or less indicative of a particular behaviour, and that: "Cutmarks and scrapes usually occur when the meat is cut or stripped from the bone during secondary butchery, but cutmarks also might result from the separation of joints during primary butchery. Chops, shears, and saws are more likely due to carcass dismemberment or joint separation during primary butchery, but chops and shears also might result during secondary butchery, [and] if bones were broken up for use in stews or to obtain marrow" (Crader 1990: 707).

In addition to the categories defined here, three others were constructed, namely chop snap, cut snap and saw snap. These categories were created on the assumption that certain skeletal elements were partially cut, chopped, or sawn, thereafter being snapped into two parts, i.e. a bone that has not been cleanly 'dissected', resulting in selected snapping behaviour to break the bone completely.

In addition to these forms of damage, one should note that there are other marks that relate to non-cultural behaviour, due to carnivore or rodent action. These can also be identified through the use of a microscope. Carnivore tooth marks are typically broader and U-shaped. Rodent gnaw marks are typically shorter, flat or round-bottomed, with paired grooves. Plant roots show irregular, dendritic pitting and grooving (Bunn 1981: 574). In addition, one also has to contend with trowel marks.

Although a type of damage may be found in either a particular zone or across two or more zones, it also needs to be quantified, as to whether one is looking at a singular action or multiple actions. For

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<sup>3</sup>. This definition of scraping is more or less synonymous with the following one for slicing provided by Potts and Shipman (1981: 577): 'Slicing marks are produced by drawing the edge of the artefact across a bone surface in a direction continuous with the long axis of the edge. This creates many fine, paralleled striations'. The differential application of terms is a methodological problem within faunal analysis, and between sub-sections of the same discipline.

example, a chop or saw mark may have at first been tentatively done, whereafter the correct saw or chop is made. This data is recorded numerically next to the type of damage that had been firstly recorded.

Once the type of damage has been identified, it has to be recorded on the same basis as zoning, where damage is noted on a presence or absence basis per zone. If the type of damage occurs in more than one particular area or stretches across zones, then it is so noted on the data sheet. As in the case of zoning, the same code is used:

1	=	Present
0	=	Absent

Now that the type of damage and its location on the bone has been identified, one still needs to indicate both the orientation and angle from which the damage occurred. Orientation notes whether the damage has been done longitudinally, transversely or obliquely to the long axis of the bone. The code used here is as follows:

1	=	Longitudinally
2	=	Transversely
3	=	Obliquely

Angulation records whether the damage was done either from above or below, or from the side.

Angulation answers the question: Where or from what angle did the damage originate? It was decided to record five groups of angulation from  $0^{\circ}$  to  $180^{\circ}$ , with intervals of  $45^{\circ}$ . Angulation is coded as follows:

1	=	$0^{\circ}$
2	=	$45^{\circ}$
3	=	$90^{\circ}$
4	=	$135^{\circ}$
5	=	$180^{\circ}$

Whether the bone is looked at anteriorly, posteriorly, medially or laterally, the same code is used, as each specimen is analyzed in an identical fashion, as all specimens, except the scapula and pelvis, are analyzed as they are anatomically positioned.

Lastly, a category is required for comments. Here notes are made on

- the preservation state of the bone;
- the degree to which it has been burnt, i.e. whether it is blackened or whitened, as a result of its proximity to a hearth or the temperature to which the material was exposed to;
- whether specific rodent or carnivore damage has been noted on the bone, e.g. rodent gnawing, carnivore puncture marks, etc.;
- whether one wishes to photograph the specimen or alternatively if there is something particularly unusual which requires photographic notation;

- whether the damage is particularly faint;
- whether a blunt knife had been used, or whether the point of a knife had been inserted into the bone;
- whether certain marks are more recent than others;
- whether the action is part of disarticulation, skinning, etc.

The resulting data sheets were then computerized using Quattro Pro Version 6.0 for Windows, in which the data can be saved in most convertible formats. The presentation of the data in a worksheet, allows one to sort the data according to any desired category - either according to a particular zone of a particular skeletal element, or to a type of damage in a particular zone of a skeletal element, or on a less complicated level by skeletal element, or type of damage. Any category or choice of selection can be further sub-divided, depending upon the information one wishes to extract. Similarly, a worksheet can be converted into a database. The advantage of using such a data sheet is that the data can be combined either on the basis of comparing units, phases within a site, or between sites.

An example is given to illustrate the use of the data sheet. The hypothetical specimen comes from House JAM, Layer 8. It represents a left metatarsal from an adult individual, which has been cleanly chopped through obliquely, from the lateral side, leaving the distal portion behind. Firstly, the specimen is given a running number (1). Thereafter it is coded (MT). It is from a fused (1) individual, and emanates from the left (1) side of the carcass. In zoning the specimen, it is noted that zones 7-10, and 17-20 are totally present (1), with half of zone 6 and 16 ( $\frac{1}{2}$ ), and a quarter of zones 5 and 15 ( $\frac{1}{4}$ ) remaining. Only one chop was noted (2 and 1). The chop mark went through zones 5-6 and 15-16 (1). It is an oblique (3) chop, which has occurred at  $45^\circ$  (2) to the long axis of the bone. A comment in the "Comments" section may record that the chop was clean or straight through the bone.

There is a problem with this data sheet, however, and it relates to: How does one deal with quantification of a type of damage? For example, if four chop marks are found on the dorsal side of a left pelvis, only one of which resulted in cleanly chopping through the specimen, does one note down four or one chop mark(s) when looking at the frequency of a particular type of damage in a given zone? Similarly, if ten or more small cuts are found within a particular zone and all relate to the same butchery action of removing sinew, defleshing or whatever, how does one quantify this? The attitude taken here is to record the total frequency of marks associated with a particular action. If, however, one wishes to make a numerical count of the frequency of cut marks and chop marks in relation to others near the distal end of a humerus, then a simple frequency table can be created in the computer program by counting type marks, instead of frequency of type marks.

## CHAPTER 5.

### THE ANALYTICAL FAUNAL RESULTS.

"We wish to recognize whether we are dealing with an assemblage that has been transported or with a residual population, that is, what remains after other parts are transported. Complicating the matter may be the presence and/or absence of destruction coupled with transport as well as different levels of destruction in different settings. How do we begin unraveling such a complicated set of possible conditions?" (after Binford 1981: 217 in Lyman 1994: 283)

In the previous chapter, the reader was presented with a methodology which aimed at facilitating the analysis and interpretation of the zooarchaeological material from the seven stratigraphic units from Sea Street houses JAM and MAN. To reiterate, the layers chosen and their respective number of identified specimens included :

JAM 4L	=	708
JAM 7L	=	243
JAM 8L	=	251

MAN 3AL	=	175
MAN 4AL	=	103
MAN 4L	=	138
MAN 7L	=	400

In total 2017 individual specimens were analyzed under the microscope. There were 3616 recorded forms of different butchery marks on them, from cut marks to chop, scrape, saw and other forms of butchery. To record both the absence/presence data and the numerous "butchery acts" over 30000 data entries were required. Despite the "intelligible set of data entries" which represented both absence and presence and butchery marks, it is now required to present this information to the reader in a schematic way, with no degree of ambiguity.

To reduce the number of drawings, it was decided to present one set of drawings for each layer, representing both left and right, and indeterminate specimens as well. To present the absence and presence data, each group of specimens was tallied to establish the total NISP for each group, e.g. mandible. Each of the zones within each bone group was also added up, and then divided by the total NISP figure. For example, in JAM 8L, 14 left mandible and 11 right mandibles were analyzed. In all the zones given to the group mandible, zone 4 was the best represented, and accounted for 21 of the possible 25 specimens. Zone 4 therefore had a possible 84 percent recovery rate on a presence vs. absence gauge. Each of the categories of bone were thus shaded in to give an impression of which zones were better represented than others. The degree of shading is on a relative scale from white to black, from zero to 100 percent.

Another exercise in shading was also undertaken to establish which skeletal elements were better represented in relation to the possible total number. A data set was established on a modified set of data extracted from the absence/presence data. Here each bone category was listed alphabetically according to unit and also phase. Each body part was broken down into the number of left, right and indeterminate specimens based both on NISP and MNI. For example, in the case of the cervical vertebrae in JAM 4L, 46 specimens were analyzed, of which zone 6 (the left posterior arch above the foramen transversarium) was represented most often by 17 cases. Therefore the minimum number of cervical vertebrae, and I must emphasize minimum, which could account for the 46 number of identified specimens is 17 and not 46.<sup>1</sup> The possible 17 cervical vertebrae were then divided by the skeletal element that was most frequently found in that layer. Each of these figures were then divided by the number of times that body part is found in the sheep's skeleton. In the above-mentioned example, five cervical vertebrae (3-7) are found in the sheep's skeleton. When the 17 minimum number of cervical vertebrae are divided by 5, we have an figure of 3.4. This number is then divided by the greatest MNI figure that can be attributed to the unit JAM 4L. In this case, the left radius was most often represented by 17 specimens. The 3.4 cervical vertebrae are then divided by the greatest MNI figure (17), and the resulting figure accounts for 20% of the minimum number of individuals that formed part of the archaeological record, i.e. the archaeological sample only represents 20% of the cervical vertebrae that should have been present if the total MNI or death assemblage for JAM 4L was 17. This figure is some reflection of the choices people made, as it is unlikely that people were acquiring the whole carcass, rather individual/communal cuts of meat from it.

A colour coding scheme was utilized as a mechanism to interpret gross patterns of "preference".

Black	=	75.0-100%
Red	=	50.0-74.9%
Green	=	25.0-49.9%
Yellow	=	0.1-24.9%
White	=	not present or not calculated for

Five categories were ignored in these sets of calculations, viz. maxilla/skull, sacral vertebrae/sacrum, caudal vertebrae<sup>2</sup>, carpals<sup>2</sup> and sesamoids. The maxilla/skull and caudal vertebrae were particularly

<sup>1</sup>. A practical problem that was encountered during the operation resulted in slight modification of the data set. Let us consider a hypothetical example to explain the problem. In constructing the worksheet, it was considered extremely important to convert the archaeological artifact into a series of zones which would enable one not only to accurately redraw the specimen, but also exactly record where the different acts of butchery had taken place. One of the mechanisms used was to record whether 1/4, 1/2, 3/4, or a whole of each of the zones was present. Although that information is vital to redraw that individual specimen, there are problems when establishing absence and presence. In our hypothetical example we have four mandibular condyles. Each is represented by three-quarters of a whole fragment. If one had to sum up these four fragments, one would get a figure of three, and assume that they only represent three individuals, while in fact they represent four. The reasoning behind this is that for two possible fragments to originate from the same specimen, each sample would have to be half of a whole, or a quarter and another three-quarter's to make up the whole. Here we have four specimens, each represented by three-quarter of a whole one, and therefore have to have come from four sheep and not three. For this reason each of the zones present were substituted with the value "1" to indicate their presence.

<sup>2</sup>. In the case of the carpals and the caudal vertebrae they have been highlighted in yellow to indicate that they are present and not absent.

difficult to calculate, as one would have to establish the exact number of bones in each group. In the case of caudal or coccygeal vertebrae, these can vary from three (in short-tailed sheep) to twenty-four or more depending upon the species one is dealing with. One would also have to make a value judgment based either on genetic information or sets of allometric data for different species. As we will see in the following chapter a number of species of sheep were imported into the colony, other than the indigenous forms of sheep kept by the Khoikhoi. For this reason, it is impossible to decide whether to divide by three or 24 specimens, as we do not know which genetic species we are dealing with archaeologically.

It was required to investigate both the positioning and frequency of the various "acts of butchery". Here again, all forms of butchery (where possible) were put on one set of schematic diagrams representing the whole skeleton for each of the units. Two conventions were used to redraw the archaeological specimens onto the diagrams. Firstly, it was decided to colour code the various forms of butchery, viz.:

Cut	=	solid black line
Chop	=	solid red line
Scrape	=	solid brown line
Saw	=	solid green line
Percussion	=	dashed black line
Chop Snap	=	solid blue line
Cut Snap	=	solid yellow line
Saw Snap	=	dotted brown line
Indeterminate	=	dotted blue line
Rodent/Carnivore damage	=	dotted yellow line

Secondly, in recording both the type and frequency of individuals acts of butchery, two assumptions were built into the worksheet. If two or more butchery marks were found next to each other in the same area, they are seen to represent one act of butchery. For example, if two chop marks are found next to each other near the acetabulum, they are likely to represent one act of butchery and not two separate acts. To convey this information, a solid red line, at whatever angle, would be drawn in with the following numbers in red: 1/2. This would indicate that we have one act of butchery represented by two chop marks. In another case one might have two solid red lines next to each other. This would indicate that we have two acts of butchery in this particular zone, at whatever angle, both executed with a chopper/ax/cleaver.

The second assumption includes intuitive judgments made about certain acts of butchery. For example, in JAM 4L, along the lateral proximal end of a femoral shaft, ten cut marks next to each other were discovered running perpendicular to the long-axis of the bone. This action is interpreted as meat removal from the bone which was hampered either by the angulation of the bone or the placement of certain muscles or tendons on that bone. In MAN 4AL, at the base of the anterior distal end of a humerus, a chop mark running perpendicular to the long-axis of the bone was considered to constitute a form of disarticulation. Judgments were also made about the nature of the implements used. In JAM 7L, a single

parallel set of blunt striations were found on the ilium shaft. These marks were definitely not made by any rodent; and after considering both the blunt nature of the marks and their straightness, it was concluded that they were possibly made by a flint (see Walker and Long 1977). Judgments therefore included decisions about whether meat removal, dismemberment or disarticulation had occurred, as well as the implement used in any possible act of butchery. Equally, intuitive knowledge was used in certain cases to evaluate abrasion of specimens, i.e. whether some specimens had possibly found their way through the stomach juices of carnivores.

In addition, this evidence on both the positioning and frequency of various butchery marks was taken one step further to investigate the relationship between the frequency of certain types of marks and their location on the sheep's skeleton. This idea was gained from the work by Richard Milo (1994) who found that there was a strong correlation between the number of elements in the sample and the number of cut elements from the Klasies River Mouth site. In his study he defined five regions within long bone morphology, viz. proximal articular end (disarticulation), proximal shaft (filleting), mid-shaft (filleting), distal shaft (filleting), and distal articulation (disarticulation). "Proximal and distal shafts were defined as the areas of origin and insertion respectively of major muscles on the particular bone (e.g. at the origin of tibialis anterior and the insertions of the peronus tertius and digital extensors on the tibia). Articular ends were defined as those areas enclosed by the joint capsule and where ligaments that bind joints are located" (Milo 1994: 194). I adopted a similar policy to Richard Milo (1994), whereby the frequencies for the joint articulations and the bone shafts were combined. I, however, decided to depart slightly from his schematic diagrams (Milo 1994: 195-6, figures 31-32), and added or changed some of the joint articulation regions.

For example, I tallied the butchery marks for the posterior end of the axis, to establish how frequently the carcass was dismembered between that region and the 3rd cervical vertebra. Due also to the large number of phalanges encountered in the faunal collection, I decided to enlarge the distal metatarsal-1st phalanx region to incorporate all three phalanges.

In addition, although noted, data from the sacrum, caudal vertebrae, skull and mandible were ignored. So too information from the dorsal ribs - head and neck region - was ignored. As the head and/or neck regions of the ribs are often found on their own, it was believed that these had been dismembered as part of a process whereby somebody had chopped or sawn through the transverse processes of the thoracic vertebrae, leaving the ball and socket joint between these two skeletal elements intact.

Once the joint or skeletal regions were defined and tallied, one needed to establish the relative percentages of a particular butchery mark for each of the established anatomical regions. The method used by Richard Milo (1994: 195) was to standardize the number of marks for uneven skeletal part frequencies by dividing by the MNI for each segment. In the faunal sample from Sea Street it was noted that humeri shafts were poorly represented. These are used as our hypothetical faunal specimens to illustrate where the problems lie with Milo's (1994) methodology. Both relate to how the eventual percentages are calculated. Let us assume that we have only one humeral shaft specimen from any phase, which has a transverse chop mark through the bone. As skeletal part frequencies are "standardized" by

dividing by the "MNI for each segment", the resulting figure for the humeral shaft region would be 100%, as we have only one chop mark and one specimen. Further erroneous results could occur where more than one butchery mark was found on a segment, coupled with low MNI figures, which are used as denominators to gain a "standardized value". It is believed that some of the high figures gained by Milo (1994) might be the result of such a scenario (see Milo 1994: 196, figure 32, where the value given for the tibio-metatarsal joint is 53%). For these reasons, it was decided to abandon Milo's (1994) methodology, and simply to divide by the sum total for a given butchery mark for each of the phases. The computerized data from Sea Street was simplified, whereby the categories cut-snap, chop-snap and saw-snap were respectively incorporated into the categories cut, chop and saw. The category 'other' included scrape, percussion, indeterminate and rodent/carnivore marks. The data on 'other' was not incorporated into a separate sub-set of diagrams, as the total count was usually low, and would result in only erroneous interpretations being made from the data.

Lastly on the basis of all the collective faunal analyses, the data was taken two steps further. Firstly one wanted to establish the likely cuts of meat that were purchased, whether the carcasses were bought whole, quartered or by specific butchering cut. As we are dealing with an historical sample and as fresh meat could not have been kept for long, it is likely that smaller skeletal portions were acquired. A profile of each of the phases was established by ranking the number of skeletal portions per category by weight (see below) as consumers choices are influenced by the percentage of consumable meat versus cost (see Chapter 3). Secondly, this information is used to evaluate how similar or dissimilar each of the phases are from each other based on this evidence and the information gained from the cut, chop and saw data. In addition, a theoretical discussion is entered into as to why there are changes or why no changes were found between the various phases. This discussion takes into account temporal, technological and other factors.

### 5.1. ABSENCE VS. PRESENCE OF SPECIFIC SKELETAL ELEMENTS.

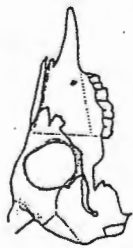
Let us firstly consider each of the skeletal elements in which some zones are better represented than others. The abbreviations used in the diagrams relate to anterior (A), posterior (P), dorsal (D), ventral (V), medial (M) and lateral (L). In cases where there is no medial and lateral side, as in the case of the skull and the groups of vertebrae, the planes given are left and right, if one had to split the skeleton along the anterior/posterior plane. The figures in brackets refers to the total NISP for that skeletal element.

#### 1. *The Skull and Maxilla (see Figure 5.1).*

The areas best represented are the occipital and parietal bone region at the posterior end of the skull. The frontal and nasal bone of the skull is poorly represented. A few fragments do come from the bone around the orbit, from the zygomatic process and the supraorbital process. Nevertheless the portion that is most consistently recovered comes from the maxilla. Included in the maxilla are the molars and premolars, portions of the palatine process of the maxilla and part of the facial tuberosity on the side of the maxilla.

JANI 4L

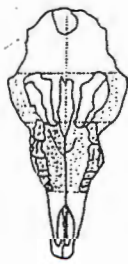
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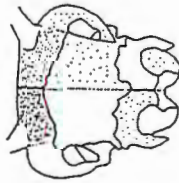
LEFT



V



P



BUCCAL



LINGUAL

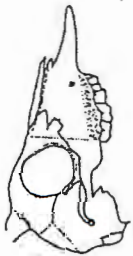


LEFT MANDIBLE (3)

MAXILLA/SKULL (14)

JAM 7L

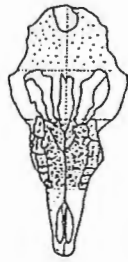
RIGHT



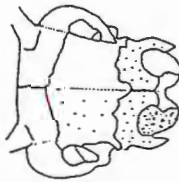
LEFT



V



P



BUCCAL



LINGUAL



LEFT MANDIBLE (15)

MAXILLA/SKULL (8)

D

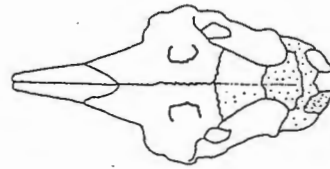
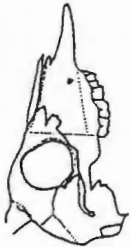


Figure 5.1: Absence and Presence of Zones within mandible, maxilla and skull.

Figure 5.1: Continued.

MAN 4L

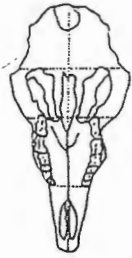
RIGHT



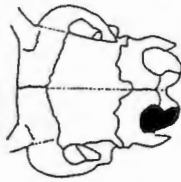
LEFT



V



P



BUCCAL



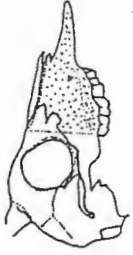
LINGUAL



LEFT MANDIBLE (2)

MAXILLA/SKULL (1)

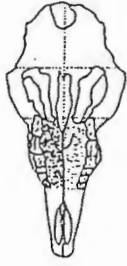
RIGHT



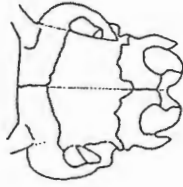
LEFT



V



P



BUCCAL



LINGUAL



LEFT MANDIBLE (11)

MAXILLA/SKULL (4)

Figure 5.1: Continued.

Figure 5.1: Continued.

JAM 8L

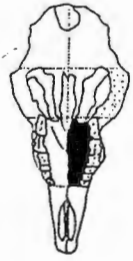
RIGHT



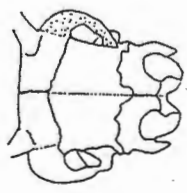
LEFT



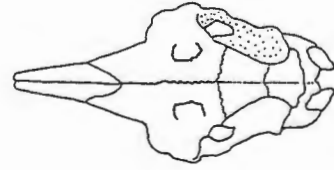
V



P



D



BUCCAL



LINGUAL

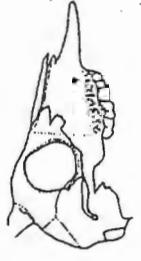


LEFT MANDIBLE (75)

MAXILLA/SKULL (5)

MAN 3AL

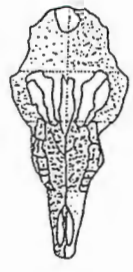
RIGHT



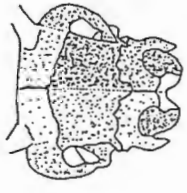
LEFT



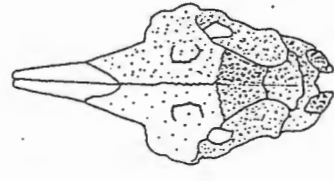
V



P



D



BUCCAL



LINGUAL



LEFT MANDIBLE (1-)

MAXILLA/SKULL (16)

Figure 5.1: Continued.

Figure 5.1: Continued.

2. *The Mandible (see Figure 5.1).*

Depending on sample size the mandible is well represented by all portions of the bone. The zones which either survive less well, or break off easier are the coronoid process, the mandibular condyle, as well as the section in front of the mental foramen. Both buccal and lingual portions of the cheek teeth, as well as the ascending ramus, from the body to the angle of the mandible, are well preserved.

3. *The Sacrum (see Figure 5.2).*

The best represented sections of the sacrum are the anterior dorsal and ventral portions, including the articular surfaces and especially the anterior articular processes. The apex and mid-section of the sacrum is poorly represented in JAM Phases 2 and 3, and simply not present in either MAN Phases 2 and 3. Both the poor presence or non-presence of these posterior sections may indicate some gross form of butchering at this point (removing the hindquarters), with some intention of either getting at the innominate and/or of chopping or cutting off the tail section of the animal.

4. *The Metapodials (see Figure 5.2).*

These originate in most cases from either unfused metacarpals or metatarsals. In other instances this is not the case. Here, part of the distal portion of either one of the two aforementioned elements, in a fused state, had been chopped, sawn or snapped off leaving part of the distal shaft attached to the metapodials. Where this had occurred, it had often been very close to the juncture of the two portions, resulting in the non-identifiability of the distal shaft to either the metatarsal or metacarpal category.

5. *Atlas (see Figure 5.3).*

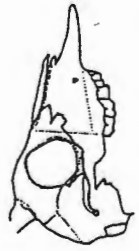
Among certain units sample size was clearly a problem. Despite this the anterior and posterior zones around the articular surfaces, with the skull and axis as well as each of the wings, are well represented. Where certain zones are more dominate than others it reflects different acts of butchery, resulting in one portion remaining and another not. In addition, the compacted nature of the bone in the atlas, also provides a reason why it is well represented in nearly all zones.

6. *Axis (see Figure 5.3).*

As with the atlas, sample size is a problem. Here sample size may, however, point towards a particular pattern. In most of the units there is almost a total absence of both the transverse and spinous process, with an almost equal absence of the arch. In contrast those portions which are best represented are (from anterior to posterior) the dens, anterior articular process, ventral spine and body of the axis. This difference between the dorsal and ventral aspects of the axis, may indicate some loss of the former in the act of butchery. Similarly as both the anterior articular process and the dens are more often present than any other section of the axis, it may be that this portion is the result of an act of butchery which serves to sever the axis from the atlas, so as to dissect the head from the rest of the skeleton.

MIAN 7L

RIGHT

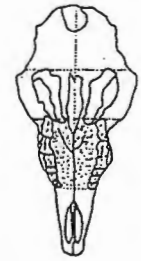


JANI 4L

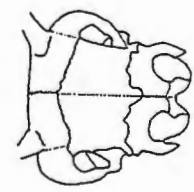
LEFT



V



P



BUCCAL

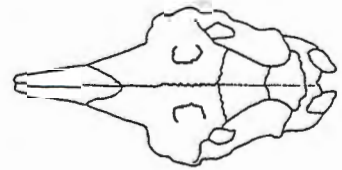


LINGUAL



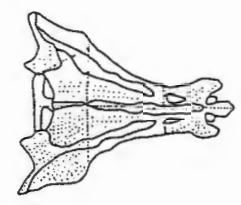
LEFT MANDIBLE (10)

D



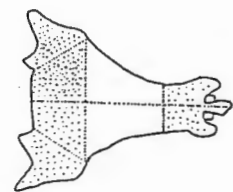
MAXILLA/SKULL (1)

D



SACRUM (5)

V



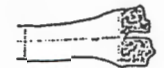
L



A



P



H



METAPODIAL (24)

Figure 5.1: Continued.

Figure 5.2: Absence and Presence of Zones within the sacrum and metapodials.

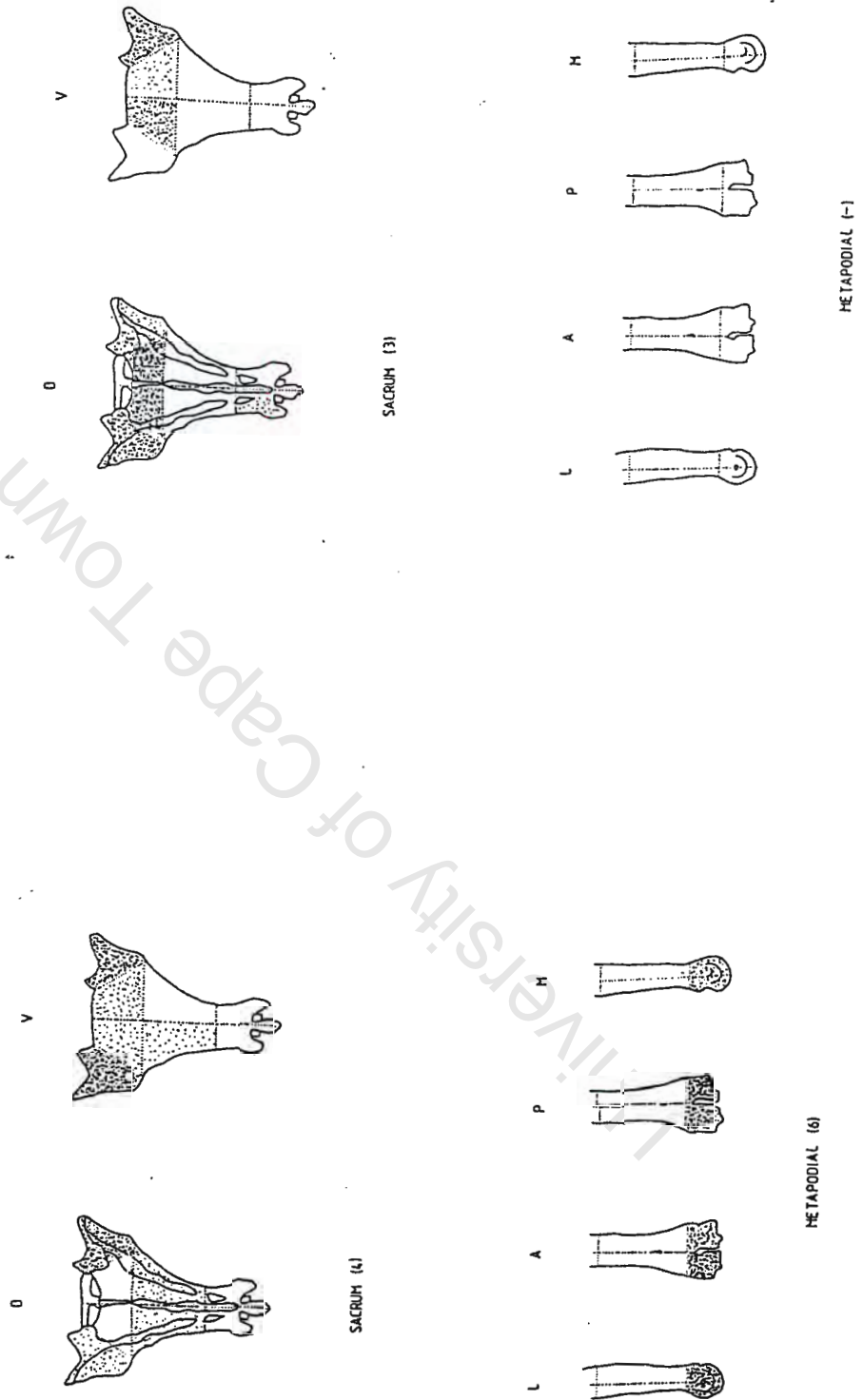


Figure 5.2: Continued.

Figure 5.2: Continued.

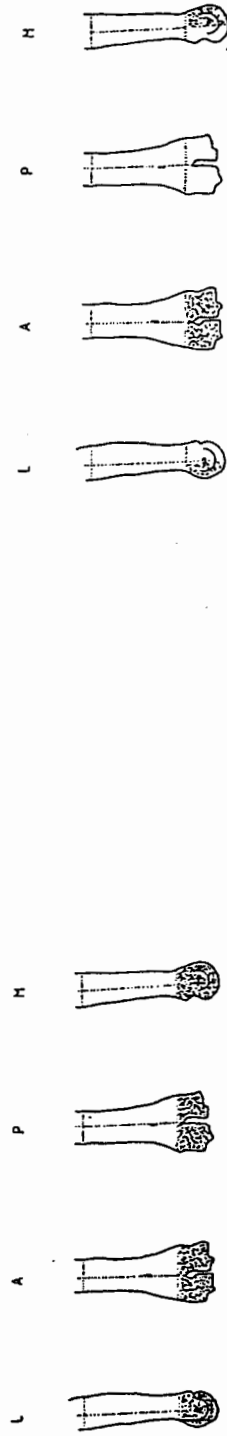
MAN 3AL

MAN 4AL



SACRUM (2)

SACRUM (1)



METAPODIAL (3)

METAPODIAL (2)

Figure 5.2: Continued.

Figure 5.2: Continued.

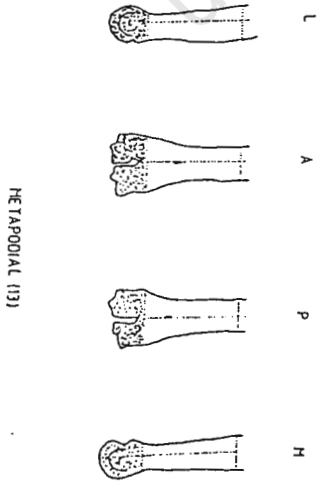
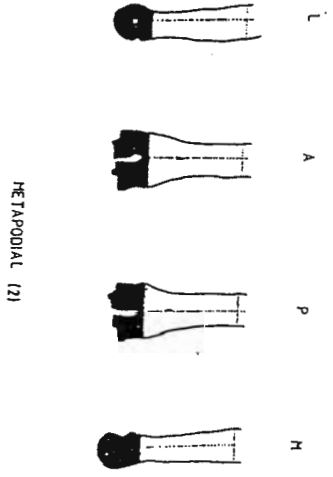
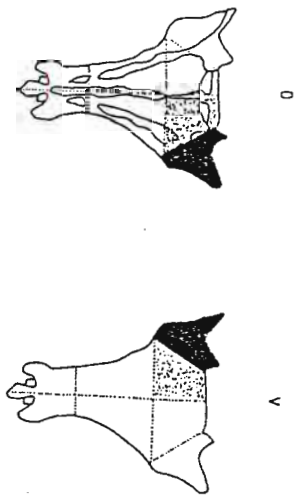
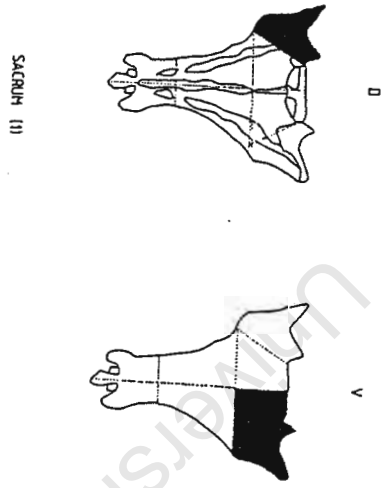
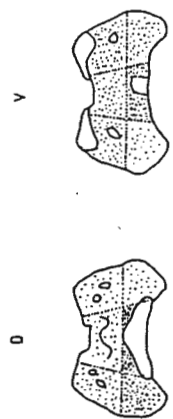
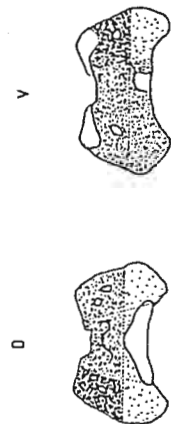


Figure 5.2: Continued.

Figure 5.2: Continued.



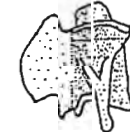
ATLAS (2L)



ATLAS (7L)

RIGHT

LEFT



RIGHT

LEFT



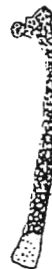
AXIS (10)

AXIS (7)

L



L



H



H

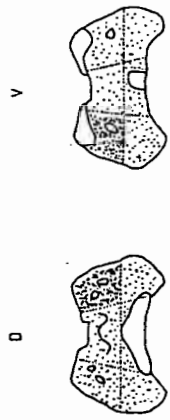


RIB (101)

RIB (71)

Figure 5.3: Absence and Presence of Zones in the atlas, axis and ribs.

Figure 5.3: Continued.

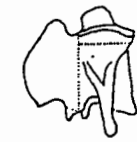


ATLAS (L)



ATLAS (R)

RIGHT LEFT



RIGHT LEFT



AXIS (L)

L



H



RIB (L6)

AXIS (R)

L



H



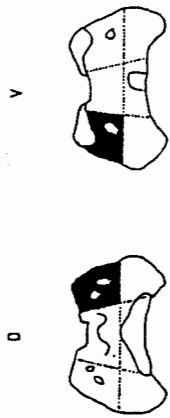
RIB (R5)

Figure 5.3: Continued.

Figure 5.3: Continued.

MAN 4AL

MAN 4L



ATLAS (I)

RIGHT



LEFT



AXIS (I)

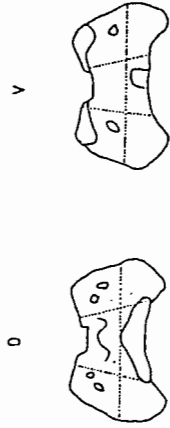
L



H



RIB (91)

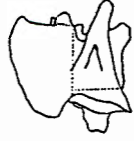


ATLAS (-)

RIGHT



LEFT



AXIS (-)

L



H



RIB (23)

Figure 5.3: Continued.

Figure 5.3: Continued.

7. *The Ribs (see Figure 5.3).*

All aspects of the rib are well represented except the sternal end, which is infrequently preserved. Often the head, neck, tubercle and the medial and lateral surfaces are well preserved, with one or more zones having a higher degree of survivability than the others. Often the head is less frequently found in the faunal assemblage, than either the head, tubercle or medial/lateral surfaces. The lower presence of the head (and/or neck) and distal end of the rib may infer that the ribs are severed from the vertebrae at or near the head (and/or neck) of the ribs, and at some point along the distal section of the medial/lateral surfaces.

8. *Lumbar Vertebrae (see Figure 5.4).*

As with the axis, the spinous process seems to be underrepresented. So too is the posterior articular process which is positioned slightly below the spinous process. In some cases the posterior articular process is better represented than in others. The percentage survivability is highest for either part of the body, as well as for the anterior articular process. The transverse process also has a reasonable high degree of survivability; however, in a very few instances, the transverse process was found whole. Often only a portion of it remained, either having broken off accidentally after use or having been deliberately butchered through, wholly or partially. The survivability or non-survivability of the transverse process may also be a function of its thinness, nearer or further from the body of the skeletal element.

9. *Thoracic Vertebrae (see Figure 5.4).*

As with lumbar vertebrae, the thoracic vertebrae show a similar general trend. The spinous process is on average better represented than among the lumbar vertebrae, but still not to a significantly high degree. Both the arch, and the anterior and transverse processes as well as the body of these vertebrae are well represented.

10. *Cervical Vertebrae (see Figure 5.5).*

Where sample size is significantly large, these vertebrae are well represented in nearly all facets, especially the zones around the vertebrae foramen incorporating the arch, the body, and parts of either the anterior or posterior articular processes. The zones which are less well represented or preserved include portions of either the lateral or ventral branches of the transverse process.

11. *The Scapula (see Figure 5.5).*

The percentage survivability of various zones within the scapula certainly favours the distal portion of this element, especially in the region of the glenoid cavity and tuberosity, and then moving ventrally to the region near the nutrient foramen along the posterior border mirroring the distance along the anterior border which encompasses a third of the scapula distally. The spine is less well represented in both the proximal and distal portions of the bone, less so towards the proximal end. Similarly, there is poorer representation of both the proximal portions of the supra- and infraspinous fossae. This break between the proximal and distal sections of the scapula in terms of absence and presence may point to

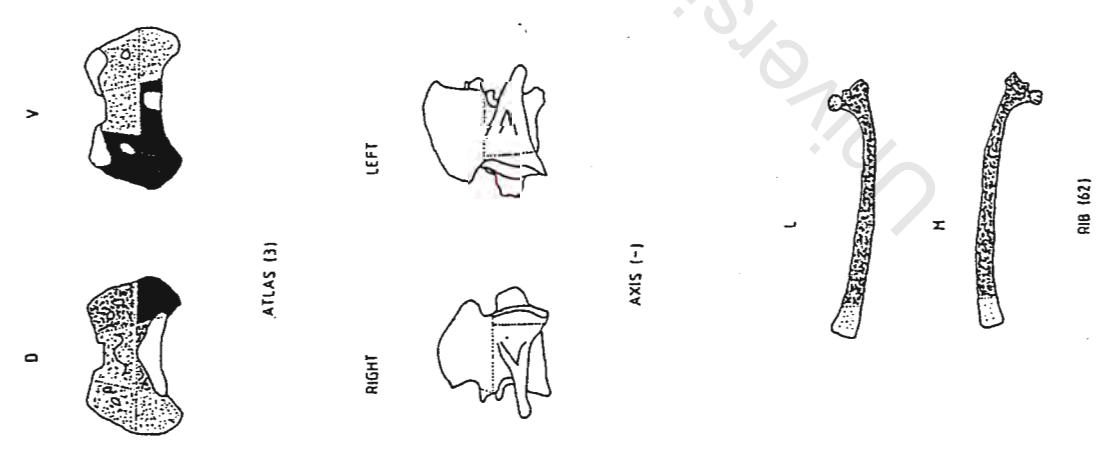


Figure 5.3: Continued.

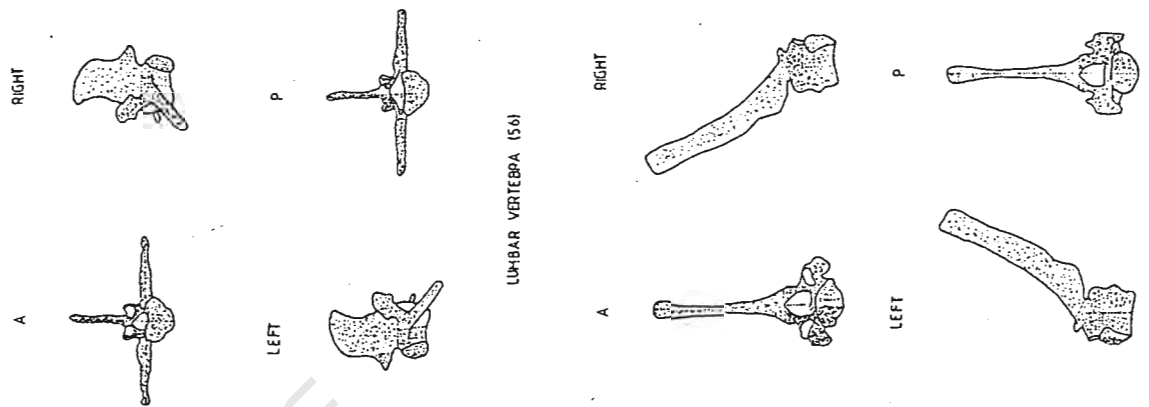
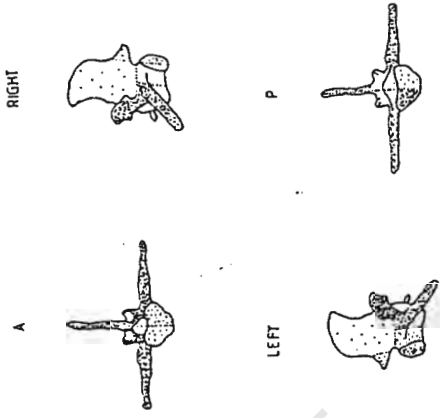
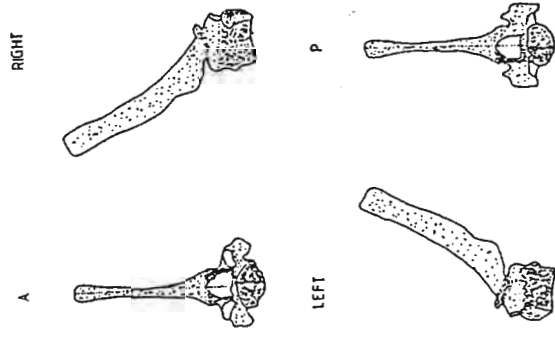


Figure 5.4: Absence and Presence of Zones on the lumbar and thoracic vertebrae.

JAM 8L



LUMBAR VERTEBRA (L3)

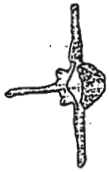


THORACIC VERTEBRA (T5)

RIGHT

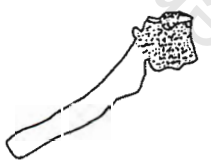


P

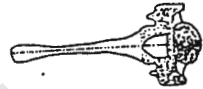


LUMBAR VERTEBRA (L5)

RIGHT



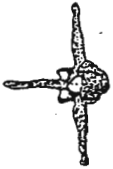
P



THORACIC VERTEBRA (T8)

JAM 7L

A

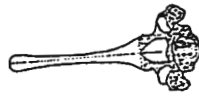


LEFT

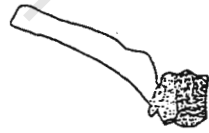


LUMBAR VERTEBRA (L5)

A



LEFT

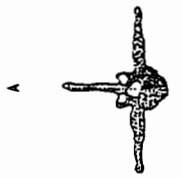


THORACIC VERTEBRA (T8)

Figure 5.4: Continued.

Figure 5.4: Continued.

MAN 4L



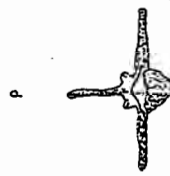
A



RIGHT



LEFT



P

LUMBAR VERTEBRA (11)



A



RIGHT



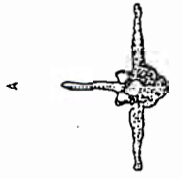
LEFT



P

THORACIC VERTEBRA (5)

MAN 7L



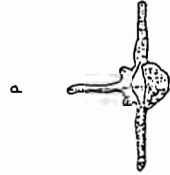
A



RIGHT



LEFT

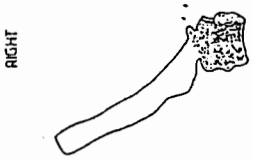


P

LUMBAR VERTEBRA (15)



A



RIGHT



LEFT



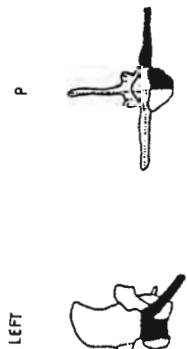
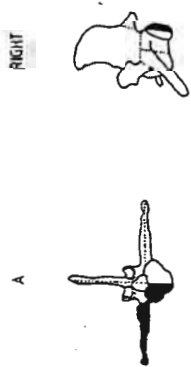
P

THORACIC VERTEBRA (11)

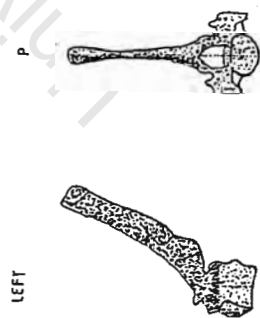
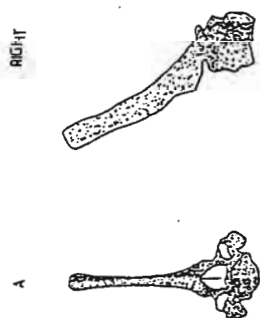
Figure 5.4: Continued.

Figure 5.4: Continued.

MAN 3AL

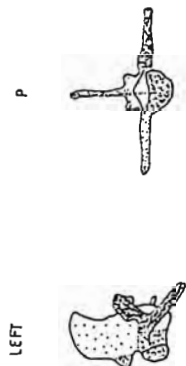


LUMBAR VERTEBRA (I)

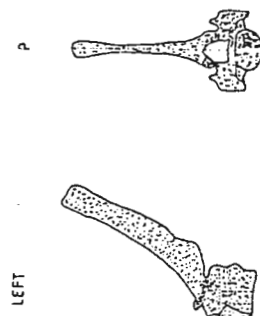
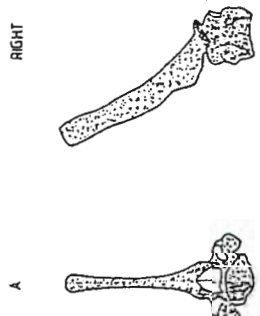


THORACIC VERTEBRA (20)

MAN 4AL



LUMBAR VERTEBRA (11)



THORACIC VERTEBRA (6)

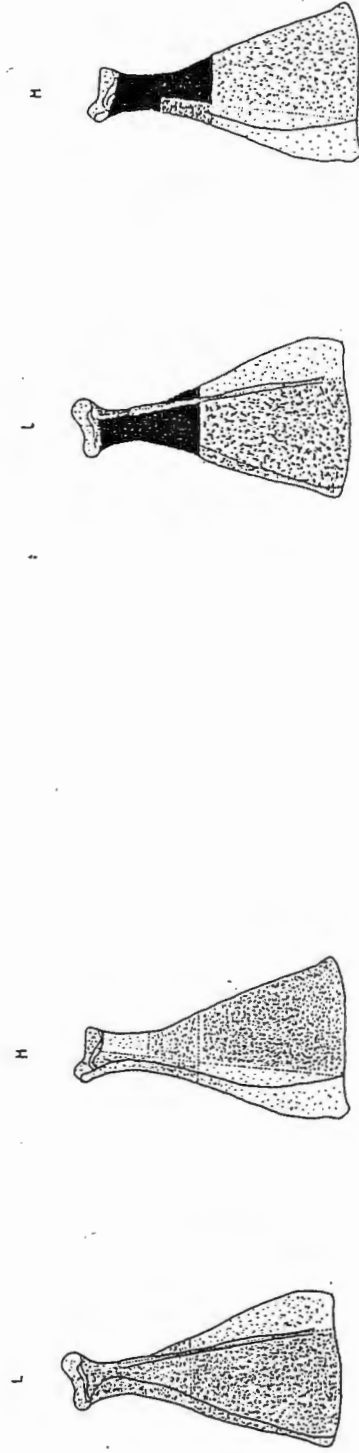
Figure 5.4: Continued.

Figure 5.4: Continued.



CERVICAL VERTEBRA (L4)

CERVICAL VERTEBRA (Z)



LEFT SCAPULA (L4)

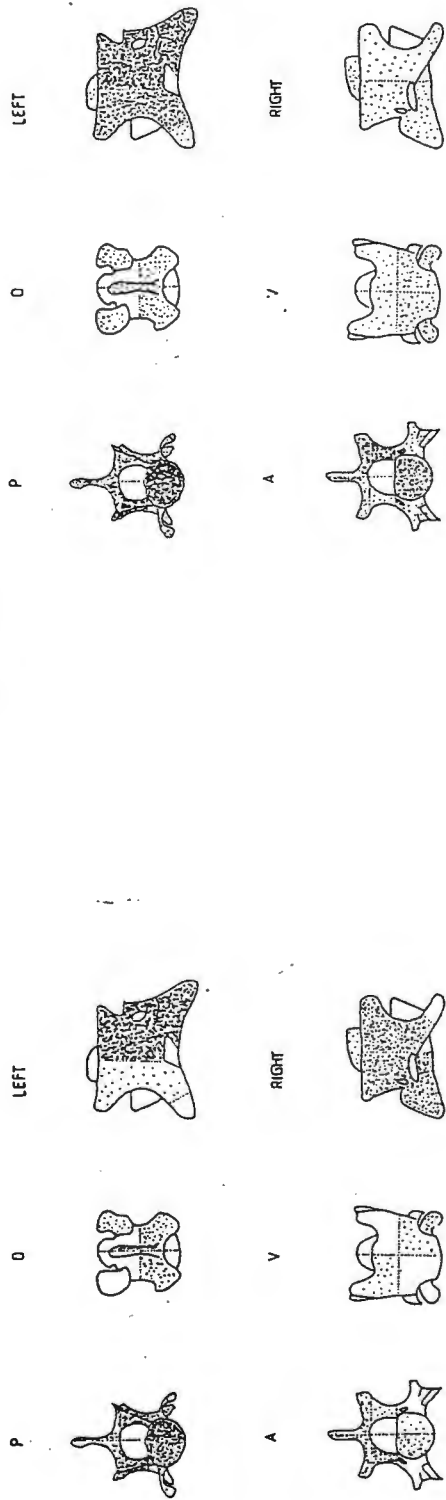
LEFT SCAPULA (Z)

Figure 5.5: Absence and Presence of Zones in the cervical vertebra and the scapula.

Figure 5.5: Continued.

JAM 8L

MAN 3AL



CERVICAL VERTEBRA (9)

CERVICAL VERTEBRA (9)

LEFT SCAPULA (5)

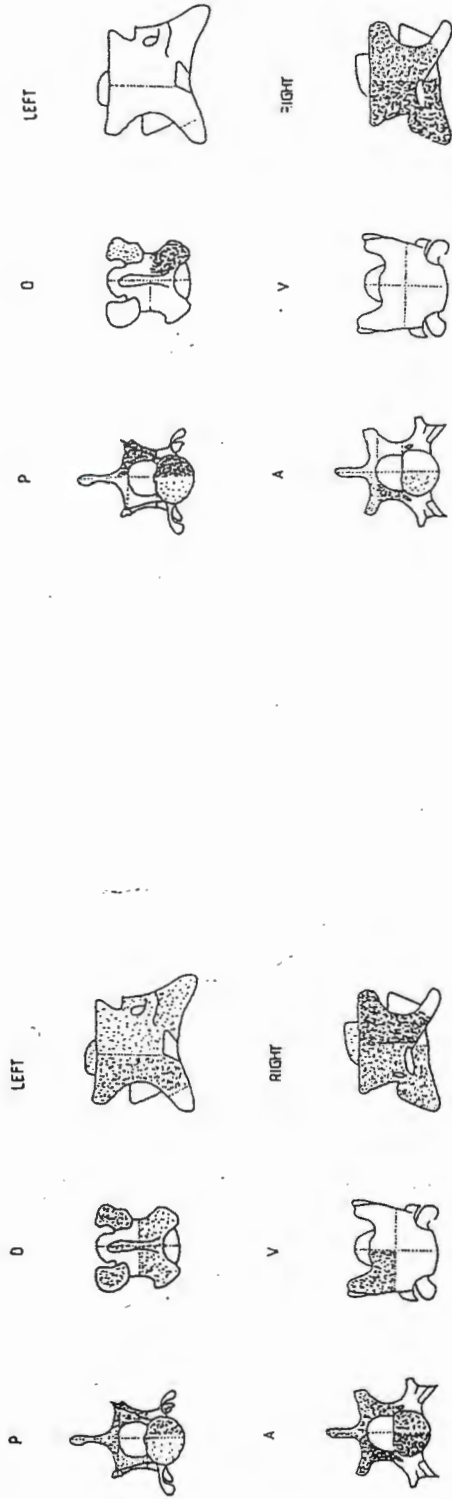
LEFT SCAPULA (6)

Figure 5.5: Continued.

Figure 5.5: Continued.

MAN 4AL

MAN 4L



CERVICAL VERTEBRA (7)

CERVICAL VERTEBRA (4)



LEFT SCAPULA (3)

LEFT SCAPULA (2)

Figure 5.5: Continued.

Figure 5.5: Continued.

some butchering pattern with the distal portion remaining articulated with the proximal humerus, and the proximal scapula remaining on its own.

12. *The Humerus (see Figure 5.6).*

Although sample size is not as large as one might hope, three interesting patterns seem to emerge. The zones best represented are those that are part of the distal humerus, especially on the medial and lateral sides of the coronoid fossa, and the condyles (medial and lateral) at the distal end. Secondly, more often than not, the proximal end is either poorly represented or non-existent. Thirdly, as with the proximal end of the humerus, the mid-shaft is similarly poorly represented or non-existent, as is the case in JAM 7L, JAM 8L, MAN 3AL, MAN 4AL and MAN 4L. These three aforementioned patterns may relate to two or three patterns of butchery. In cases where the distal end is only present, one could interpret this as evidence of distal shaft butchering resulting in its inclusion with the proximal radius and ulna as a butchering unit (see MAN 4AL). A variation of this may be a butchering selection higher up the shaft towards its proximal end as in MAN 7L. Thirdly, we may be having mid-shaft breakage, with the deliberate intention of dividing the humerus into proximal and distal halves, as may be the case in each of the units except MAN 7L, with the added motive to get at the marrow cavity.

13. *The Ulna (see Figure 5.6).*

Here the section best represented are the mid-sections of the ulna, including the processus aneonaeus and the semilunar notch which articulates with the distal end of the humerus, as well as the posterior mid-shaft of the ulna.<sup>3</sup> Those that are less represented include the olecranon and the distal shaft. The absence of the olecranon as an unfused portion of the proximal end of the ulna may reflect that we are dealing with individuals younger than 2½ years (30 months). The alternative interpretation is that during dismemberment of the distal humerus, either anteriorly or posteriorly, that part of proximal end of the ulna (either including the olecranon or not) is ending up as part of a different butchering unit. Similarly the absence or under-representation of the distal shaft may also indicate another point where one butchering unit was severed from another. If this was the case, one would expect the proximal radius to be severed from its distal portion at some point along its shaft.

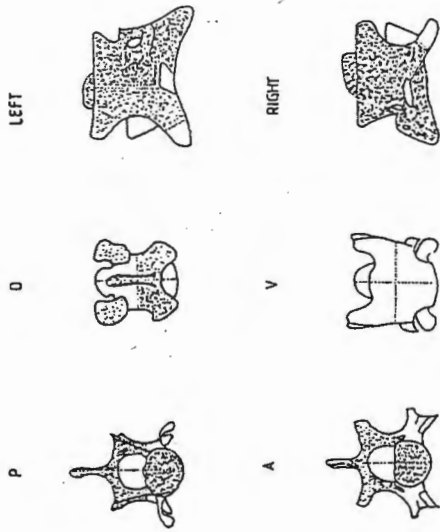
14. *The Radius (see Figure 5.6).*

In the previous section it was suggested that the proximal radius may have been incorporated with the proximal ulna and distal humerus as part of a butchering unit. A cursory survey of the zones best represented reveals three possible patterns. In JAM 4L and MAN 3AL there is clear evidence that this is the case. In each of the other units except in MAN 4L this may also be the case, with the radius being severed slightly further down the shaft, which could be seen as a slight alteration of the first pattern. Secondly, one notices that the skeleton element could alternatively have been severed at some point along the shaft either distally (see MAN 4AL and MAN 4L) or proximally, or in the mid-shaft region. The third

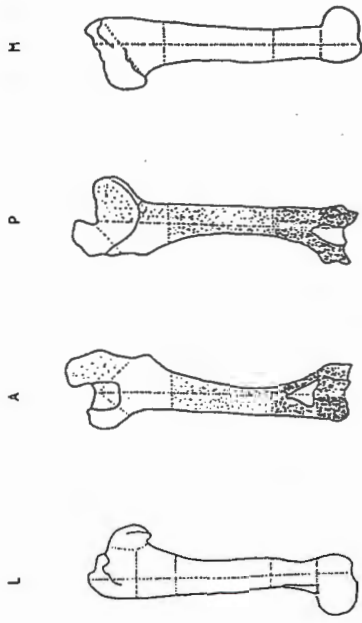
<sup>3</sup> The tight fit of the distal humerus, proximal ulna and radius as one articulating joint may well have influenced the presence of the mid-shaft region and the semi-lunar notch to the exclusion of other zones.

MAN 7L

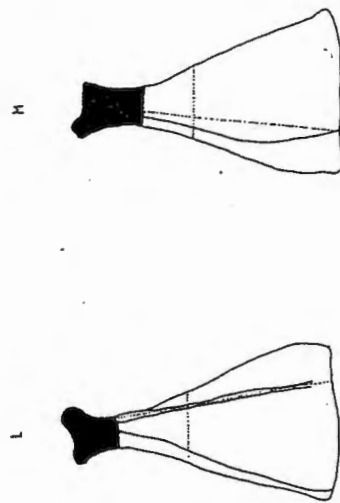
JAM 4L



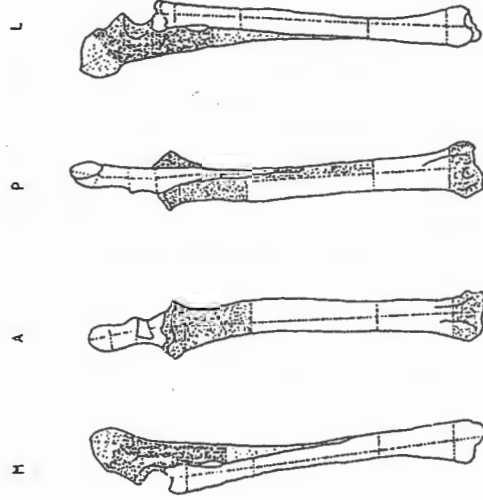
CERVICAL VERTEBRA (5)



LEFT HUMERUS (20)



LEFT SCAPULA (10)



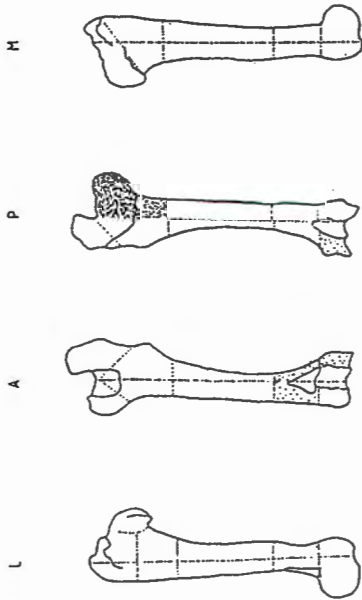
(43) RIGHT RADIUS AND ULNA (16)

Figure 5.5: Continued.

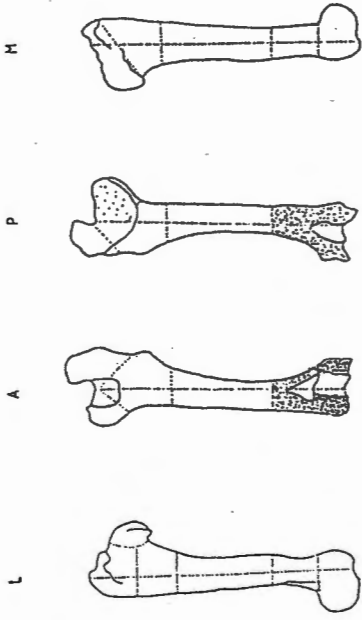
Figure 5.6: Absence and Presence of Zones in the humerus, radius and ulna.

JAM 7L

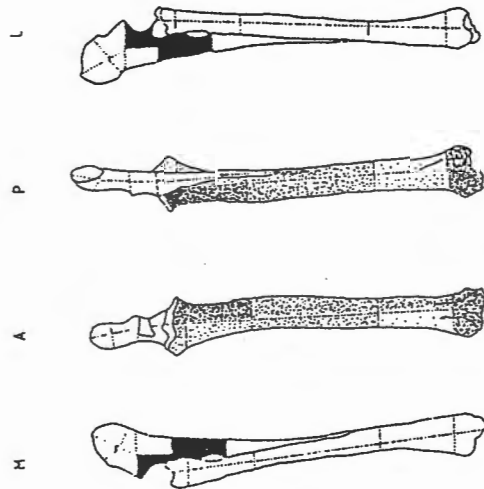
JAM 8L



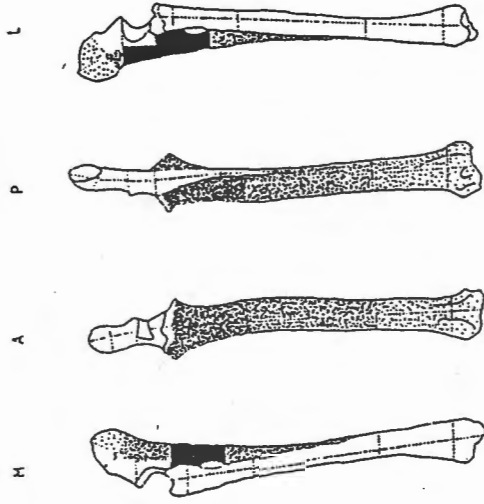
LEFT HUMERUS (61)



LEFT HUMERUS (6)



(11) RIGHT RADIUS AND ULNA (11)



(11) RIGHT RADIUS AND ULNA (3)

Figure 5.6: Continued.

Figure 5.6: Continued.

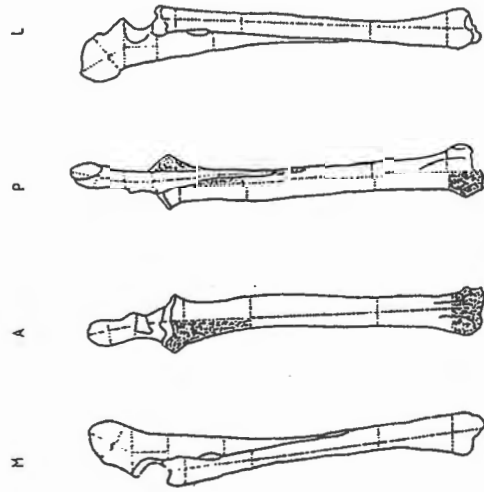
MAN JAL

MAN 4AL

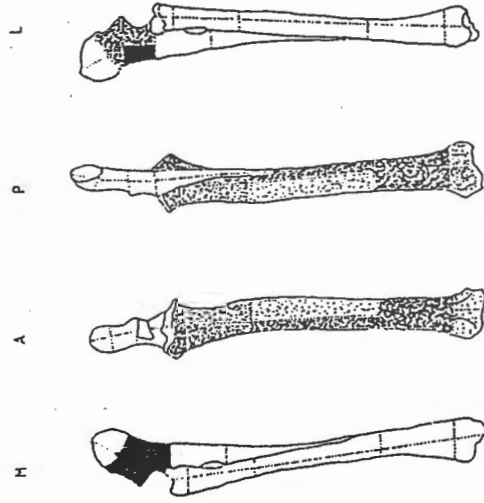


LEFT HUMERUS (4)

LEFT HUMERUS (4)



(7) RIGHT RADIUS AND ULNA (-)

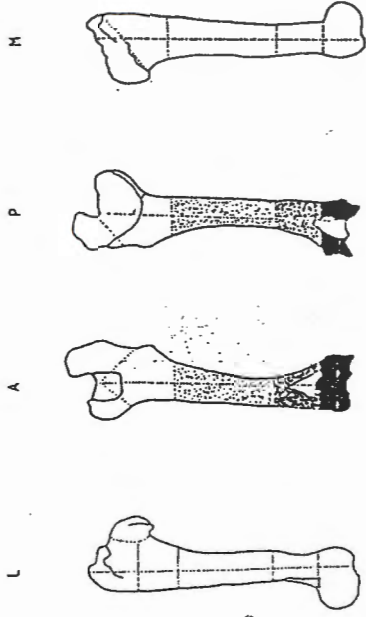


(7) RIGHT RADIUS AND ULNA (2)

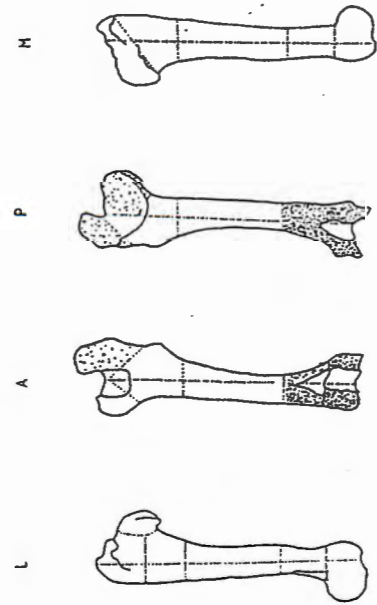
Figure 5.6: Continued.

Figure 5.6: Continued.

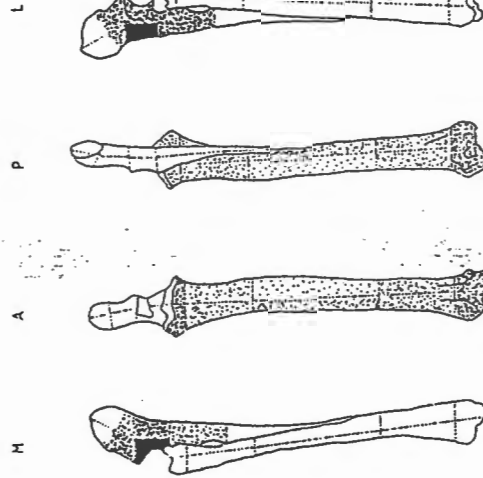
MAN 7L



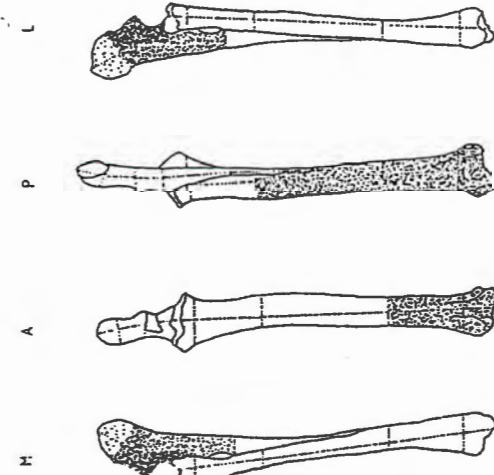
LEFT HUMERUS (6)



LEFT HUMERUS (4)



(15) RIGHT RADIUS AND ULNA (3)



(2) RIGHT RADIUS AND ULNA (7)

MAN 4L

Figure 5.6: Continued.

Figure 5.6: Continued.

interesting point, rather than pattern, is that the distal epiphysis is well represented in most of the units (JAM 4L, JAM 7L, MAN 3AL and MAN 7L). Their higher representation may imply that a number of the distal radii originate from unfused individuals, i.e. ones younger than 3 years (36 months). This does not mean that there are no fused individuals in the sample, simply that the high incidence of unfused epiphyses should not go unnoted.

15. *The Pelvis/Innominate (see Figure 5.7).*

This body part also shows some patterning. In each case, with no exceptions, the area around the acetabulum is best represented. Those areas which are less represented may indicate three patterns. In each of the units the area least represented is the anterior (proximal) portion of the innominate incorporating the tuber sacrale and the tubercoxae. The underrepresentation of this portion may indicate that the anterior (proximal) portion of the innominate is being severed from the posterior region between the last lumbar vertebrae (6th) and the anterior portion of the sacrum. The second possibility may have been a mid-shaft dismemberment along the ilium (see MAN 3AL and 4L) resulting in the acetabulum remaining intact with the head of the femur. The lesser representation or absence (see MAN 4L) of the posterior portion of the pelvis along the lesser sciatic notch and ridge (zones 7, 10, 11 and 14) may have some significance in the act of butchering, possibly to get at the femur or to separate the left and right pelvis medially.

16. *The Femur (see Figure 5.8).*

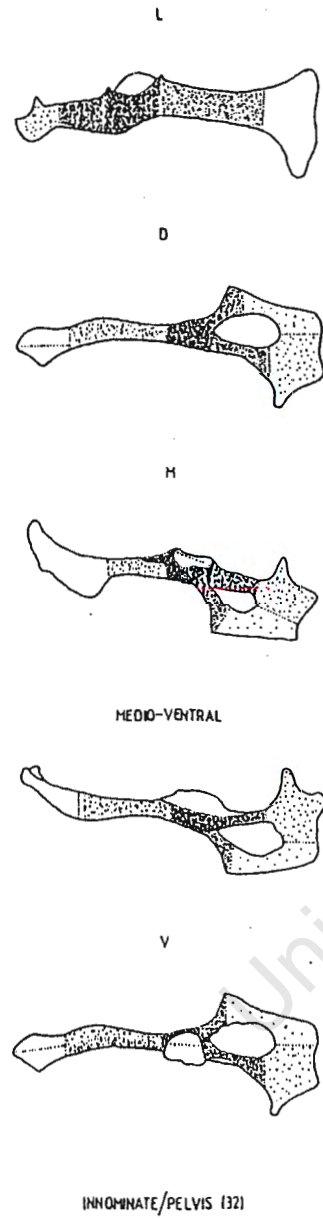
As with other skeletal elements, we again can see a number of patterns. In MAN 4AL we have clear evidence of mid-shaft absence, with only proximal and distal aspects remaining. Alternatively, in MAN 4L, we have distal absence, with proximal and mid-shaft presence. The absence of the distal section may infer that the proximal end remains articulated with the acetabulum of the pelvis while the distal end is ending up as part of another butchering unit, the metatarsal below. In other cases, both proximal and distal ends show greater representation than mid-shaft presence. This can very clearly be seen in JAM 4L, JAM 7L, MAN 3AL and to a lesser degree in JAM 8L and MAN 7L.

The presence of the mid-shaft, albeit lesser, in those cases could be seen as mid-shaft breakage resulting in a higher presence of proximal and distal ends, with mid-shaft fragments or splinters ending up in the adiagnostic fragments section. The last pattern is the high presence of the femoral head and/or presence or absence of the major trochanter. Here we are either dealing with individuals younger than 30-36 months (see Silver 1969) as either the femoral head or major trochanter remains unfused. Alternatively the proximal end of the femur is being severed from the rest of the leg, resulting in its attachment to the acetabulum.

17. *The Tibia (see Figure 5.8).*

Again we note some characteristic patterns. In both MAN 3AL and MAN 4AL only the distal portions of the tibia remain, with dismemberment along the proximal mid-shaft region. In other cases, where parts of the proximal shaft remain (see JAM 4L, JAM 7L, JAM 8L and MAN 7L proximal view),

JAM 4L



JAM 7L

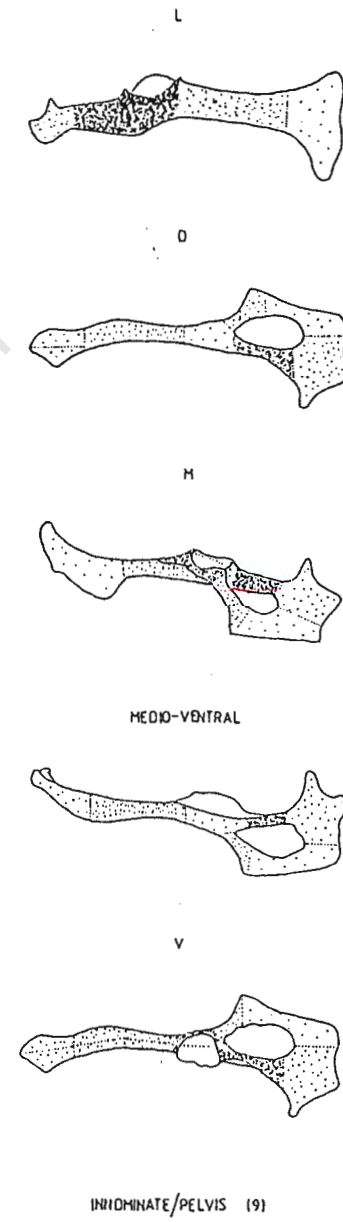
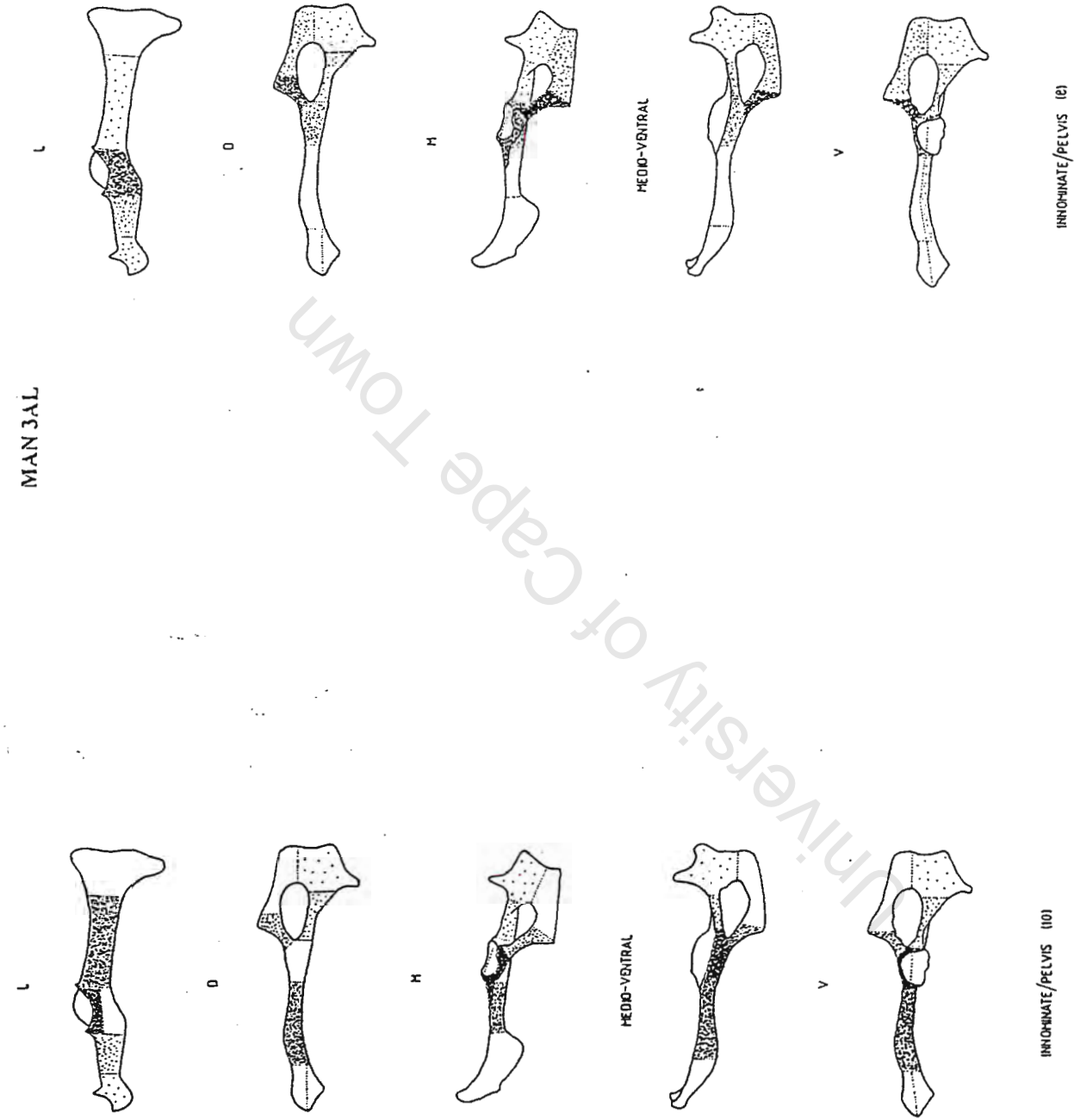


Figure 5.7: Absence and Presence of Zones in the innominate or pelvis.

Figure 5.7: Continued.

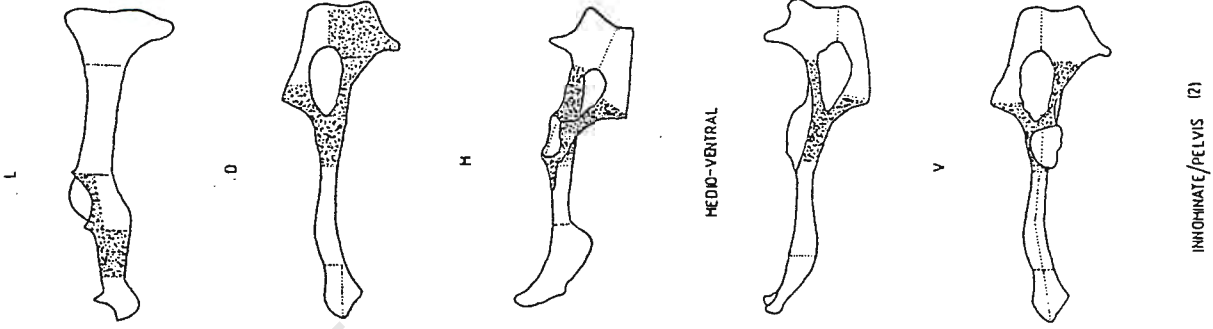


JAM 8L

Figure 5.7: Continued.

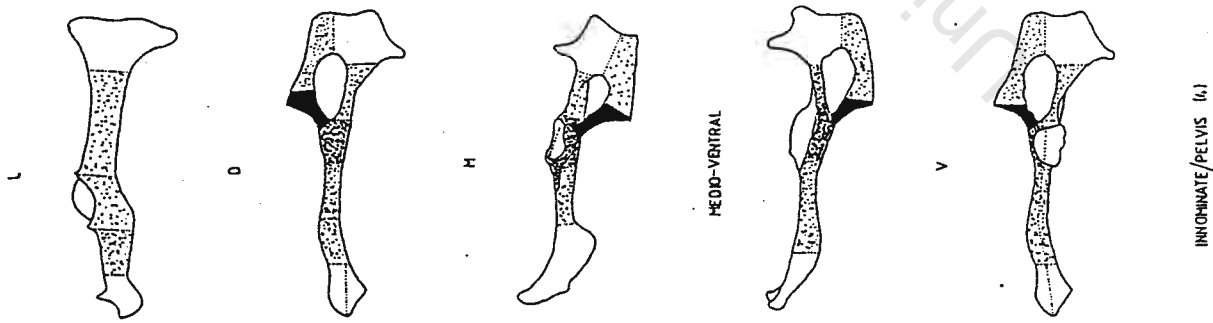
Figure 5.7: Continued.

MAN 4L



INNOMINATE/PELVIS (2)

MAN 4AL

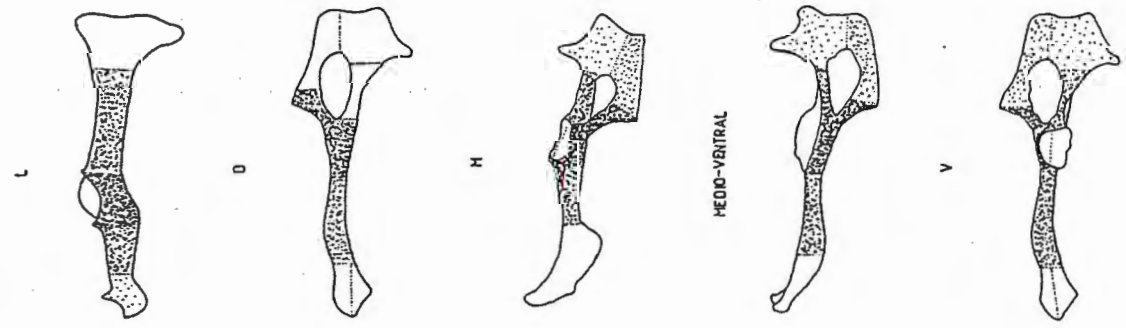


INNOMINATE/PELVIS (1)

Figure 5.7: Continued.

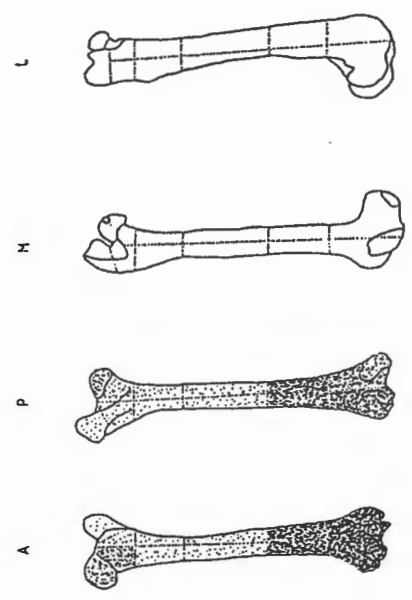
Figure 5.7: Continued.

MAN 7L

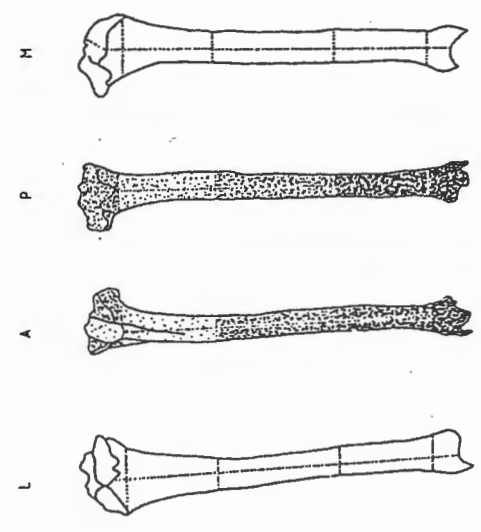


INNOMINATE/PELVIS (8)

JAM 4L



LEFT FEMUR (19)



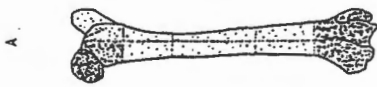
LEFT TIBIA (17)

Figure 5.7: Continued.

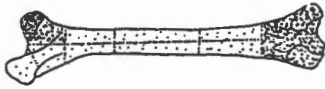
Figure 5.8: Absence and Presence of Zones in the femur and tibia.

JAN 7L

JAN 8L



A



P



M



L



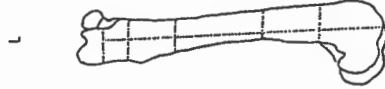
A



P



M



L

LEFT FEMUR (10)

LEFT FEMUR (11)



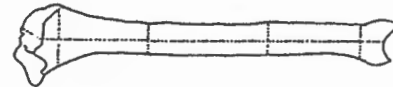
L



A



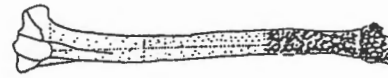
P



M



L



A



P



M

LEFT TIBIA (5)

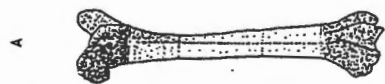
LEFT TIBIA (6)

Figure 5.8: Continued.

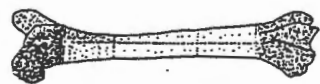
Figure 5.8: Continued.

MAN 3AL

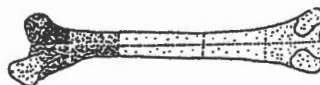
MAN 4AL



A



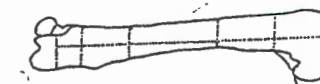
P



M



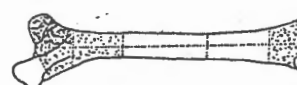
L



A



P



M

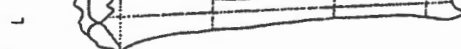


L



LEFT FEMUR (17)

LEFT FEMUR (5)



L



A



P



M



L



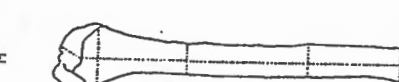
A



P



M



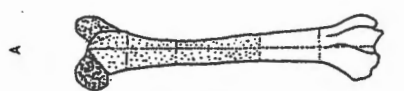
LEFT TIBIA (3)

LEFT TIBIA (4)

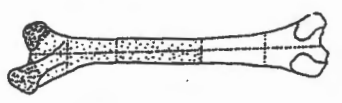
Figure 5.8: Continued.

Figure 5.8: Continued.

MAN 4L



A



P

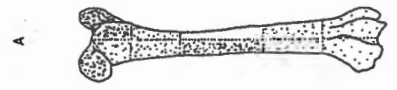


H

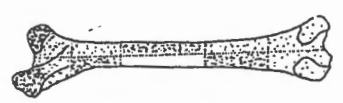


L

MAN 7L



A



P



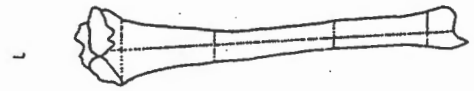
H



L

LEFT FEMUR (7)

LEFT FEMUR (14)



L



A

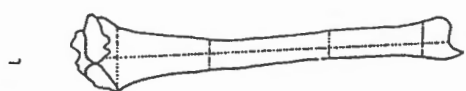


P



H

LEFT TIBIA (3)



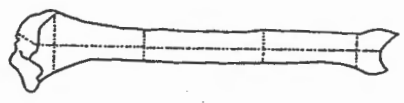
L



A



P



H

LEFT TIBIA (19)

Figure 5.8: Continued.

Figure 5.8: Continued.

there is nevertheless a greater emphasis on the distal portions of the tibia. I see both these sets of information pointing towards proximal shaft breakage, resulting in proximal ends remaining articulated with the distal femur, and the distal end remaining attached to the tarsals.

18. *Metacarpals (see Figure 5.9).*

Both metacarpals and metatarsals are slightly more difficult to interpret. Each of the zones are well represented in general. Butchery does not seem to be prevalent in the mid-shaft region. Dismemberment is either towards the proximal or distal ends of the mid-shaft region (see JAM 4L, MAN 3AL, MAN 4AL, MAN 4L, MAN 7L). In JAM 7L and 8L, the mid-shaft region is better represented than either proximal or distal ends, suggesting that in the sample of 22, there is an 'equal' proportion of those that have been severed proximally and distally along the mid-shaft region. The other pattern refers to the MAN 3AL layer where the medio-posterior proximal end is missing. Here the metacarpal had been put on its lateral side, with a medial chop resulting in the absence of that portion. This may suggest that these skeletal elements were also butchered at their proximal ends. Whether this was to get at the marrow cavity or its attachment to the carpals cannot be said.

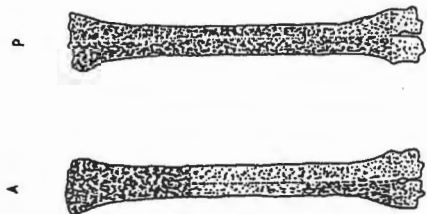
19. *Metatarsals (see Figure 5.9).*

These skeletal elements similarly indicate either distal or proximal butchery along the mid-shaft. As in the case of MAN 3AL mentioned above, we have a similar incidence with JAM 8L, where a medial chop may have been intended to separate the tarsals from the metatarsal at its proximal end. Lastly, the absence or lesser presence of the medial and lateral condyles in some of the layers may either reflect their attachment to the phalanges as part of a butchering unit or alternatively the presence of individuals younger than 20 - 28 months. The significant presence of both condyles in some layers (see MAN 4L and 7L) does not exclude the possibility that the phalanges remained articulated with the distal metatarsal area as one butchering unit.

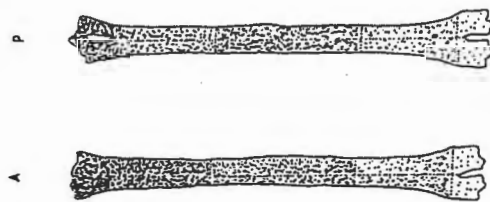
20. *Carpals, Tarsals and Patella (see Figure 5.10 and 5.12).*

Where carpals are present, they are usually represented whole, and in cases where they were not, portions near their articulations were broken off. Among the smaller tarsal bones, the same holds true, except in one instance. One of the lateral malleoli from JAM 4L was particularly abraded, suggesting possible digestion through the stomach of an animal - most likely domestic dogs which were known to have roamed around the town. The larger tarsal bones (calcaneum, astragalus and naviculo-cuboid) show a slightly different pattern, although they are usually well represented across most zones. Where this was not the case, a longitudinal, an oblique, or perpendicular act of butchery resulted in a greater or lesser degree of the skeletal element remaining. The calcaneum is the most revealing of the three skeletal elements. Here either the proximal or distal end is represented less than the body of that element. Butchery at the distal end may reflect dismemberment of the distal tibia from the proximal metatarsal at the region of the tarsals. Similarly loss of the proximal end may relate to attempts to get access to the

JAM 4L

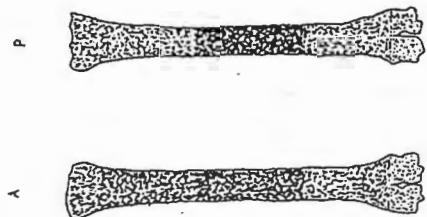


LEFT METACARPAL (17).

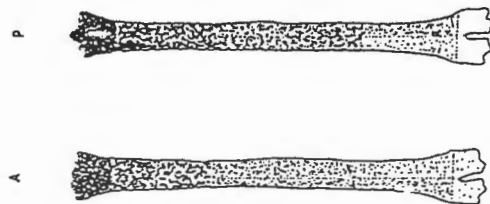


LEFT METATARSAL (12)

JAM 7L



LEFT METACARPAL (6)



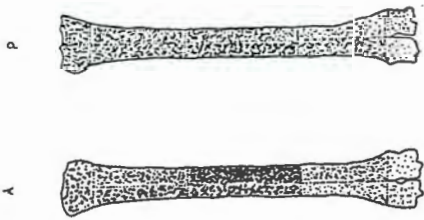
LEFT METATARSAL (8)

Figure 5.9: Absence and Presence of Zones in the metacarpal and metatarsal.

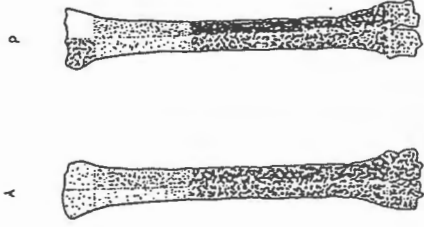
Figure 5.9: Continued.

JAM 8L

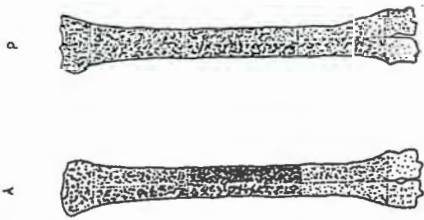
MIAN 3AL



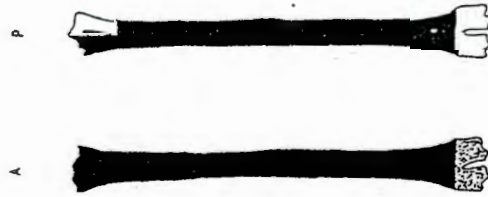
LEFT METATARSAL (2)



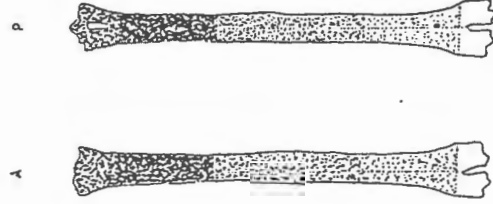
LEFT METATARSAL (7)



LEFT METATARSAL (8)



LEFT METATARSAL (16)

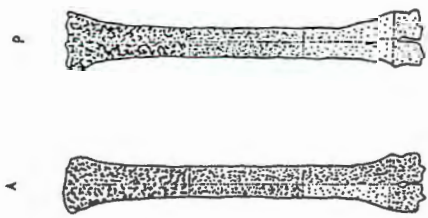


LEFT METATARSAL (21)

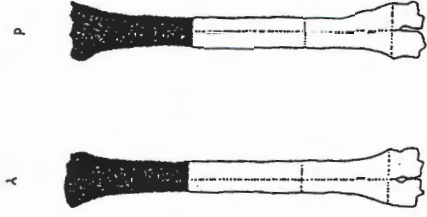
LEFT METATARSAL (27)

MAN 4AL

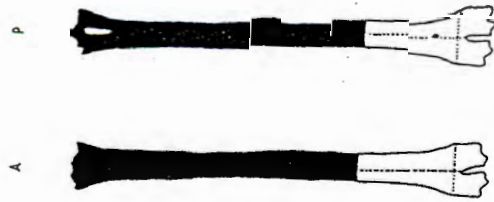
MAN 4L



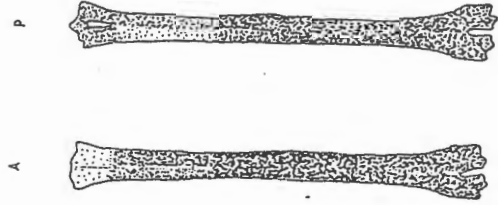
LEFT METACARPAL (5)



LEFT METACARPAL (1)



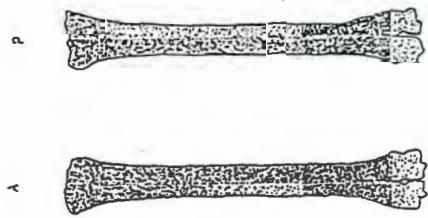
LEFT METATARSAL (1)



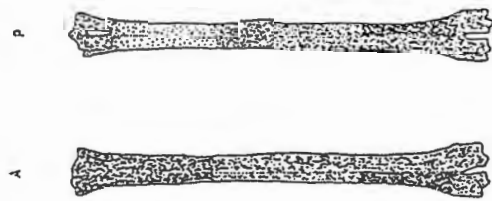
LEFT METATARSAL (7)

Figure 5.9: Continued.

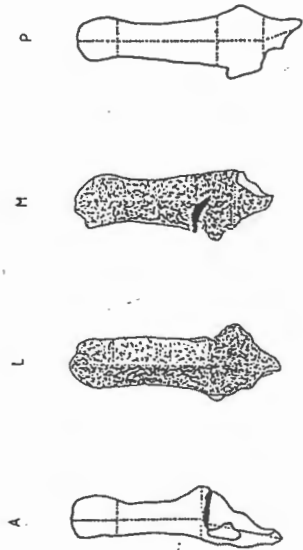
Figure 5.9: Continued.



LEFT METACARPAL (11)



LEFT METATARSAL (13)



RIGHT CALCANEUM (18)



LEFT ASTRAGALUS (15)



LEFT NAVICULO-CUBOID (17)

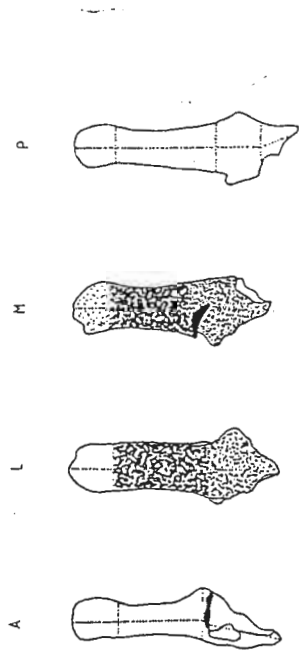
LEFT PATELLA (1)

Figure 5.9: Continued.

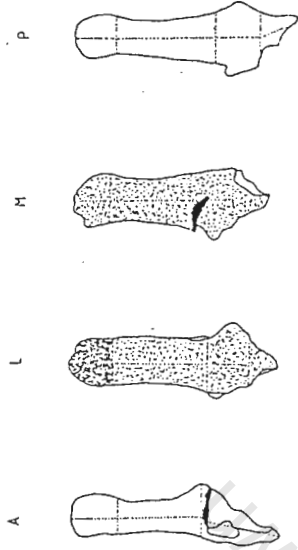
Figure 5.10: Absence and Presence of Zones in the calcaneum, astragalus, naviculo-cuboid and patella..

JAM 7L

JAM 8L



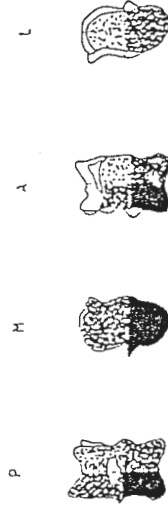
RIGHT CALCANEUM (4)



RIGHT CALCANEUM (4)



LEFT ASTRAGALUS (7)



LEFT ASTRAGALUS (6)



LEFT NAVICULO-CUBOID (12)



LEFT NAVICULO-CUBOID (2)



LEFT PATELLA (11)

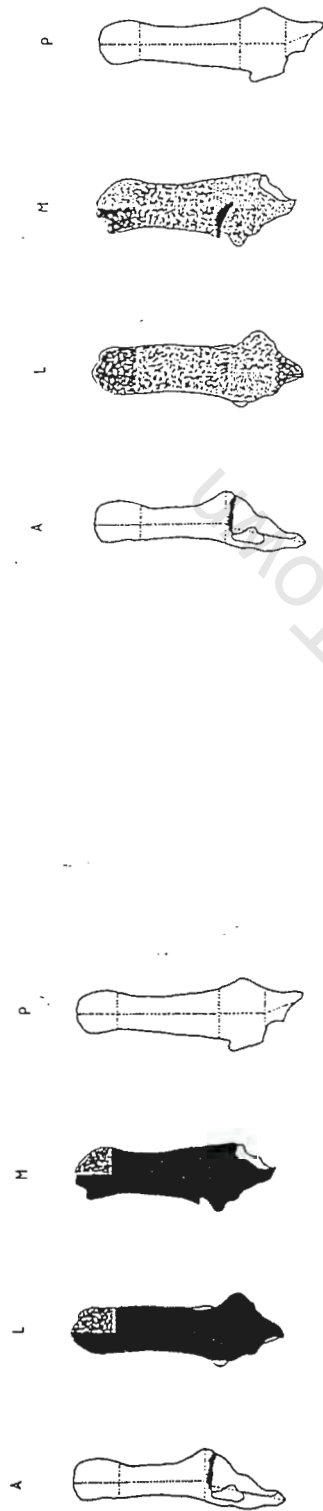


LEFT PATELLA (3)

Figure 5.10: Continued.

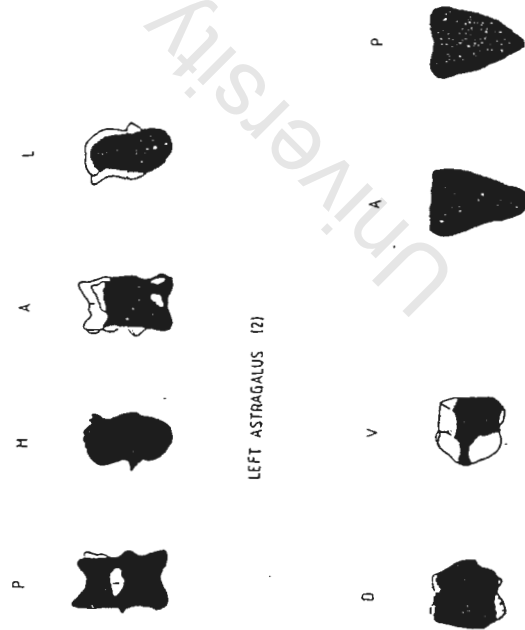
MAN 3AL

MAN 4AL



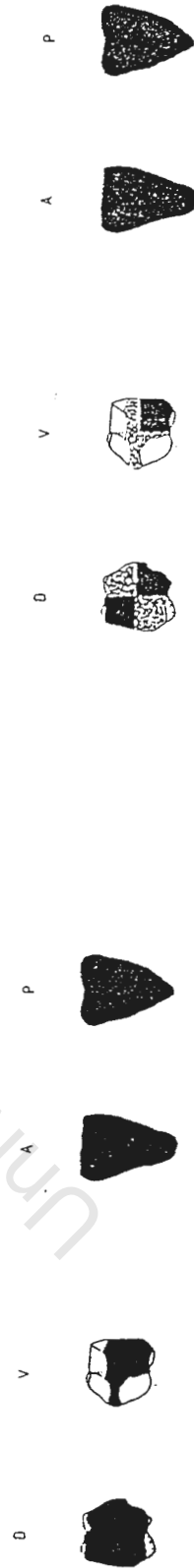
RIGHT CALCANEUM (4)

RIGHT CALCANEUM (8)



LEFT ASTRAGALUS (2)

LEFT ASTRAGALUS (4)



LEFT NAVICULO-CUBOID (4)

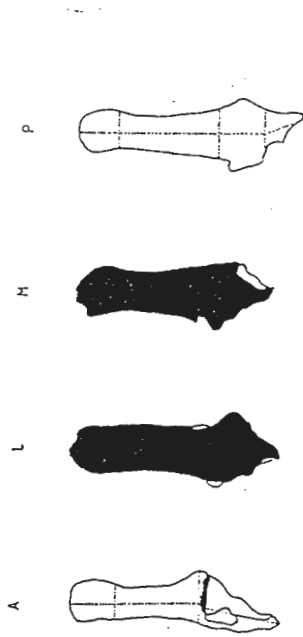
LEFT NAVICULO-CUBOID (4)

LEFT PATELLA (3)

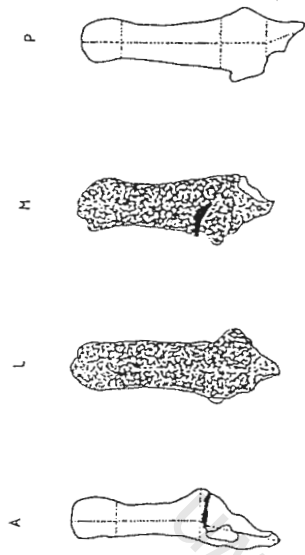
LEFT PATELLA (1)

MAN 4L

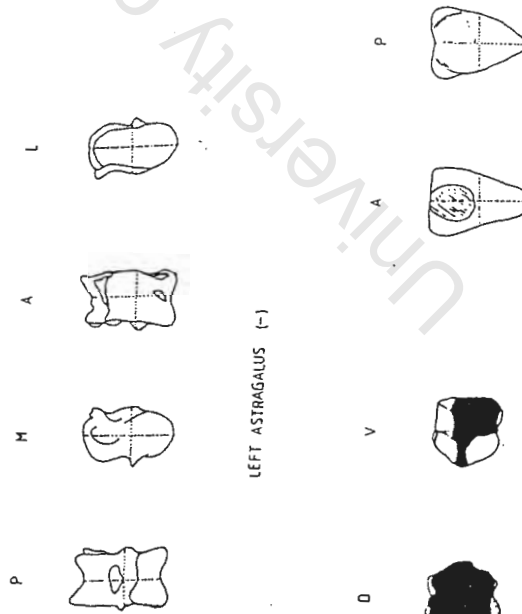
MAN 7L



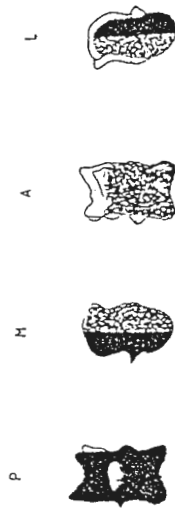
RIGHT CALCANEUM (I)



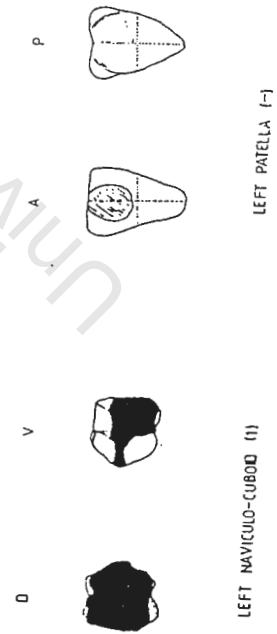
RIGHT CALCANEUM (I3)



LEFT ASTRAGALUS (-)



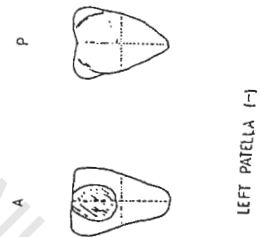
LEFT ASTRAGALUS (I0)



LEFT NAVICLIO-CUBOID (I)



LEFT NAVICLIO-CUBOID (I11)



LEFT PATELLA (-)



LEFT PATELLA (I)

Figure 5.10: Continued.

Figure 5.10: Continued.

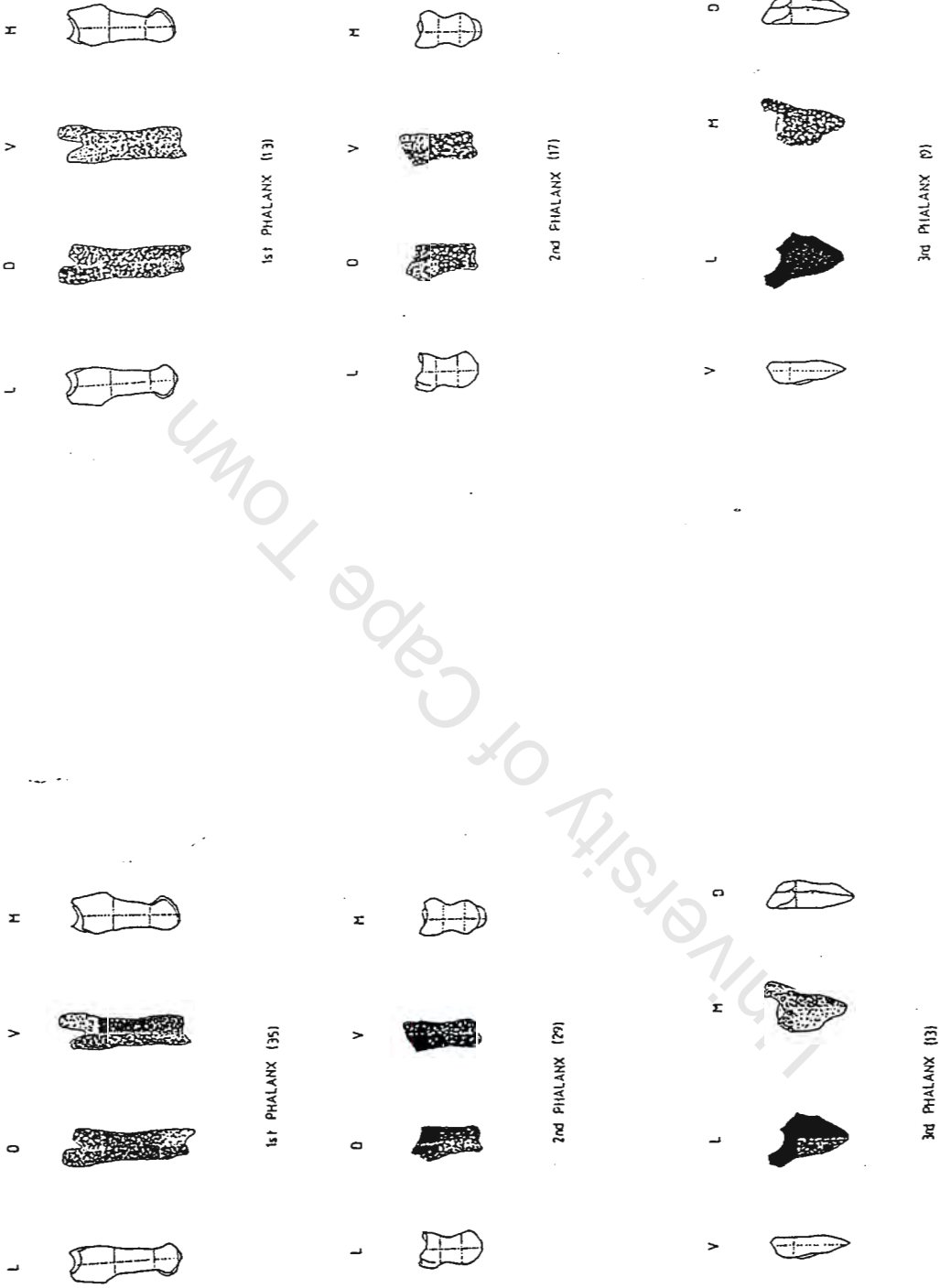


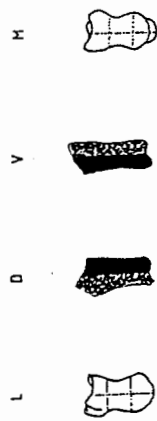
Figure 5.11: Absence and Presence of Zones in the first, second and third phalanges.

Figure 5.11: Continued.



1st PHALANX (20)

1st PHALANX (7)



2nd PHALANX (7)

2nd PHALANX (5)

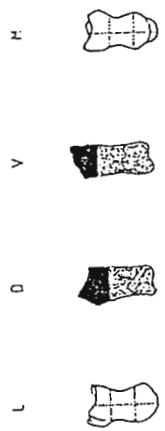


3rd PHALANX (13)

3rd PHALANX (3)



1st PHALANX (6)



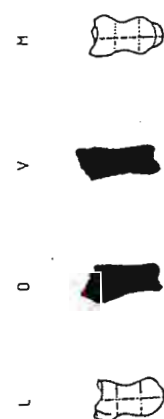
2nd PHALANX (2)



3rd PHALANX (2)



1st PHALANX (9)



2nd PHALANX (7)



3rd PHALANX (4)

Figure 5.11: Continued.

Figure 5.11: Continued.

JAM 4L

MAN 7L

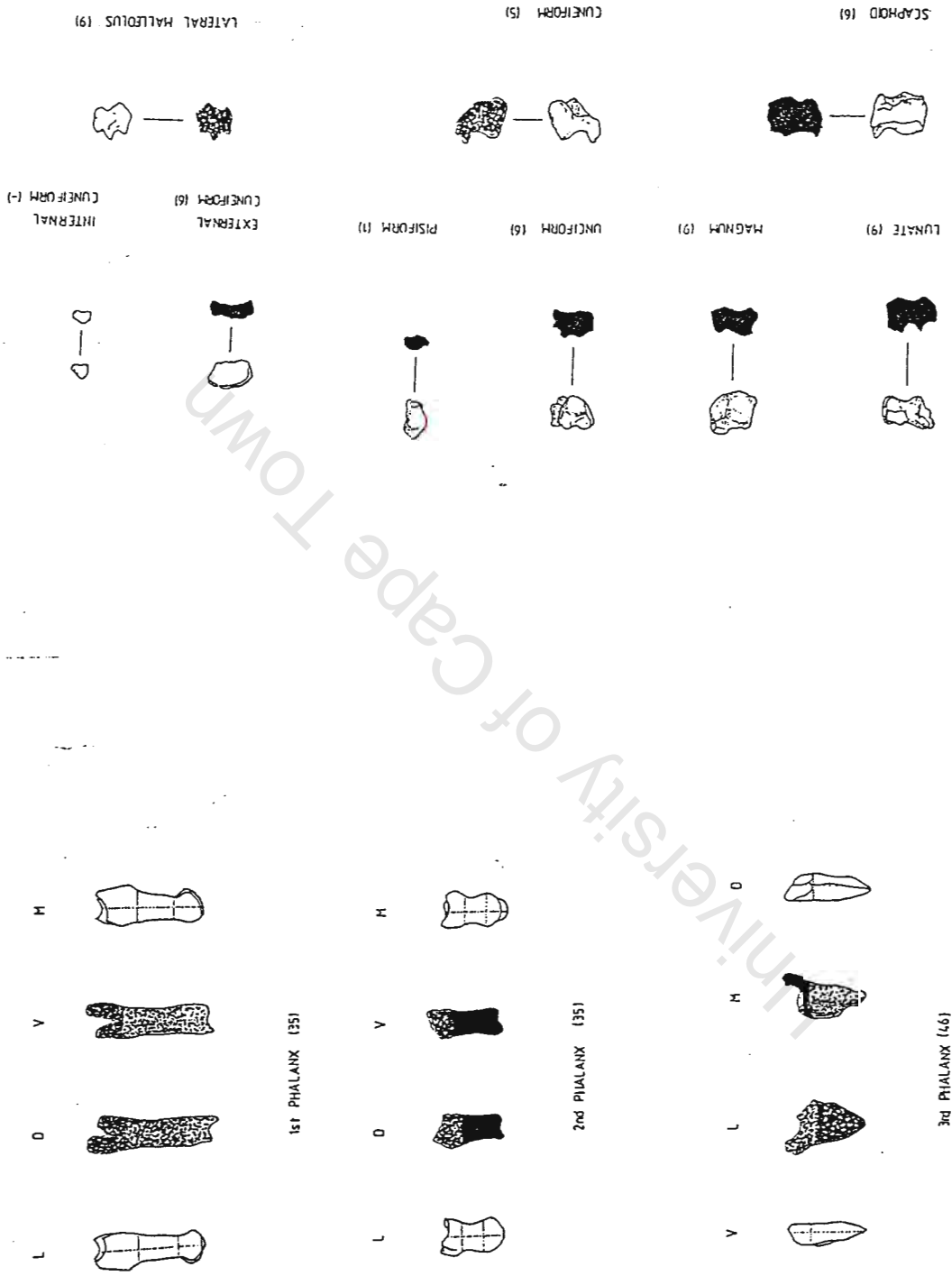


Figure 5.12: Absence and Presence of Zones in some of the carpal and tarsals.

Figure 5.11: Continued.

JAM 8L

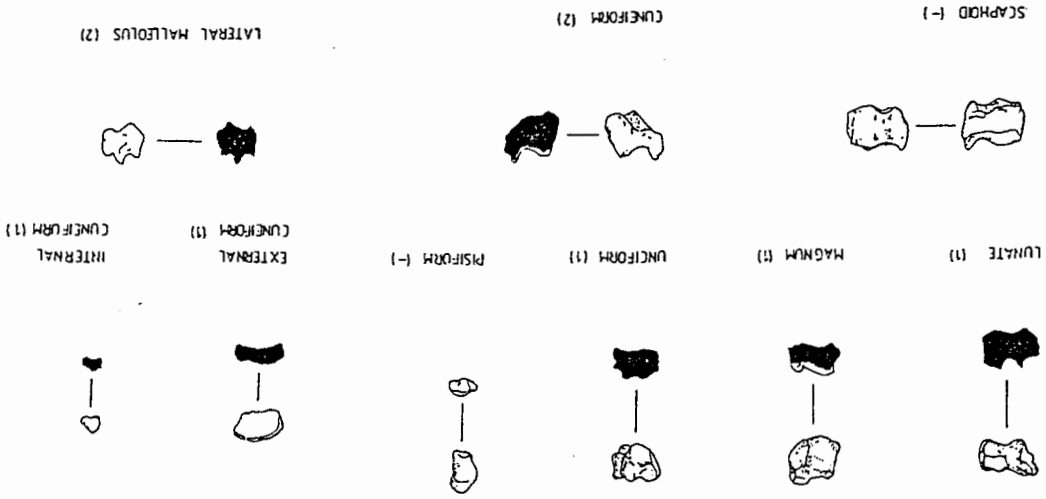


Figure 5.12: Continued.

JAM 7L

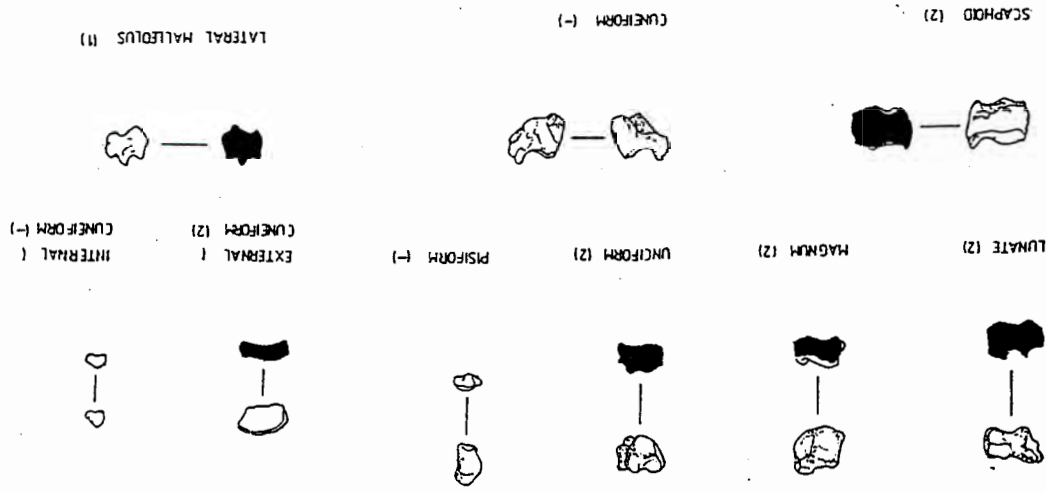
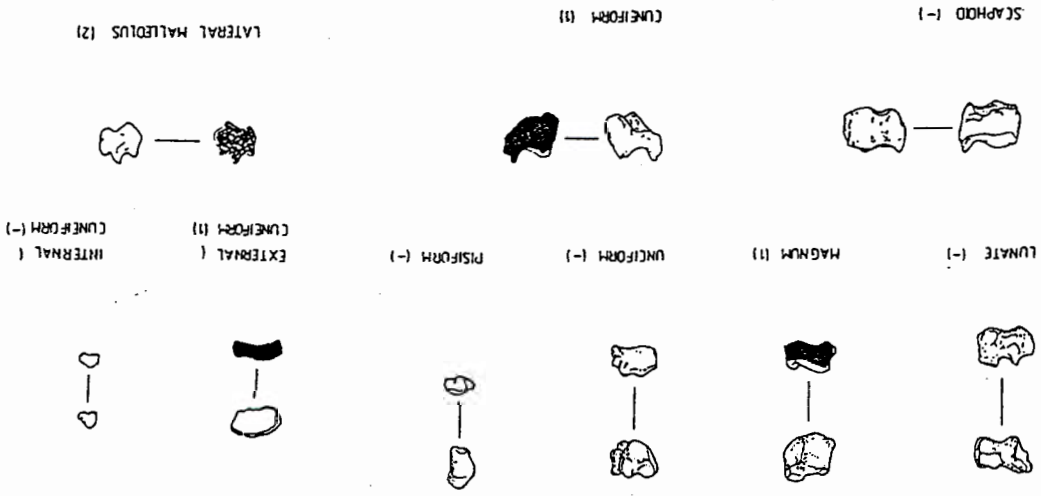


Figure 5.12: Continued.

MAN 4AL



MAN 3AL

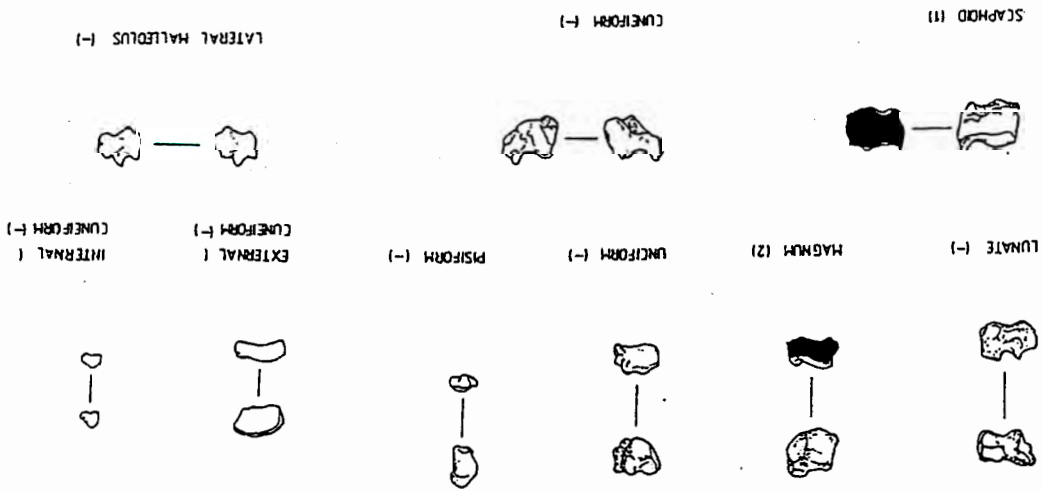
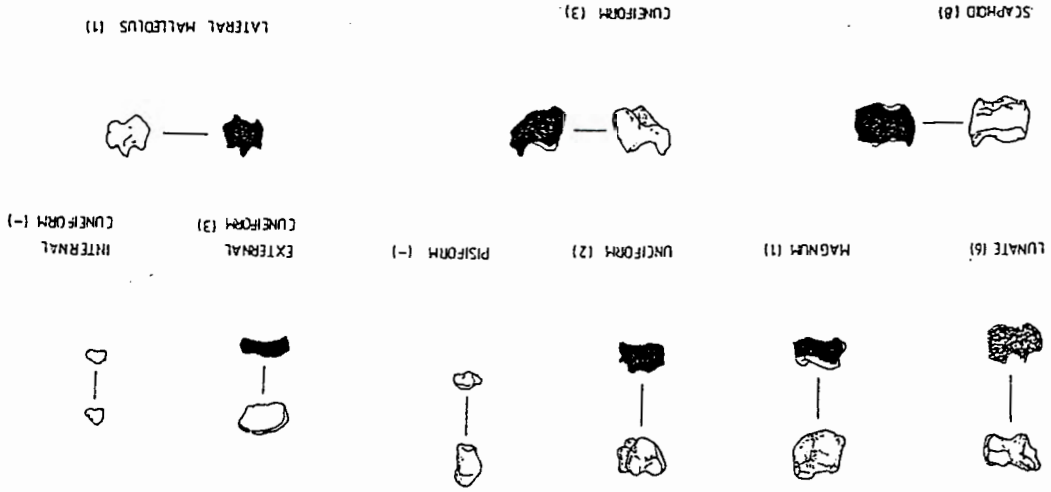


Figure 5.12: Continued.

Figure 5.12: Continued.

MAN 7L



MAN 4L

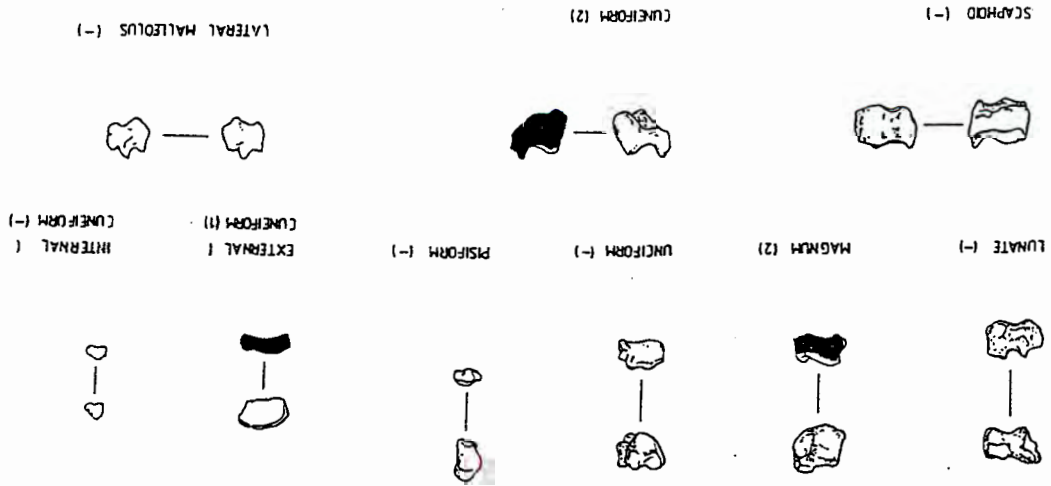


Figure 5.12: Continued.

Figure 5.12: Continued.

distal tibia. Lastly, the patella, being a skeletal element with high bone density is well represented across all phases.

#### 21. *The Phalanges (see Figure 5.11).*

All three phalanges are well represented across all zones, often between 75 and 100 percent. Among 1st phalanges, the zones best represented are generally the distal or proximal ends. In MAN Phase 2 the distal end is underrepresented, while in MAN Phase 3 the proximal end is similarly underrepresented, suggesting that these ends are the points at which butchery had most likely occurred. Among second phalanges, butchery often occurs towards the proximal end nearer the articulation with the 1st phalanx. The one exception is a 2nd phalanx in JAM 8L, where a skeletal element has been chopped through longitudinally, resulting in half of it remaining. Lastly, among third phalanges, the zones best represented are those nearer or at the point of articulation with the 2nd phalanx. If the third phalanx is butchered, it similarly occurs near the articulation. Are these butchery patterns a function of "pootjies" remaining high in the dietary choice of those responsible for the Sea Street refuse?

### 5.2. WHICH BODY PARTS ARE BEST REPRESENTED IN THE FAUNAL COLLECTIONS?

Let us now investigate the particular preferences of certain skeletal elements over others (see Appendix E), remembering the colour coding mentioned above. In JAM 4L (see Figure 5.13) the best represented body parts are both radii, i.e. from the upper forelimb. In JAM 7L (see Figure 5.14) there again is a preference for the upper forelimb (radius) with the additional choice of the mandible, which is also most preferred in JAM 8L (see Figure 5.15). In MAN 3L (see Figure 5.16) we have a different trend, with the selection of the upper hindlimb (femur). In MAN 4AL (see Figure 5.17), the radius and in MAN 4L the ulna, both of the upper forelimb are equally well represented in the archaeological record. In MAN 4L (see Figure 5.18) as in JAM 8L the mandible is well represented. In MAN 7L (see Figure 5.19), part of the upper forelimb (radii) is again well represented, with additional support from both the tarsals and the 3rd phalanges. Therefore the best representation from the sheep's skeleton is limited mostly to the upper forelimb especially the radii, with some leg bone (femur, tarsals and phalanges) making up the complement, with the mandible well represented in JAM Phase 2 (see Figure 5.22).

The second group of skeletal elements less well represented are not exclusively limited to the forelimb of the animal. Although the ulna and humerus are also well represented in JAM 4L, MAN 4AL, MAN 4L and MAN 7L, the metacarpals are well represented in MAN 4AL and MAN 7L. In addition, the scapula from the shoulder are well represented in both JAM Phase 3 and MAN Phase 3 (see Figures 5.20 and 5.21), with no equal importance given to it in either JAM or MAN Phase 2 (see Figures 5.22 and 5.23). Besides forelimb and shoulder presence from the forequarter of the carcass, the pelvis is well represented in both Phases 2 and 3 across both JAM and MAN. In addition, in JAM Phase 2, both tibia and metacarpal are well supported; while in MAN Phase 2 and 3, support comes from the rest of the hindlimb, including femur, tibia, tarsals, metatarsals and phalanges. Apart from both hind- or forequarter

Figure 5.13: Percentage survivability per skeletal element for JAM 4L.

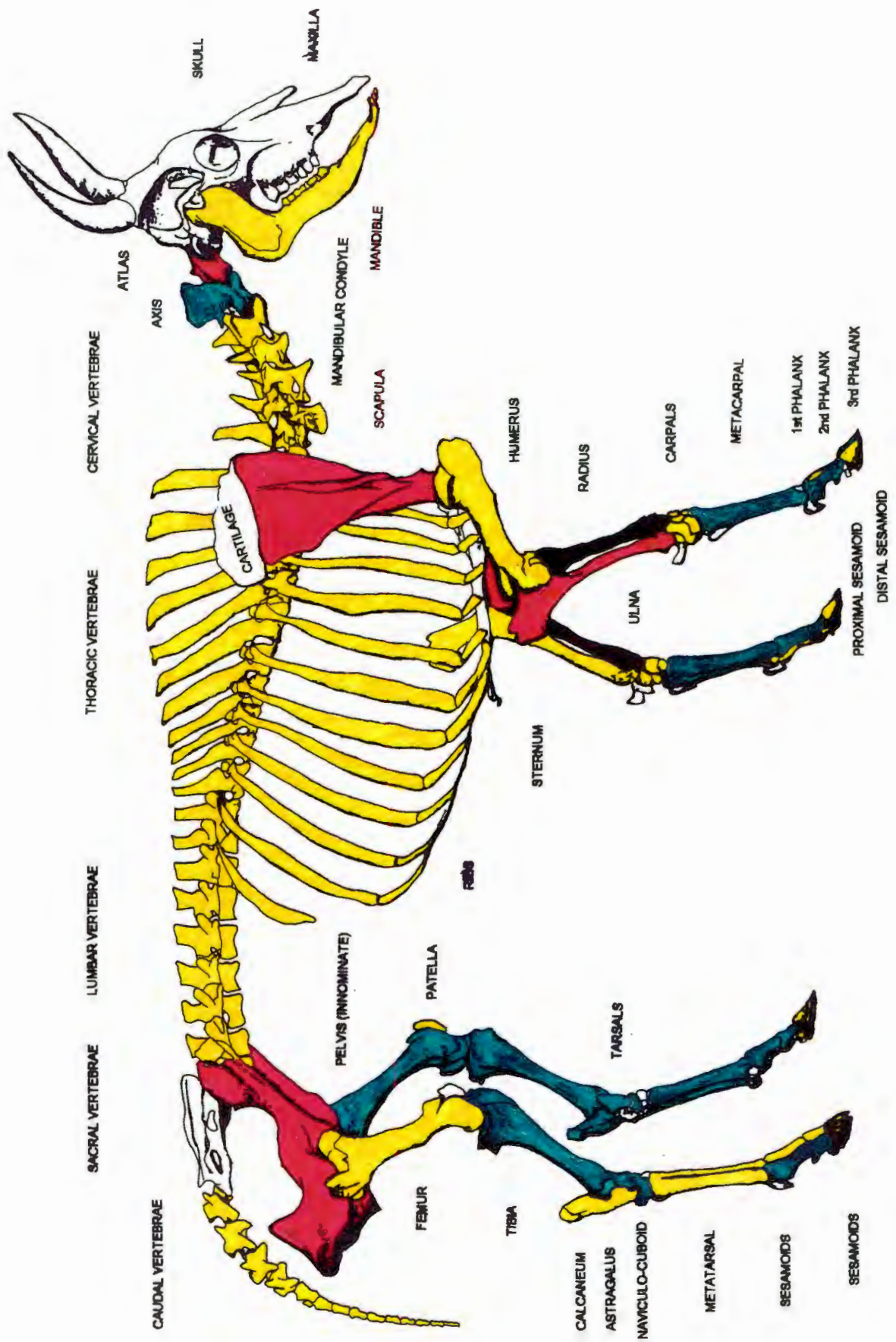


Figure 5.14: Percentage survivability per skeletal element for JAM 7L.

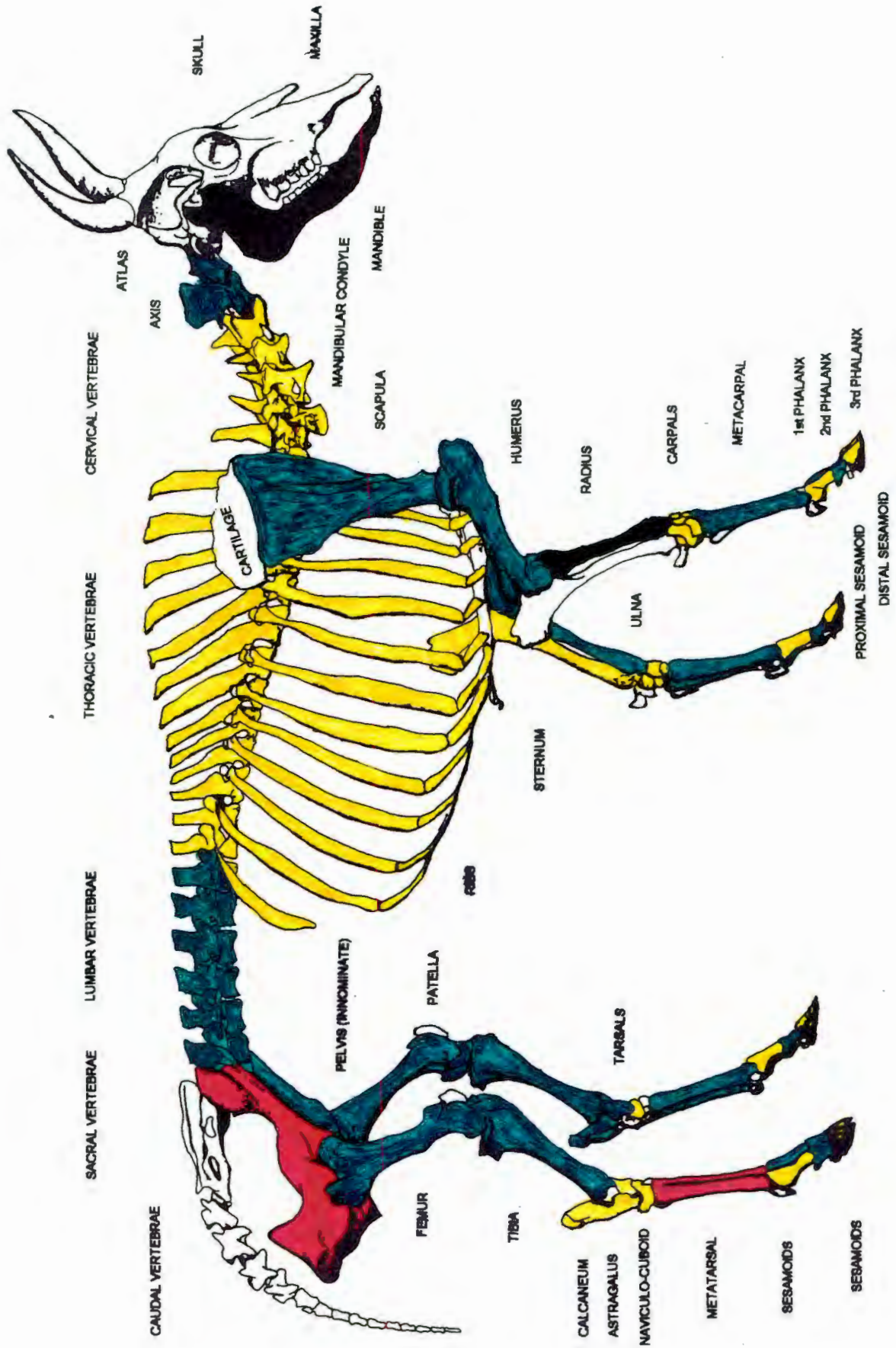


Figure 5.15: Percentage survivability per skeletal element for JAM 8L.

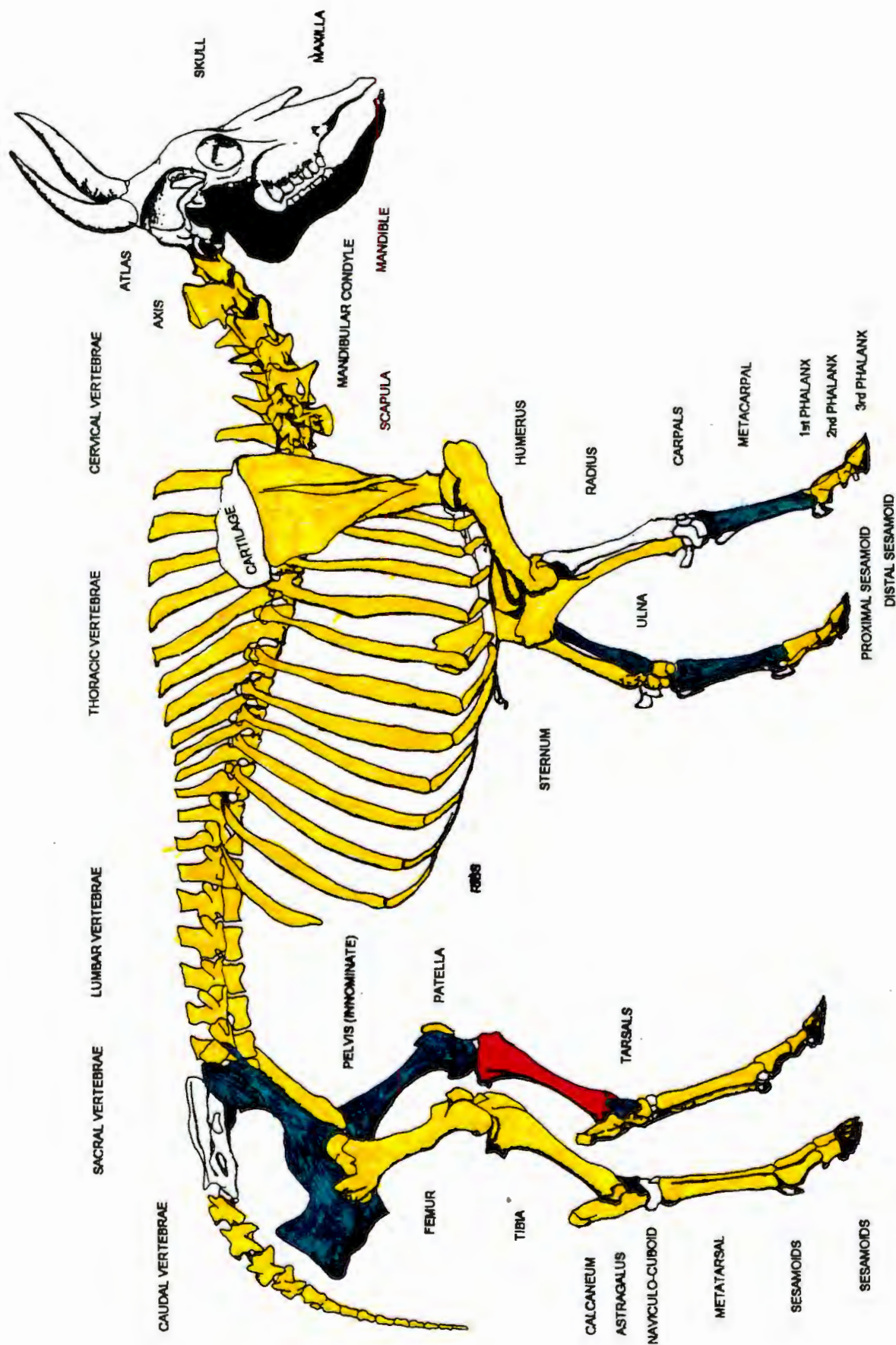


Figure 5.16: Percentage survivability per skeletal element for MAN 3AL.

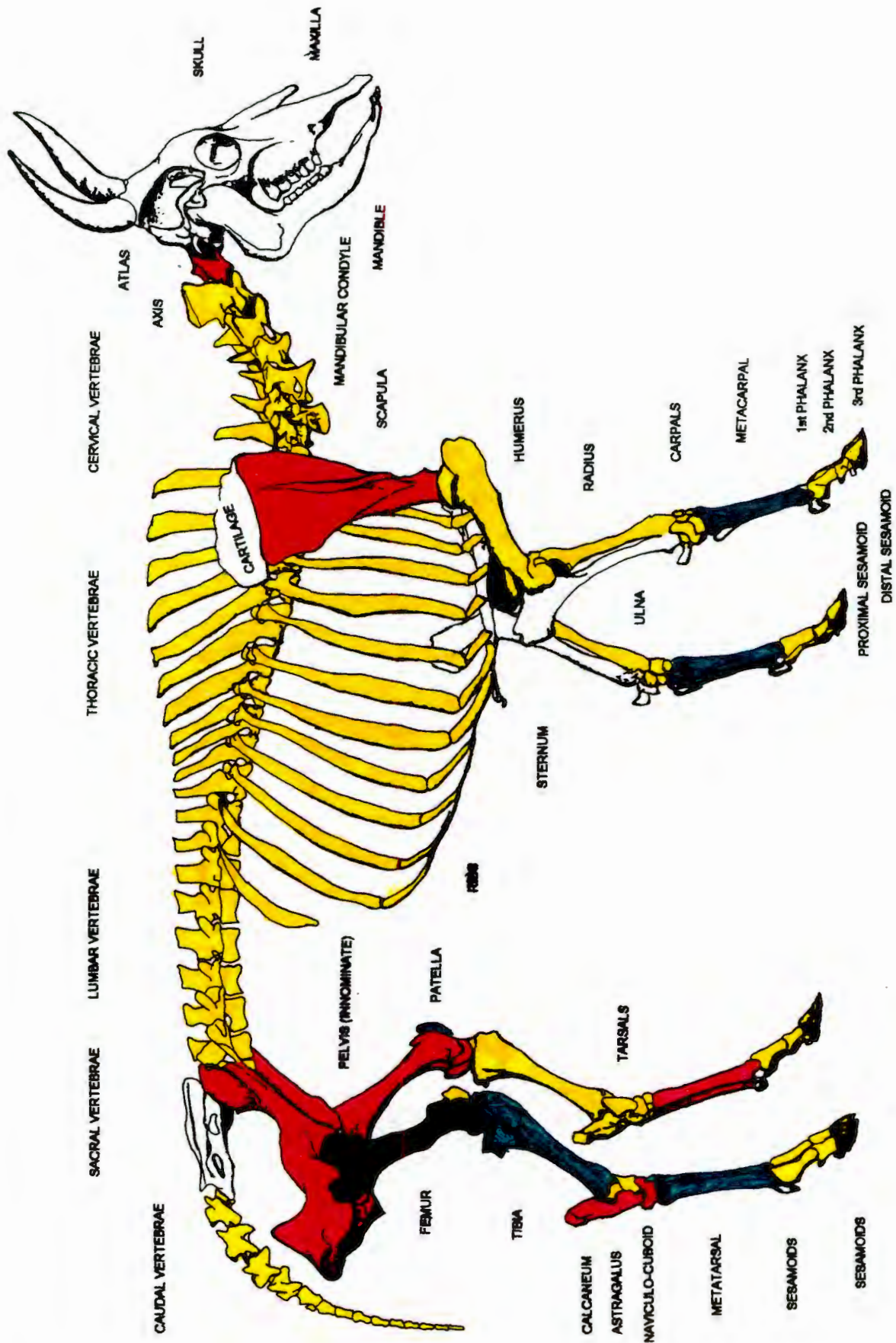


Figure 5.17: Percentage survivability per skeletal element for MAN 4AL.

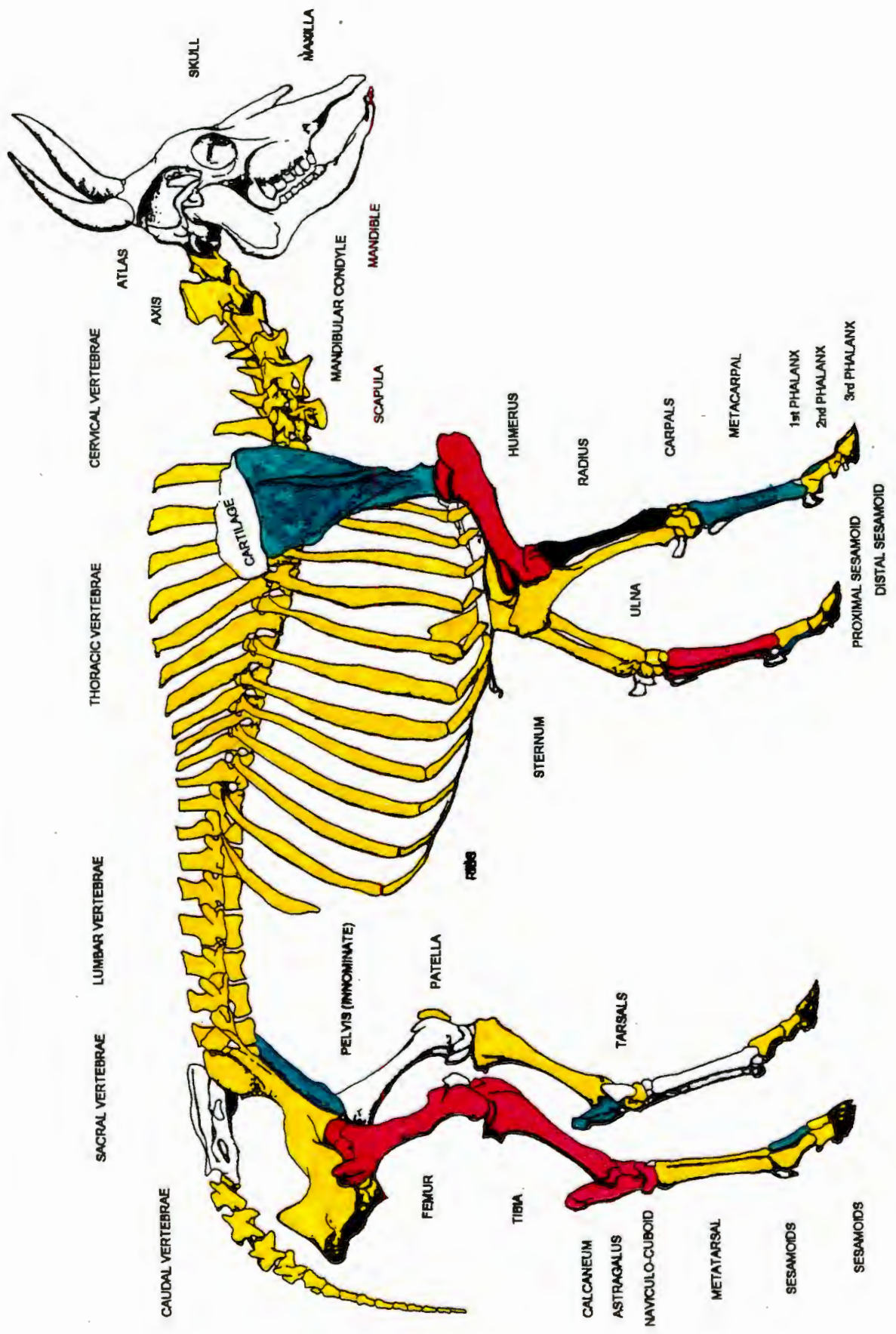


Figure 5.18: Percentage survivability per skeletal element for MAN 4L.

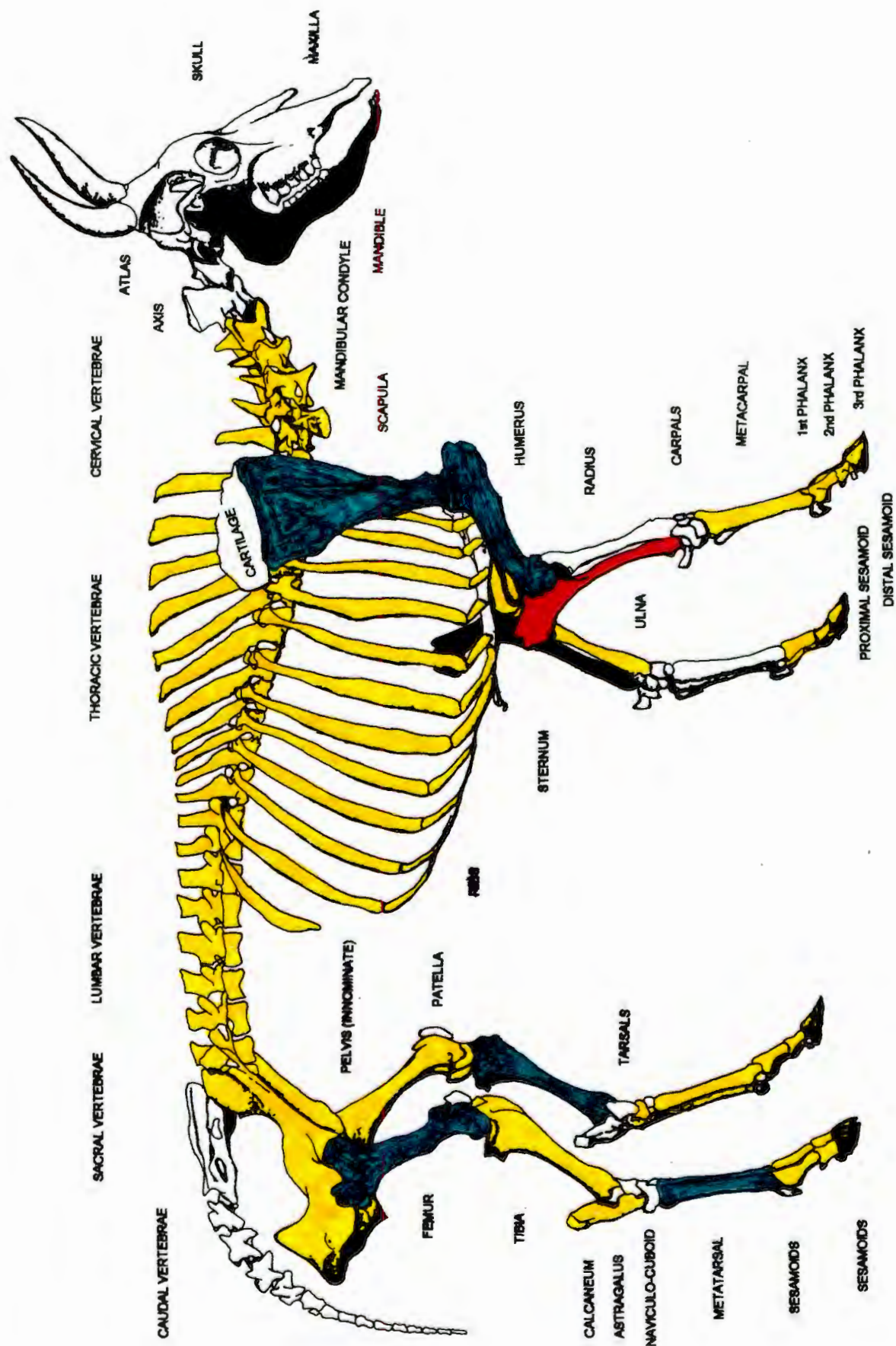


Figure 5.19: Percentage survivability per skeletal element for MAN 7L.

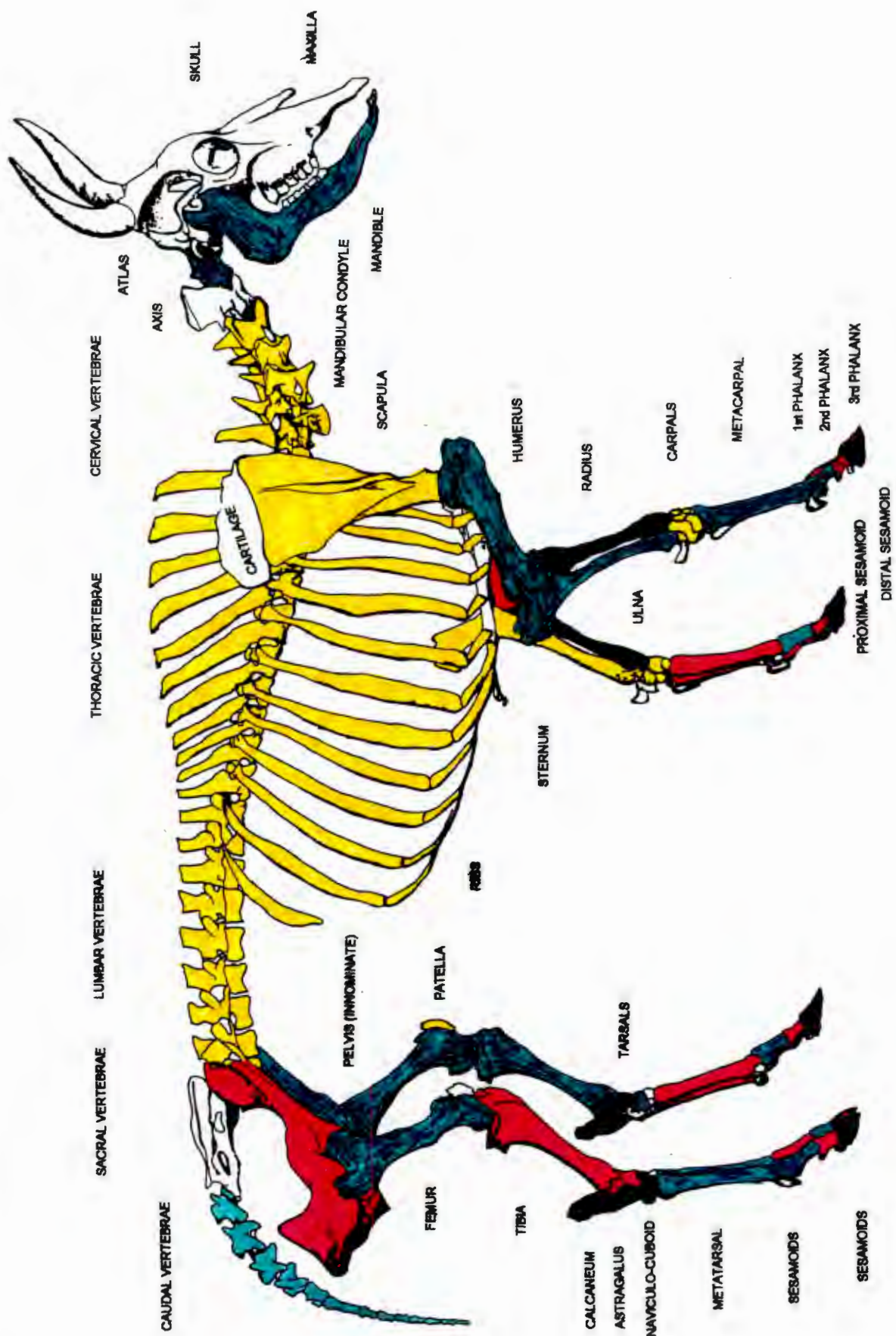


Figure 5.20: Percentage survivability per skeletal element for JAM Phase 3.

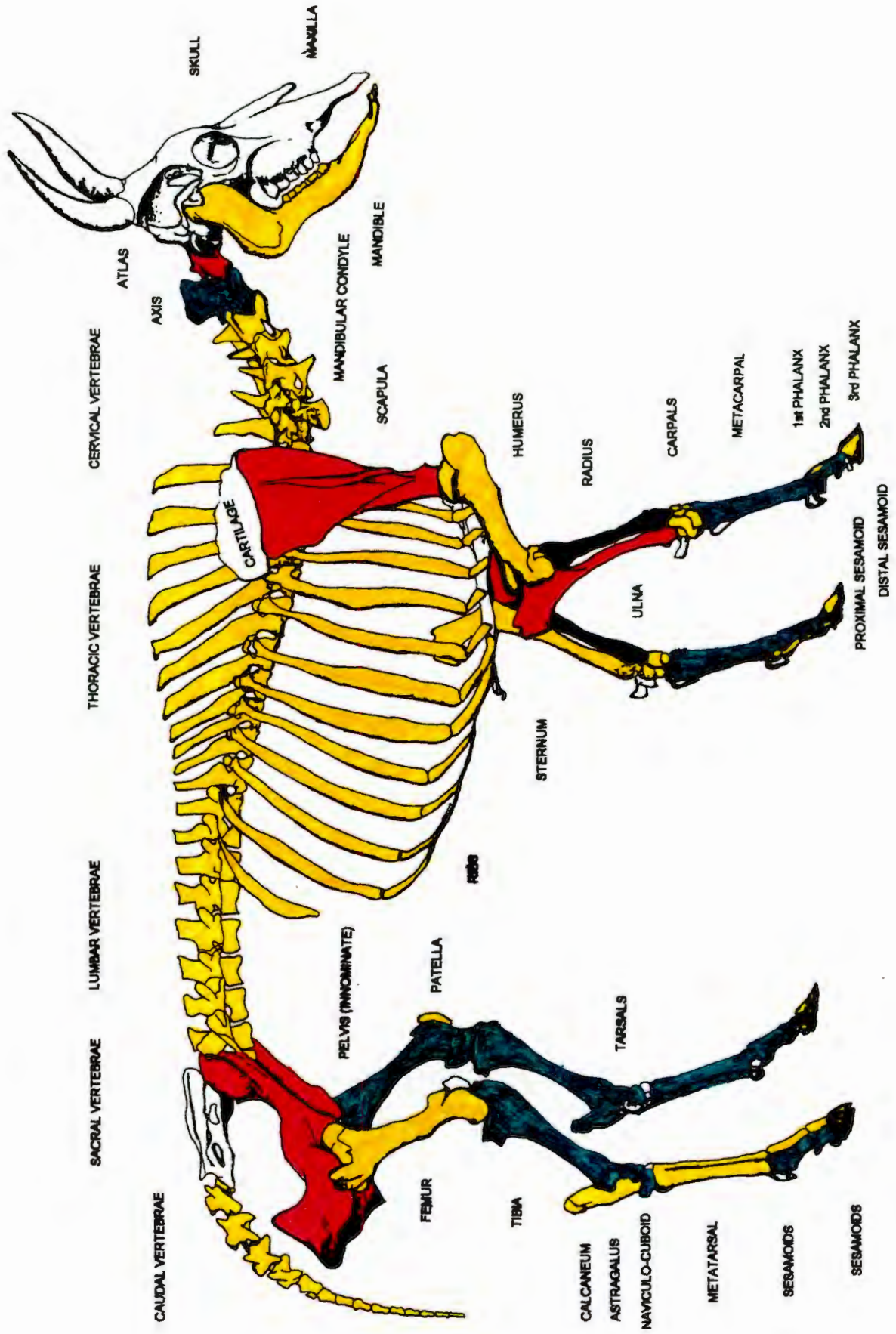




Figure 5.22: Percentage survivability per skeletal element for JAM Phase 2.

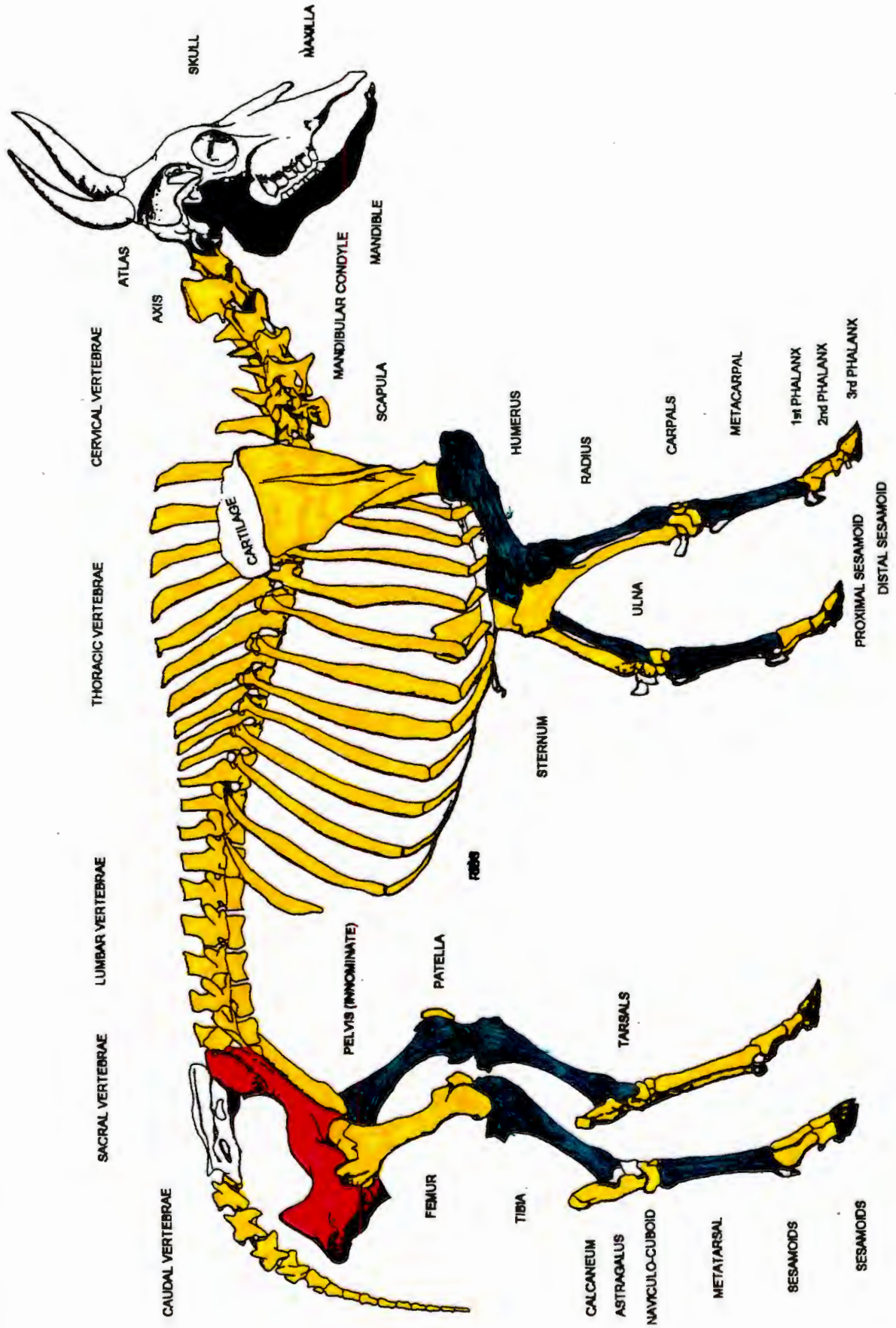
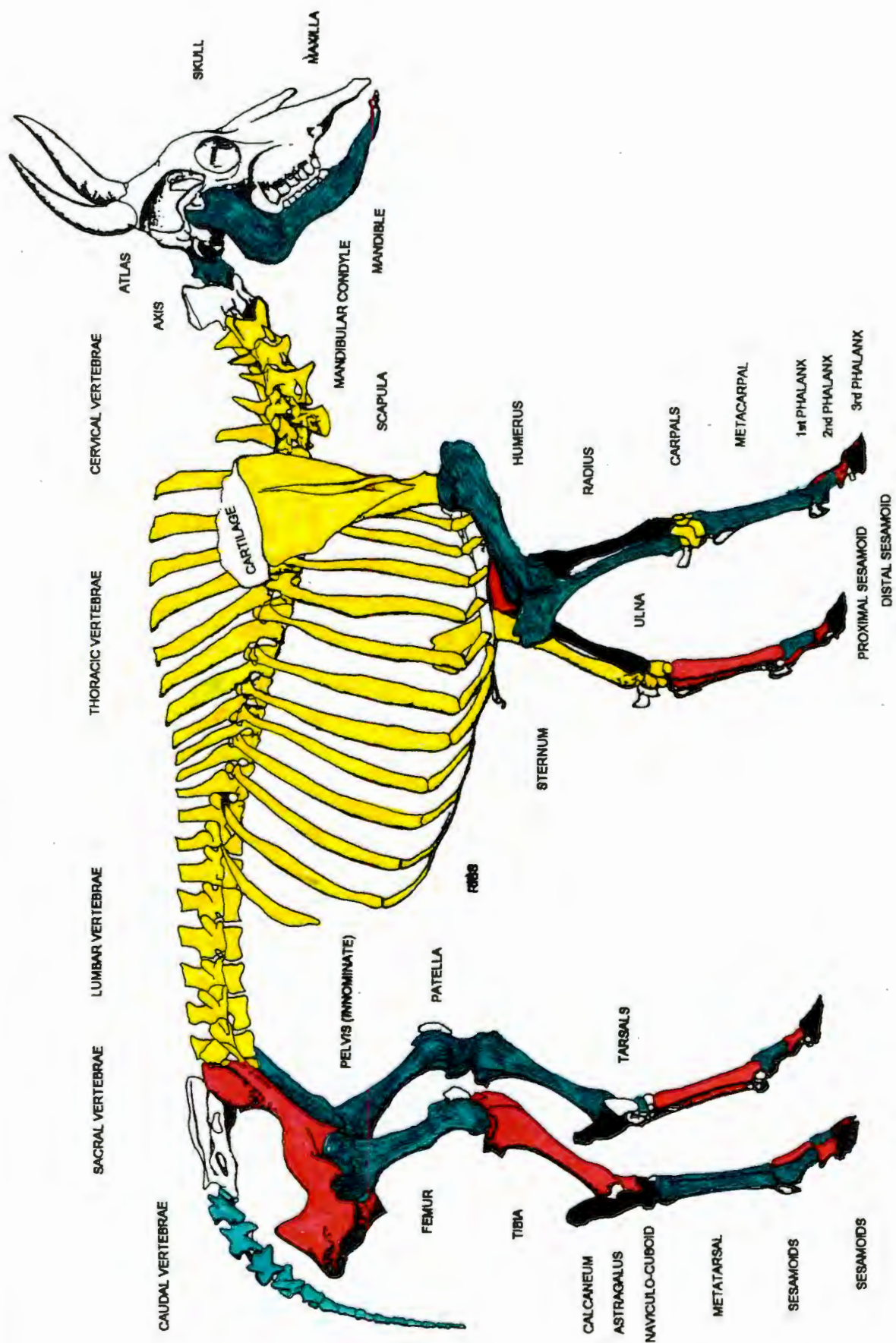


Figure 5.23: Percentage survivability per skeletal element for MAN Phase 2.



presence, preference is also given to the atlas, that bone which links the cranial with the post-cranial skeleton. The trend has therefore moved away from the foreshank, to the raised shoulder or chuck which includes both the scapula and part of the humerus, with a greater emphasis on skeletal elements coming from the leg (pelvis, sacrum, femur, tibia, tarsals, and metatarsals), with foreshank presence in JAM and MAN Phase 3.

The penultimate group to be considered is that which accounts for between 25.0 and 49.9 percent of the skeletal elements in relationship to the total MNI for each unit or phase. Here both fore- and hindlimb bones are equally represented, although there is a greater consistency in presence of metacarpal bones. Despite this, skeletal elements from the scapula to the metacarpal, and from the femur to the metatarsal, are well presented. In addition, the first and second cervical vertebrae (atlas and axis), and the mandible, and the first and second phalanges also come to the fore in this group. In all previous cases there had been a total absence of any vertebrae or ribs making any appearance. In this group there are, however, two exceptions. In JAM 7L the lumbar vertebrae, and in MAN Phase 3 (MAN 3AL, MAN 4AL and MAN 4L) the cervical vertebrae both contribute greater than 25 percent in relationship to the total MNI. Their prominence here suggests some preference for the chuck/neck cuts or chops and either part of the hotel rack or loin or loin chops. As the cervical and lumbar vertebrae seem to be the exception to the general trend, one nevertheless can see a general preference for both hind- and forequarter to the near exclusion of the rest of the axial skeleton, other than the presence of the atlas, axis and mandible.

Lastly, we need to consider those skeletal elements which are least well represented in the faunal collection. Here again we can note a few patterns. Almost without exception the caudal, lumbar, thoracic and cervical vertebrae (excluding the first and second cervical vertebra), the ribs, carpals and many of the phalanges have a low degree of survivability. This is not surprising, as Brain (1969) has established that there is a clear relationship between bone density and its survivability. In his work (Brain 1969: 20, table V) he lists the 3rd-7th cervical vertebrae, lumbar vertebrae, phalanges, ribs, thoracic vertebrae and caudal vertebrae with the following respective values for percentage survivability: 3.2, 1.7, 1.3, 0.9, 0.6 and >0.1.

The lower percentage survivability for the femora and metatarsals from JAM Phases 2 and 3 do not seem to fit the pattern for MAN Phases 2 and 3. The most likely interpretation relates to the severing of these two skeletal elements as part of a particular butchering unit. For example, the severing of the femur proximally or distally along the shaft would have resulted in respective portions remaining attached to the acetabulum of the pelvis or the medial and lateral condyles of the proximal tibia. Similarly, the severing of the metatarsal either proximally or distally would either have resulted in a distal tibia-proximal metatarsal or distal metatarsal-1st phalanx joint articulation. In addition, the low percentage survivability of the humerus in JAM Phase 2 and in other units has similarly been interpreted as a result of distal or proximal mid-shaft breakage with an axe/cleaver/chopper, with the explicit purpose of creating either two separate butchering units (distal scapula-proximal humerus and distal humerus-proximal ulna/radius), quartering the carcass at this specific point, or an attempt to get at the marrow.

One further pattern is noted when one looks at the percentage survivability relationship between radii and ulnas. Although ulnas are poorly represented in certain phases or units, there is always a directional underrepresentation of ulnas to radii. A possible interpretation hereof may lie in disarticulation/dismemberment around the humerus-radius-ulna joint, whereby the nature of the butchery procedure had resulted in more robust skeletal elements, or those with higher bone density or better bone morphology, having a higher likelihood of surviving. This resulted in the lower representation of ulnas to radii.

One nevertheless has to ask oneself whether what one is actually seeing is not related to particular absence or presence, but rather fusion rates or percentage survivability of certain skeletal elements over others. Two interesting trends seem to emerge. Firstly, let us consider the fusion rates listed in the previous chapter. If one accepts the fusion times for sheep given by Silver (1969: 285-288), remembering that we are probably dealing with a different species of sheep or hybrids of sheep and that these sheep are living in different climatic environments to those from which Silver (1969) amassed his data, which would result in slightly different figures, the pattern would nevertheless remain the same, we note the following six patterns:-

1. The distal end of the radius fuses at 36 months, while both distal and proximal ends of the ulna fuse at 30 months. The high presence of these skeletal elements in the faunal assemblage suggest that most of these animals are either between 2½ and 3 years of age.
2. The presence of the pelvis/innominate in each of the four phases across both houses suggests that these legs of sheep were exclusively coming from more aged individuals. The ilium of the pelvis only fuses at 42 months. Therefore most of these individuals must have been over 3½ years of age before they were slaughtered.
3. The rest of the leg bones, calcaneum and those from the upper hindlimb (femur, tibia and calcaneum) if fused, came from individuals between the ages of 18 and 42 months, i.e. between 1½ and 3½ years. Again we are not dealing with juvenile sheep. In some specific units we are clearly dealing with juveniles, but in general there is an overall pattern towards older individuals.
4. The metacarpals and metatarsals come from both juvenile and adult sheep. The proximal ends of these bones fuse at birth, while the distal ends fuse between 20 and 28 months. Considering the presence of a number of metapodials across most units suggest that a number of individuals were below 20 months. One must, however, note that a reasonable number of metapodials were from fused animals, where dismemberment had occurred in the distal metacarpal or distal metatarsal shaft region, leaving either one of these sections attached to the epicondyles.
5. The scapula is exclusively well represented in both JAM and MAN Phase 3, but underrepresented in Phase 2. This skeletal element fuses early in the life of the individual, and therefore could come from both juvenile or adult individuals.

6. The phalanges that make up each of the assemblages are almost exclusively fused, with one or two exceptions. As the proximal end fuses before birth, and the distal end between 13 and 16 months, we are therefore dealing with individuals that are generally older than 16 months, close to one-and-a-half years old. This however does not explain the high presence of 1st, 2nd and 3rd phalanges in MAN Phase 2. Even considering the evidence below, they account for between 55 and 72 percent presence or percentage survivability in relationship to the number expected for the maximum MNI attributed for that phase. If one accepts the possibility or even probability that the refuse which accounts for Phase 3 in MAN could have been the result of one fill episode, whether from one household or backyard, or a collection of either, they still represent the greater than average selection for foot bones ("pootjies"), that can be interpreted in any other way (see point 1 below).

If one considers the percentage survivability figures given by Brain (1969) and remembers that he sees percentage survivability directly related to the "Specific Gravity of the part concerned, but inversely to the fusion times expressed in months" (Brain 1969: 19), we note four things :-

1. The three best represented skeletal elements listed by Brain (1969) are the distal humerus, the proximal ulna and radius, and the half mandible. Of significance here is that both the mandible and the radius were similarly well represented in the sample population under study.
2. Those skeletal elements next best represented by Brain (1969) are the scapula, distal radius and ulna, and metacarpals from the forelimb, and the pelvis, femur, tibia, calcaneum, astragalus, and metatarsals from the hindlimb, as well as the atlas and axis. These are exactly those portions of the skeleton which take second and third place after the upper forelimb.
3. Those skeletal elements surviving least in the assemblage (below 5 percent survivability) include the cervical, thoracic and lumbar vertebrae, the ribs and the phalanges. In nearly all cases this does seem to hold true, except in MAN Phase 2 where the percentage survivability for phalanges ranges between 55 and 72, in MAN Phase 3 where the cervical vertebrae account for 25.5 percent, and in JAM 7L (part of JAM Phase 3) where the lumbar vertebrae account for 28.6 percent of those expected to be recovered.
4. The lower or higher percentage survivability of bones to what is expected may be influenced by both selection or non-selection criteria, as well as the bone density of that skeletal element or portion thereof. The best example of this is that of the phalanges in MAN Phase 2 discussed above. Their high presence cannot be explained by either percentage survivability which incorporates aspects of "Specific Gravity", nor in terms of fusion times. The only other possibility is that the selective sale of certain butchering units may account for the high percentage of phalanges here. A similar trend can be seen in all phases other than JAM Phase 2 (JAM 7L and 8L). In all layers other than in JAM Phase 2, there is a particular low presence of mandibles. Why are there less sheep's jaws here? Similarly does the low presence of radii in JAM 8L, MAN 3AL, and MAN 4L suggest a non-selection for parts of the foreshank? Or is their loss

directly related to consistent or "gross" forms of butchery on these skeletal elements, where a skeletal element is consistently being sawn/chopped/smashed in a particular zone?

### 5.3. WHO DID WHAT WHERE?

Now that we have discussed what has remained as part of the faunal assemblage, let us now turn to the exact placement, positioning, orientation and frequency of the various types of butchery. The various levels of butchery can be divided up as follows. Primary butchery entails killing the animal, skinning the carcass, removal of its innards, head and possibly splitting the carcass into two sides of meat. Secondary butchery would entail quartering the carcass, i.e. the establishment of large butchery units, while tertiary butchery would result in the establishment of individual cuts of meat. Finally, these would then be prepared and consumed at the residential or commercial locus.

#### 1. *The Skull and Maxilla (see Figure 5.24).*

The clearest cases of "gross"/consistent forms of butchery come from JAM 4L and MAN 3AL (both phase 3 units). In both units we have a saw mark running longitudinally through the occipital and parietal bone (posterior end of the skull); and in MAN 3AL as well we have a chop mark running obliquely in the parietal bone area. The saw mark is seen as a primary form of butchery to split the skull to get at the brain, while the chop mark is interpreted, although not exclusively, as a secondary or tertiary form of butchery, where an individual had resorted to splitting open possibly a whole skull to get at the brain. Two muscles originate in the region of the zygomatic bone. The zygomaticus' origin lies in the temporal process of the zygomatic bone; while the masseter is attached to both the facial crest of the zygomatic bone and the ventral surface of the zygomatic arch (Getty 1975: 796, 799). The cut marks that are on the skull are either on the parietal or occipital bones, the posterior end of the frontal bone, around the zygomatic processes, or alternatively at the occipital condyles. The cut marks, other than those at the condyles, are interpreted as either occurring prior to, during or after cooking at the household unit, either to facilitate cooking or remove what "meat" there was on the bone. The cut marks on the occipital condyles relate more directly to the disarticulation of the atlas from the skull. The regular placement of cut marks in the region of the maxilla near the molars suggest the facilitation of meat/muscle/tendon removal either prior to cooking or during consumption. For example, the buccinator muscle runs between the maxilla and mandible from the alveolar border of the maxilla to between the angle and ascending ramus of the mandible (Getty 1975: 795).

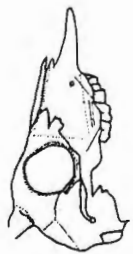
#### 2. *The Mandible (see Figure 5.24).*

This skeletal element is littered with cut marks on both buccal and lingual surfaces. For example, the mandibles in JAM 8L had at least 187 cut marks on both buccal and lingual sides. The least degree of clustering is at the mandibular condyle, coronoid process and near the incisor teeth. These cut marks are interpreted as facilitating "meat" removal from the mandible either before or after cooking. Where other butchering marks are found, they follow two general patterns. Where chop marks are found in the



JAM 8L

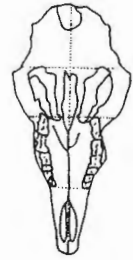
RIGHT



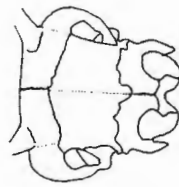
LEFT



V



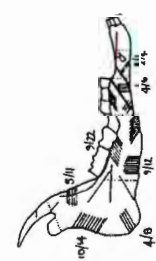
P



BUCCAL



LINGUAL

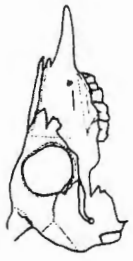


LEFT MANDIBLE (20725)

MAXILLA/SKULL (6/5)

MAN 3AL

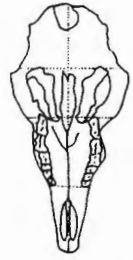
RIGHT



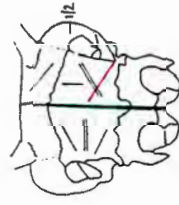
LEFT



V



P



BUCCAL



LINGUAL



LEFT MANDIBLE (6/6)

MAXILLA/SKULL (10/16)

Figure 5.24: Continued.

Figure 5.24: Continued.

MAN 4AL

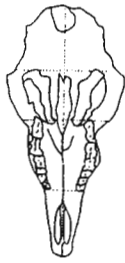
RIGHT



LEFT



V



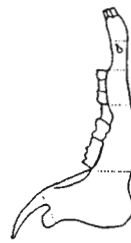
P



BUCCAL



LINGUAL

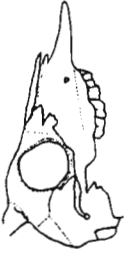


LEFT MANDIBLE (1/2)

MAXILLA/SKULL (-/1)

MAN 4L

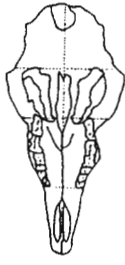
RIGHT



LEFT



V



P



BUCCAL



LINGUAL



LEFT MANDIBLE (11/11)

MAXILLA/SKULL (2/6)

Figure 5.24: Continued.

Figure 5.24: Continued.

ascending ramus region or near the coronoid process or condyle, they inevitably relate to removal of the mandible from the skull below the zygomatic process of the temporal bone. In other instances (see JAM Phase 2) we have chop or chop-snap marks between the mental foramen and the angle of the mandible. These are partly related to attempts to get access to the marrow cavity within the mandible. Elsewhere they may relate to the dismemberment of the mandible from the skull, by chopping through the various muscles. The masseter (mentioned above) inserts itself on the lateral surface of the ramus; while the temporalis inserts itself on the coronoid process and adjacent medial and lateral surfaces, with the diagastricus attached to the medial surface of the mandibular body (Getty 1975: 799-801).

3. *The Sacrum (see Figure 5.25).*

The chop and saw marks are almost exclusively limited to the anterior portion of the sacrum, either near the articular processes or wings. Chop marks are exclusively longitudinally, while saw marks run either perpendicularly, longitudinally or obliquely. The saw marks which run transversely were intended to sever the sacrum from the lumbar vertebra, and/or facilitate access to the proximal end of the pelvis. The oblique saw marks and the longitudinal saw and chop marks were aimed at dismembering the upper hind limb from the sacrum. Alternatively, the oblique saw marks lower down the sacrum in JAM 7L, would have resulted similarly in mid-shaft breakage along the ilium of the pelvis.

4. *The Metapodials (see Figure 5.25).*

These skeletal elements show three trends. The cut marks found on the metapodials may have resulted from the intended disarticulation of either the metatarsal or metacarpal from the phalanges, but more likely relate to the skinning of the carcass. Alternately we note chop marks, saw marks and a saw-snap mark (in JAM 4L) either above or below where fusion takes place, as suggesting dismemberment of either the distal metatarsal or -carpal from the phalanges.

5. *The Atlas (see Figure 5.26).*

As in the case of the axis (see below) we have at least two clear patterns. The cut marks that are found are almost exclusively at or near the anterior or posterior articular surfaces, or around the corners of the wing. Most of these cut marks relate to disarticulation of the atlas from either the occipital condyles of the skull or anterior portion of the axis. The chop and saw marks point to a similar pattern, rather of dismemberment than disarticulation from the same skeletal elements. In JAM 4L and JAM 8L we have a few instances where saw marks have been found within the posterior region of the articular surfaces, both dorsally and ventrally. The only possible interpretation is that sawing along the mid-axis of the carcass had ended up further along the cervical vertebrae than had been intended, thus resulting in these saw marks appearing.

6. *The Axis (see Figure 5.26).*

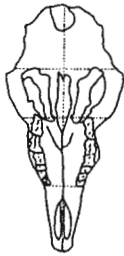
As with the atlas, the cut marks are similarly clustered either around the dens and anterior articular process or the posterior end of the body and the posterior articular process, i.e. at points where

JAM 4L

LEFT



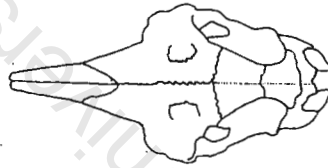
V



P



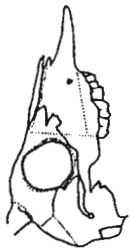
D



MAXILLA/SKULL (1/1)

MAN 7L

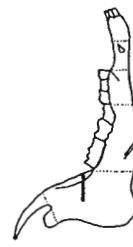
RIGHT



BUCCAL



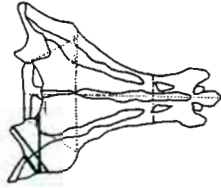
LINGUAL



LEFT MANDIBLE (6/10)

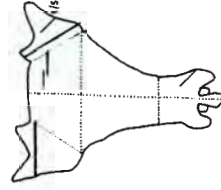
JAM 4L

D



SACRUM (4/5)

V



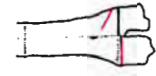
L



A



P



H



METAPODIAL (7/24)

University of Cape Town

Figure 5.25: Butchery marks on the sacrum and metapodials.

Figure 5.24: Continued.

JAM 7L

JAM 8L



SACRUM (4/4)

SACRUM (3/3)



METAPODIAL -/6/

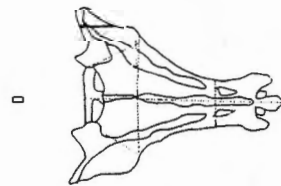
METAPODIAL (-)

Figure 5.2.5: Continued.

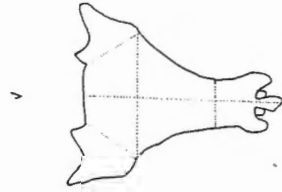
Figure 5.2.5: Continued.

MAN 3AL

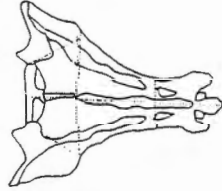
MAN 4AL



SACRUM (1/2)

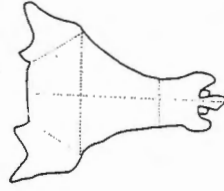


D



SACRUM (1/1)

V



L



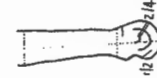
A



P



M



L



A



P



M



METAPODIAL (2/3)

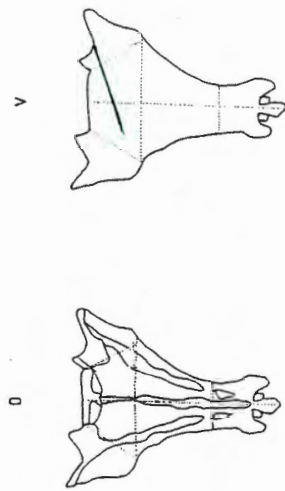
METAPODIAL (1/2)

Figure 5.25: Continued.

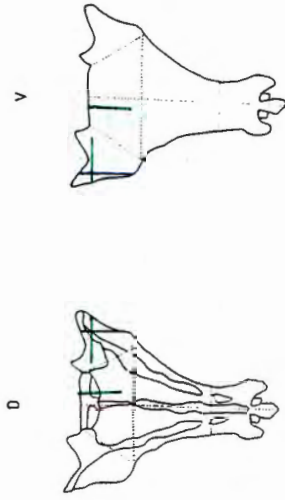
Figure 5.25: Continued.

MAN 4L

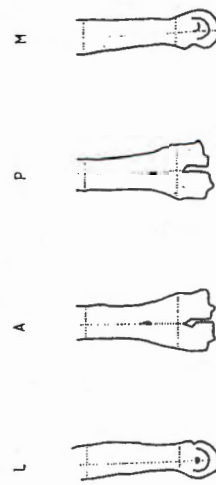
MAN 7L



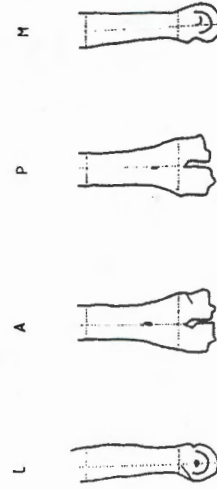
SACRUM (1/1)



SACRUM (2/2)



METAPODIAL (-/2)



METAPODIAL (1/13)

Figure 5.25: Continued.

Figure 5.25: Continued.

JAM 4L

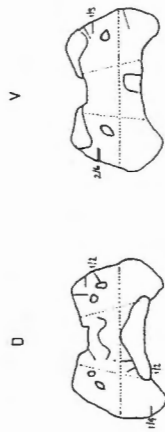


ATLAS (16/21)

RIGHT LEFT



JAM 4L

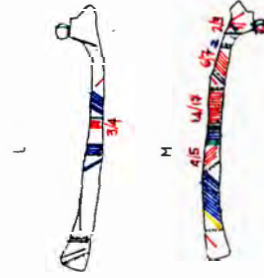


ATLAS (16/21)

RIGHT LEFT

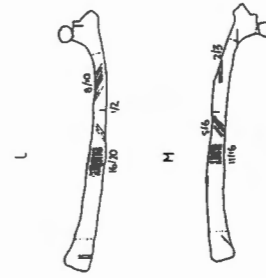


AXIS (9/10)



RIB (77/103)

AXIS (9/10)



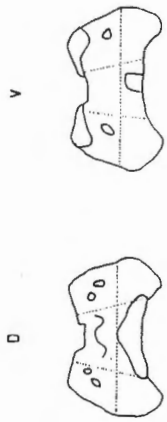
RIB (77/103)

Figure 5.26: Continued.

Figure 5.26: Butchery marks on the atlas, axis and ribs.

JAM 7L

JAM 8L



ATLAS (I/4)

RIGHT



LEFT



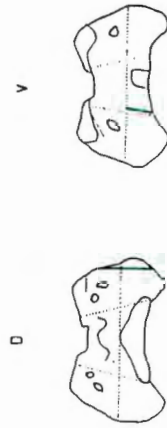
AXIS (2/3)



M



RIB (3/4/41)



ATLAS (3/4)

RIGHT



LEFT



AXIS (1/1)



M



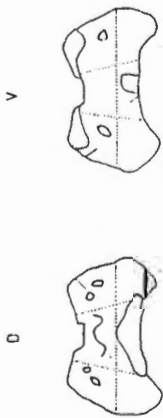
RIB (71/76)

Figure 5.26: Continued.

Figure 5.26: Continued.

MAN 3AL

MAN 4AL

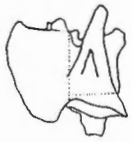


ATLAS (3/4)

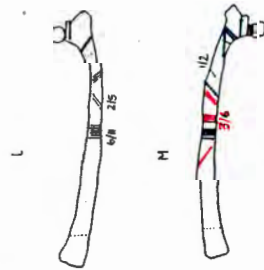
RIGHT



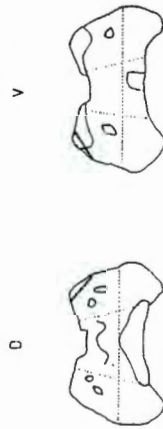
LEFT



AXIS (1/1)



RIB (16/25)



ATLAS (1/1)

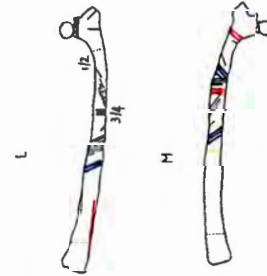
RIGHT



LEFT



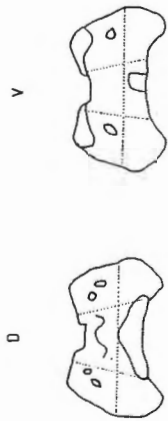
AXIS (1/1)



RIB (2/9)

Figure 5.26: Continued.

Figure 5.26: Continued.

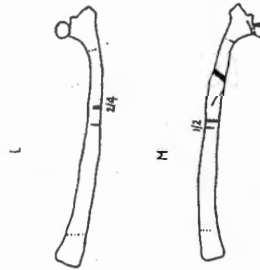


ATLAS (→)

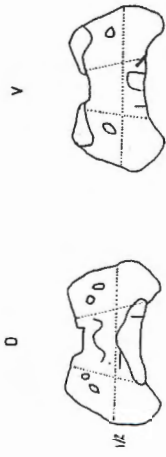
RIGHT LEFT



AXIS (→)

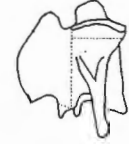


RIB (21/23)

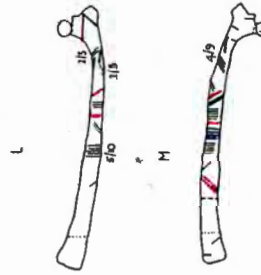


ATLAS (2/3)

RIGHT LEFT



AXIS (→)



RIB (27/62)

Figure 5.26: Continued.

Figure 5.26: Continued.

articulation with other skeletal elements occur. Where chop and saw marks most frequently occur is around the anterior articular process, implying dismemberment of the atlas and axis at this point. In JAM 4L we also have two saw snap marks in this region. Alternatively these "grosser" butchery patterns occur through the spinous process and arch or obliquely through the postero-ventral area of the body. These marks can best be interpreted as attempts to gain access to the 3rd cervical vertebra. The lower incidence of the latter form of butchery, suggests that this was not the dominant pattern.

7. *The Ribs (see Figure 5.26).*

These skeletal elements are slightly more difficult to interpret. The cut marks are scattered all through the rib, being most prominent along the lateral and medial surfaces, less so in the neck and tubercle region, and even lesser around or slightly behind the head. Cut marks at the sternal end are infrequent. The cut marks around the head and neck may be interpreted as some attempt at disarticulation<sup>4</sup> from the thoracic vertebrae, while those marks along the medial or lateral surfaces best relate to pre-cooking or consumption. In cases where cut marks are found running longitudinally to the length of the rib or where pointed knife ends have been found. They may suggest primary or secondary butchery, where either the butcher or consumer attempted to, or did, split the rack of ribs.

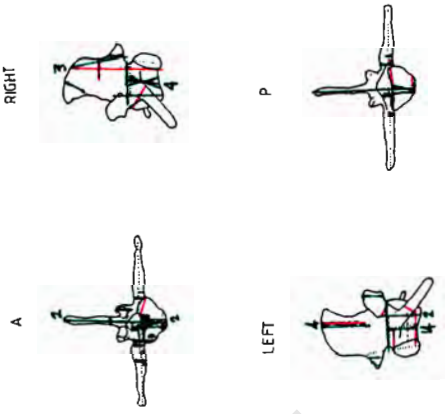
The larger forms of butchery also include every category from chop right through to saw snap, and including percussion. This suggests that an array of implements were used to sever the ribs from the vertebrae either around the head, along the neck and/or along the medial and lateral surface region, either transversely or obliquely. In a number of instances it was found that the ribs were severed both in the neck region and along the medial and lateral surfaces. One of the possibilities here is that rib racks may have been removed by chopping or sawing during sagittal splitting, or may have been partially chopped and then snapped off. It is not uncommon for the strong articulations on the cranial ribs to be chopped through while the caudal ribs are bent backwards until they snap. The presence of intact proximal ribs implies that it was common for some ribs, probably one of the racks, to remain articulated to the thoracic vertebrae (see Woodborne 1994: 5). The impression gained is that the racks of ribs were either placed medially or laterally on a surface, and then were chopped, sawn or hacked with some implement either obliquely or transversely half to three-quarters of the way down the length of the rib. Subdivision of the rack seems mostly to have been achieved by chopping through the medial aspect, where most of the grosser forms of butchery have been found. The destiny of the sternum is not known, as only one sternal fragment was found.

8. *Lumbar Vertebrae (see Figure 5.27).*

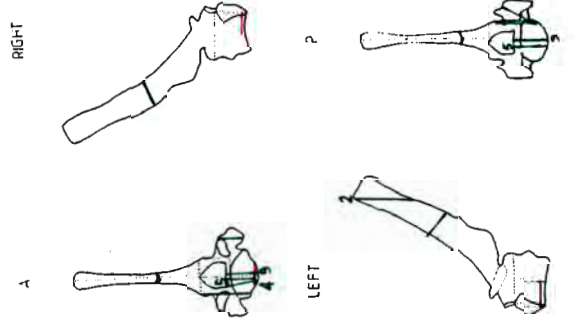
The cut marks are again clustered mostly around the articulations: the anterior and posterior articular processes, at some point along the dorsal and ventral transverse process and in a few cases on the left or right side of the body. In all cases but the latter, these suggest assisted attempts at disarticulation. The pattern seen at the Drostdy is somewhat similar. Woodborne (1994: 5) noted that cut marks on the

<sup>4</sup> Muscles that may have hindered disarticulation include the levatores costarum. These are the series of small muscles which overlie the vertebral ends of the intercostal spaces of the 2nd to 13th rib (Getty 1975: 818).

JAM 4L

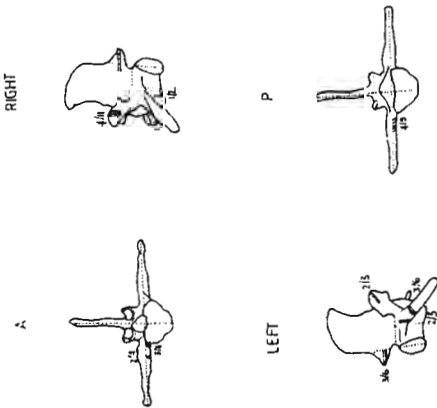


LUMBAR VERTEBRA (44/56)

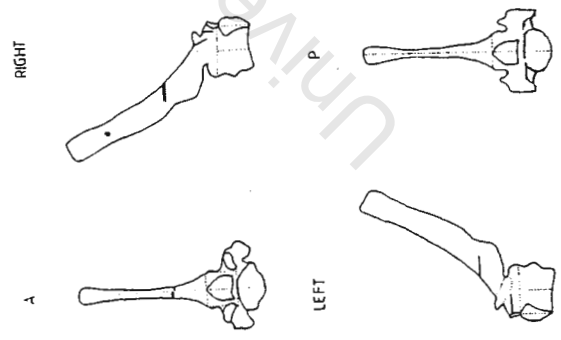


THORACIC VERTEBRA (25/29)

JAM 4L



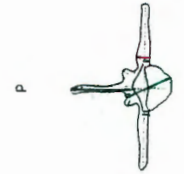
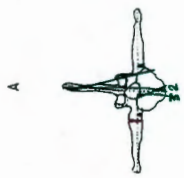
LUMBAR VERTEBRA (44/56)



THORACIC VERTEBRA (25/30)

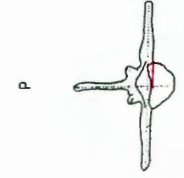
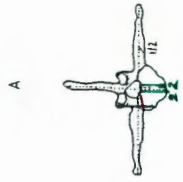
Figure 5.27: Butchery marks on the lumbar and thoracic vertebrae.

JAM 7L

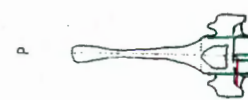
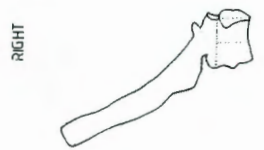


LUMBAR VERTEBRA (14/15)

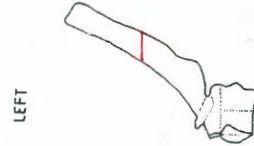
JAM 8L



LUMBAR VERTEBRA (12/13)



THORACIC VERTEBRA (8/8)

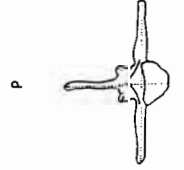
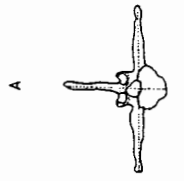


THORACIC VERTEBRA (4/5)

Figure 5.27: Continued.

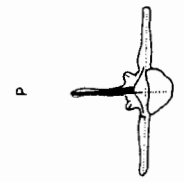
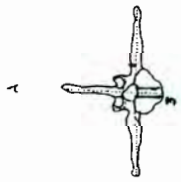
Figure 5.27: Continued.

MAN 3AL



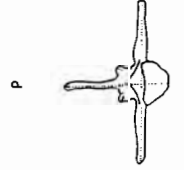
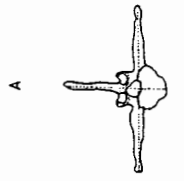
LUMBAR VERTEBRA (L1/L5)

MAN 4AL



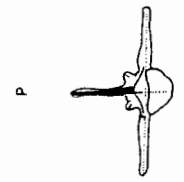
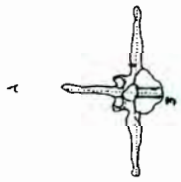
LUMBAR VERTEBRA (10/11)

MAN 3AL

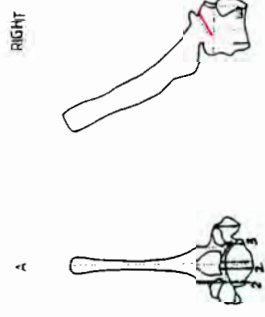


LUMBAR VERTEBRA (L1/L5)

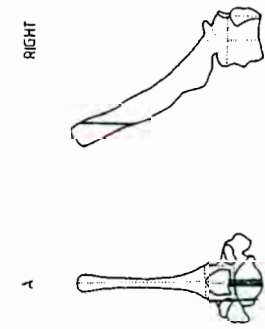
MAN 4AL



LUMBAR VERTEBRA (10/11)



THORACIC VERTEBRA (T1/T20)

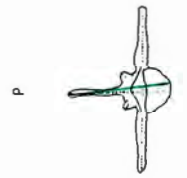
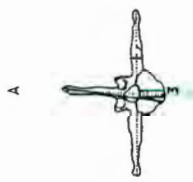


THORACIC VERTEBRA (6/6)

Figure 5.27: Continued.

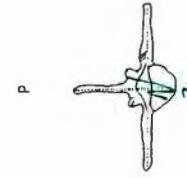
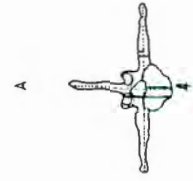
Figure 5.27: Continued.

MAN 4L

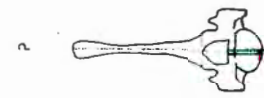
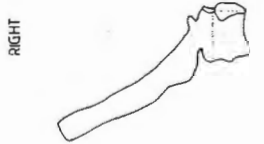
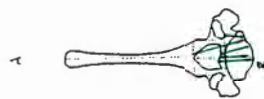


LUMBAR VERTEBRA (11/11)

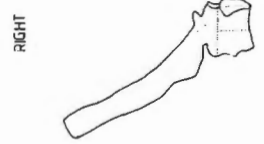
MAN 7L



LUMBAR VERTEBRA (13/16)



THORACIC VERTEBRA (5/5)



THORACIC VERTEBRA (11/11)

Figure 5.27: Continued.

Figure 5.27: Continued.

"cervical and lumbar vertebrae are mostly on the processes and are the result of cutting with a knife orientated parallel to the spine. These must have been inflicted prior to cooking - during meat removal from the neck and lower back. How the meat was served cannot be determined, but the sirloin and diminutive fillet off the lumbar vertebrae are prime pieces".

The chop and saw marks also show clear patterns. Here the skeletal element is often chopped or sawn through at the anterior and posterior ends of the body, often resulting in portions of the anterior or posterior articular processes or the spinous process being severed off with it. Alternatively the vertebrae are severed around the mid-section of the body (see all phases). The second pattern is the exclusive use of the saw to saw through the centrum of the body and/or the spinous process. These butchery patterns are not always centrally through the long-axis of the skeletal element, but also obliquely or transversely through either half of the centrum. Lastly, in a few layers (see JAM 4L, JAM 7L, JAM 8L and MAN 4AL) there are examples of either sawing or chopping resulting in the body being separated from the spinous process, suggesting that the spines were sometimes sawn or chopped off from the rest of the vertebrae. Portions of the transverse processes are also infrequently severed from the rest of the body.

#### 9. *Thoracic Vertebrae (see Figure 5.27).*

As with the lumbar vertebrae, these show a similar pattern. Cut marks are infrequently found; but where they are, it is usually around articulations or near the ventral portion or base of the body. The saw marks show a similar pattern of either mid-section splitting, or on either side of the centrum, or alternatively through the lateral articulations. Lateral articulation dismemberment would imply that these sections remain attached to the dorsal/vertebral end of the ribs. This form of sectioning is less frequent than mid-section splitting. In JAM 4L and MAN 4AL there is evidence for separation of the thoracic vertebrae from each other through the spinous process. In other cases (see JAM 4L and 8L) the dorsal spines are separated from the rest of the skeletal element either with a saw or chopper/ax/cleaver. Lastly, there are examples of longitudinal sawing or chopping through the lateral body. If severing is occurring between the arch and the body, it might similarly infer the separation of the dorsal spines from the rest of the vertebrae.

The significance of this may lie in the thoracolumbar fascia which extends the length of the thoracic and lumbar regions. The longissimus thoracis et lumborum, for example, occupies the angle formed by the spines of the lumbar and thoracic vertebrae, the ribs and the lumbar transverse processes, with some attachment to the transverse processes and spines of the last three or four cervical vertebrae (Getty 1975: 811, 812). Although there are a number of other muscles which attach or originate at a particular vertebral aspect, the removal of the spines from the body may have formed a functional cut.

A closer butchery interpretation of the patterns found on the thoracic and lumbar vertebrae are nevertheless required. The cut marks on the ventral surfaces of the transverse processes of the lumbar vertebrae invariably relates to the removal of the fillet steak. While cut marks on the dorsal spines and dorsal surfaces of the transverse processes likely relate to the removal of the thick sirloin which runs the dorsal length of the lumbar vertebrae, the removal of certain muscles (e.g. the thoracolumbar fascia or the longissimus thoracis et lumborum) which are attached to both the lumbar and thoracic vertebrae would

more likely have been chopped up into smaller pieces and ended up in the stewing pot. However, the exact removal of the dorsal spines still cannot be fully explained. If there is a purpose, it probably relates to the post-filleting of the vertebrae.

10. *Cervical Vertebrae (see Figure 5.28).*

As with lumbar and thoracic vertebrae we see similar patterns. Cut marks are almost absent among this group of skeletal elements. Where they do occur it is almost exclusively around the articulations. More pronounced here is the use of the saw to saw through the central axis of the bone, or alternatively through either side of the centrum, or obliquely across the central axis, and less frequently near the arches. Alternatively the saw is being used laterally to sever one cervical vertebra from the next (see JAM 4L, JAM 8L, MAN 3AL and MAN 7L). In addition, the ax/cleaver is being used to facilitate the separation of one vertebra from the next around the articulations (see JAM 4L).

As with the Drostdy material, there was no evidence for percussion on any of the vertebrae, undoubtedly because they contain no marrow apart from the fatty spinal cord which is easily exposed without breaking the bone (Woodborne 1994).

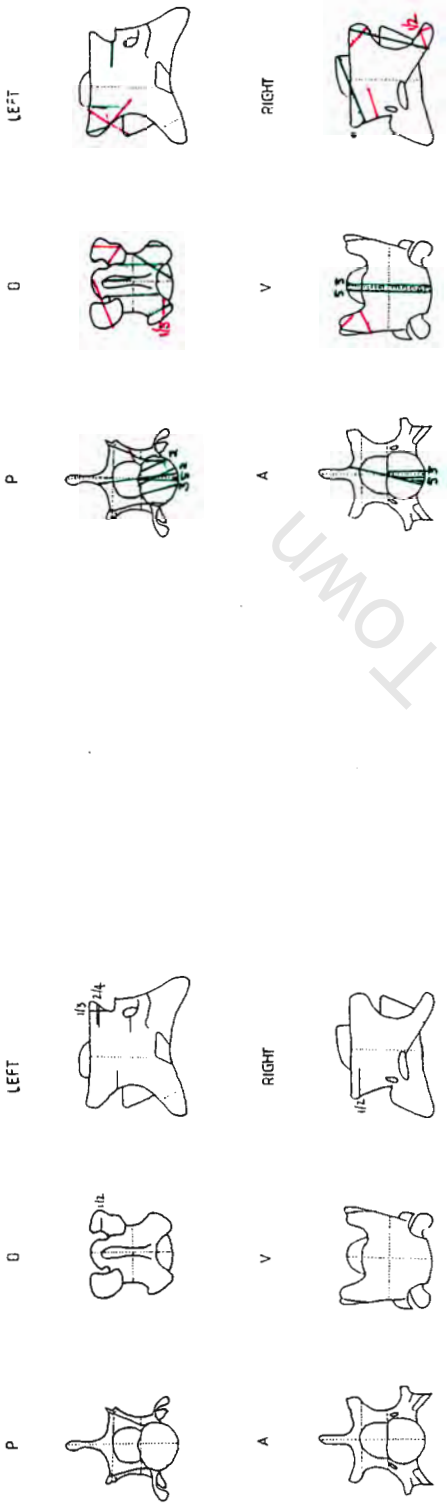
11. *The Scapulae (see Figure 5.28).*

These skeletal elements show different patterns to previous mentioned body parts. Although some cut marks are found near the articulation of the distal scapula with the proximal humerus, most cut marks are found along either the anterior or posterior dorsal or ventral border, or at or above the distal end of the spine below the acromion.

Chop marks are dominant in the area between the glenoid cavity and the acromion, with a lesser frequency of saw, saw snap and chop snap marks. The similar pattern is repeated along the mid-section of the anterior and posterior border, suggesting dismemberment either distally or proximally of the acromion, although dismemberment at the glenoid cavity or through the tuber scapulae is not unknown. Both the spine, acromion, and glenoid cavity are either important points of attachment or endings of various muscles between various skeletal elements. For example the omobrachial fascia is attached to the spine of the scapula and extends to the caudal border of that region which is the point of origin for the teres major which is attached to the teres tubercle of the humerus. The deltoideum inserts itself on the acromion of the scapula. The coracobrachialis originates at the coranoid process of the scapula, while the biceps brachi originates at the supraglenoid tubercle of the scapula (see Getty 1975: 831, 835-838). Therefore dismemberment may have occurred at points where, or near to which, attachment took place, i.e. in this case through the musculature around the scapula.

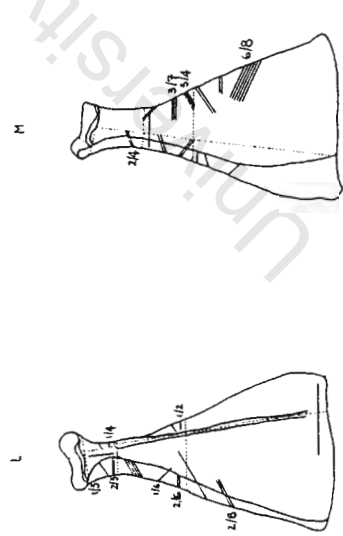
12. *The Humerii (see Figure 5.29).*

Where cut marks occur most predominantly is on both medial and lateral sides of the coronoid fossa, or on the medial, lateral or basal portions of the medial and lateral condyles, i.e. at articulation points on the humerus. Similarly chop, saw and chop snap marks are predominantly at the distal end of the humerus above or below the condyles, suggesting that this is a point of dismemberment. In other



CERVICAL VERTEBRA (31/46)

CERVICAL VERTEBRA (31/46)



LEFT SCAPULA (29/29)

LEFT SCAPULA (29/29)

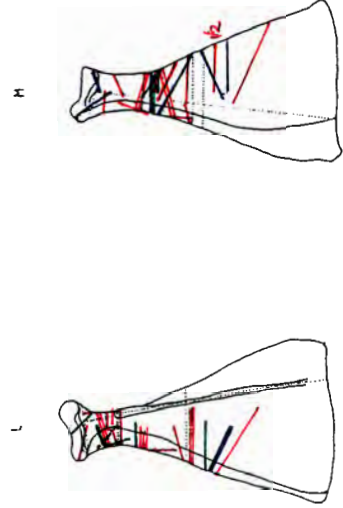
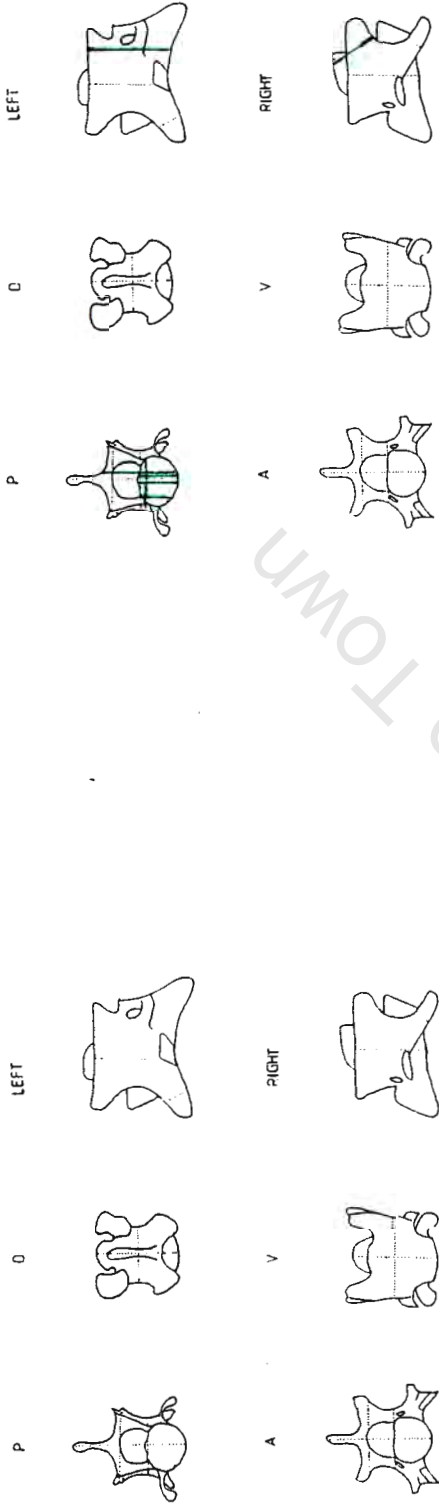


Figure 5.28: Butchery marks on the cervical vertebra and the scapula.

Figure 5.28: Continued.

JAM 7L

JAM 8L



CERVICAL VERTEBRA (7/7)

CERVICAL VERTEBRA (7/7)



LEFT SCAPULA (4/4)

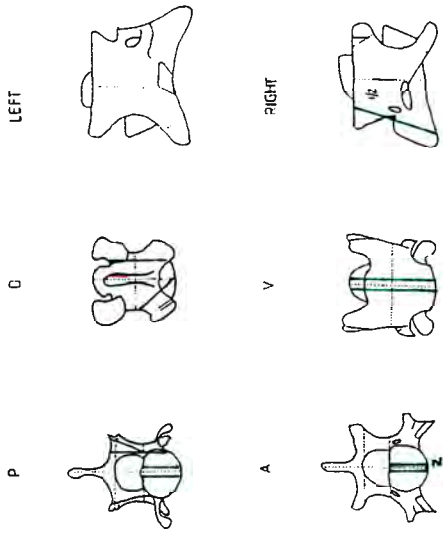
LEFT SCAPULA (5/5)

Figure 5.28: Continued.

Figure 5.28: Continued.

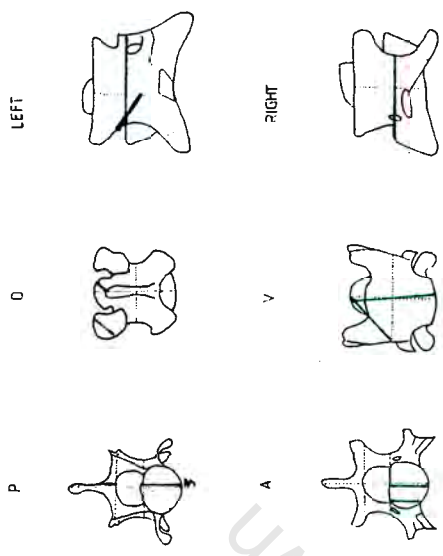
MAN 3AL

MAN 4AL



CERVICAL VERTEBRA (8/9)

LEFT SCAPULA (6/6)



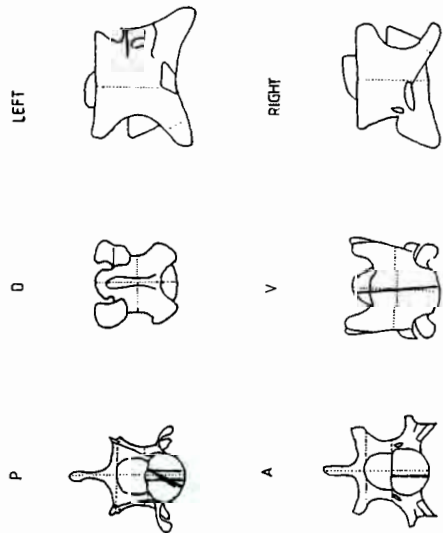
CERVICAL VERTEBRA (16/7)

LEFT SCAPULA (2/3)

Figure 5.28: Continued.

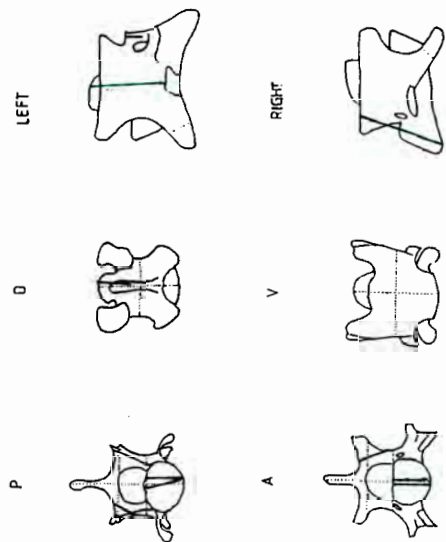
Figure 5.28: Continued.

MAN 4L

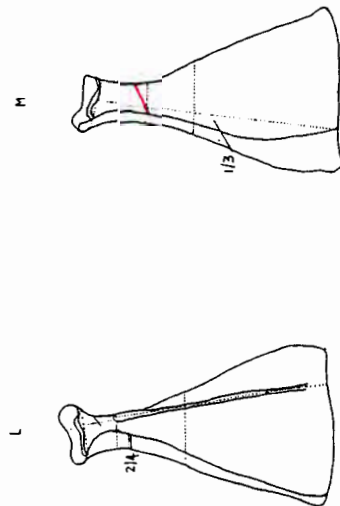


CERVICAL VERTEBRA (L4/L1)

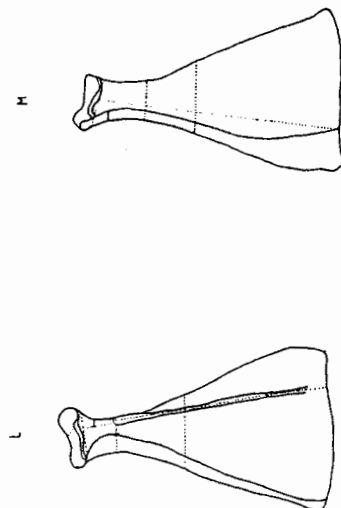
MAN 7L



CERVICAL VERTEBRA (S5/S)



LEFT SCAPULA (L27)

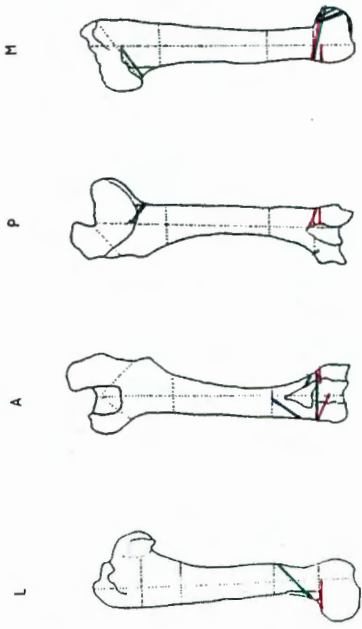


LEFT SCAPULA (I17)

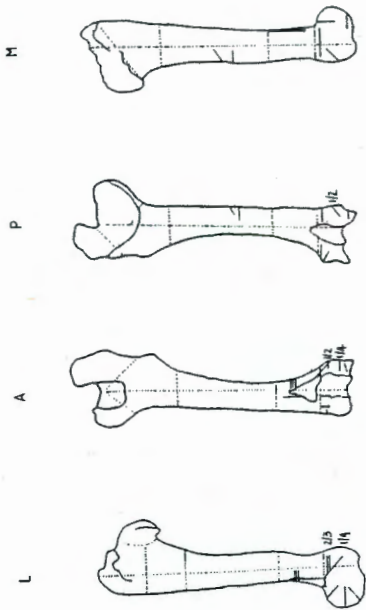
Figure 5.28: Continued.

Figure 5.28: Continued.

JAM 4L

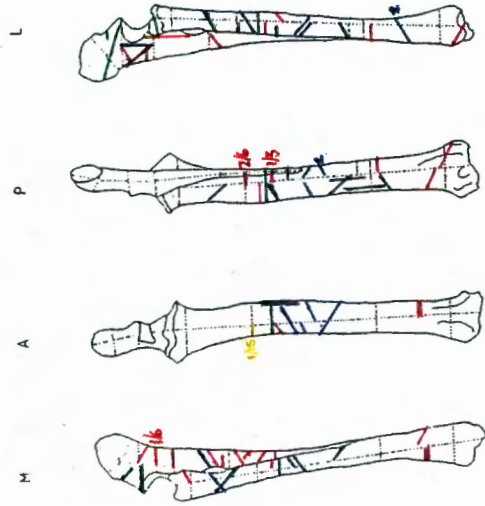


LEFT HUMERUS (16/20)

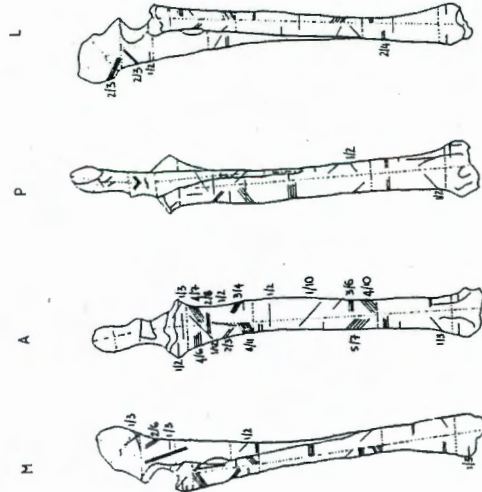


LEFT HUMERUS (16/20)

JAM 4L



(29/43) RIGHT RADIUS AND ULNA (10/16)

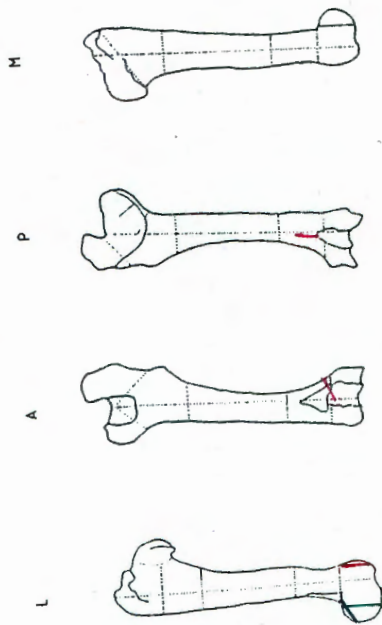


(29/43) RIGHT RADIUS AND ULNA (10/16)

Figure 5.29: Continued.

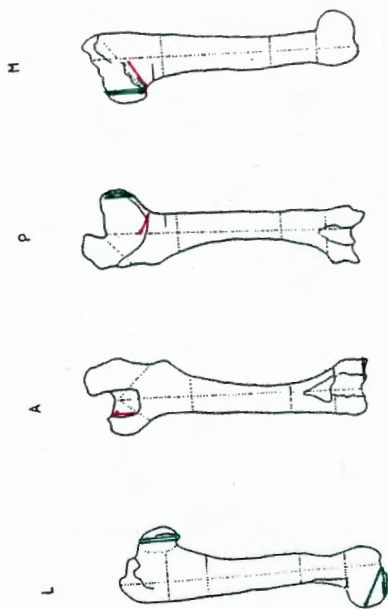
Figure 5.29: Butchery marks on the humerus, radius and ulna.

JAM 8L

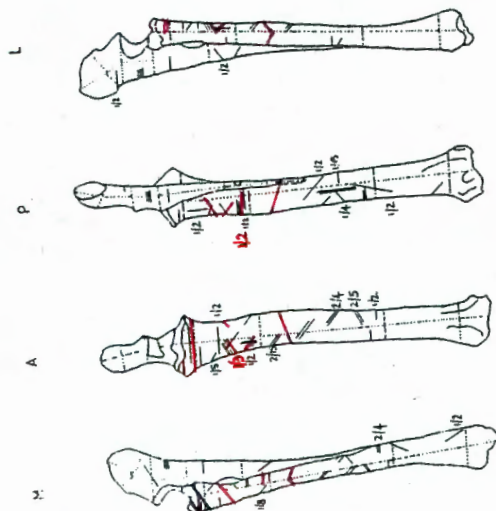


LEFT HUMERUS (6/6)

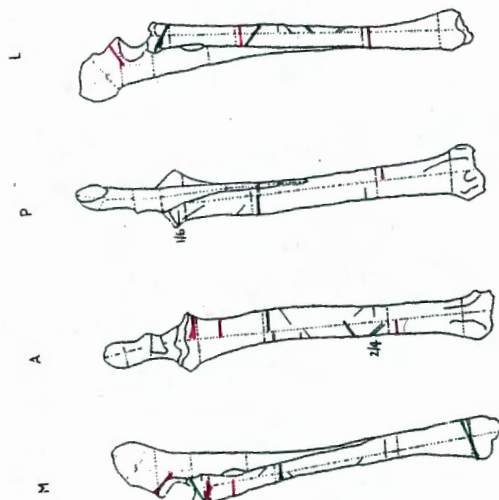
JAM 7L



LEFT HUMERUS (6/6)



(9/11) RIGHT RADIUS AND ULNA (3/3)

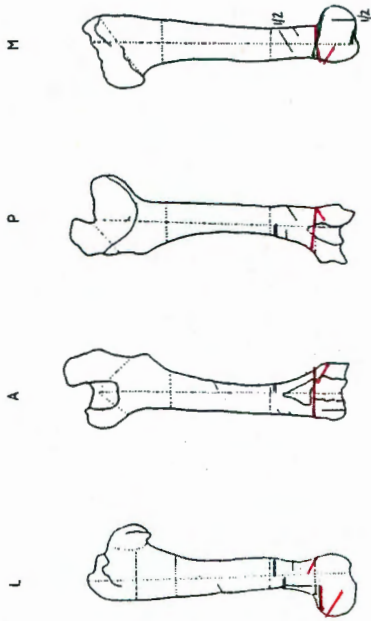


(8/12) RIGHT RADIUS AND ULNA (12/12)

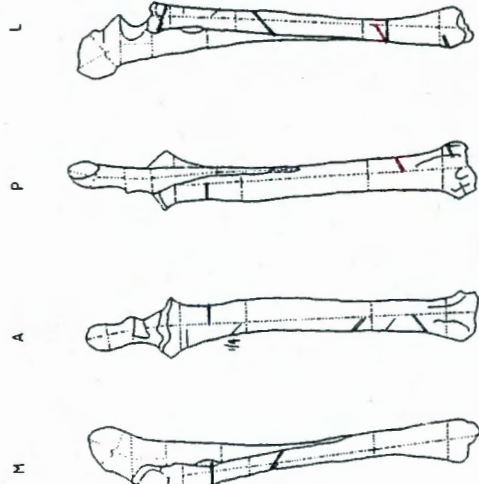
Figure 5.29: Continued.

Figure 5.29: Continued.

MAN 4AL

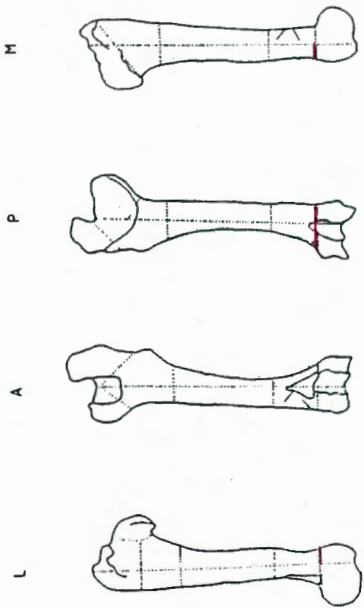


LEFT HUMERUS (4/4)

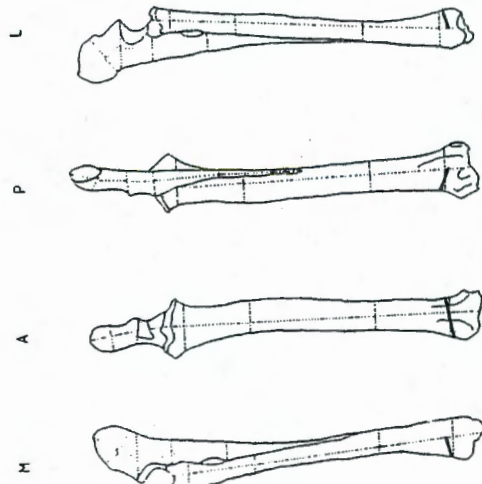


(5/7) RIGHT RADIUS AND ULNA (1/2)

MAN 3AL



LEFT HUMERUS (2/4)

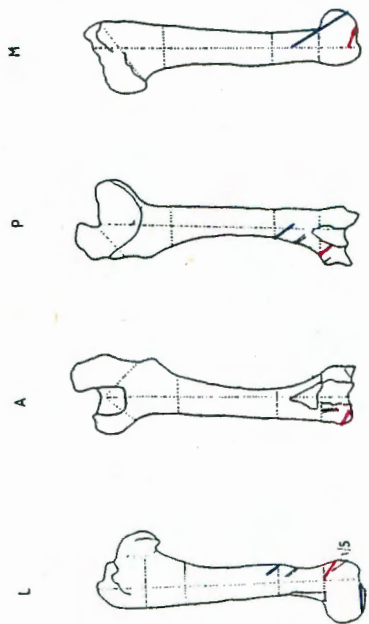


(1/2) RIGHT RADIUS AND ULNA (-)

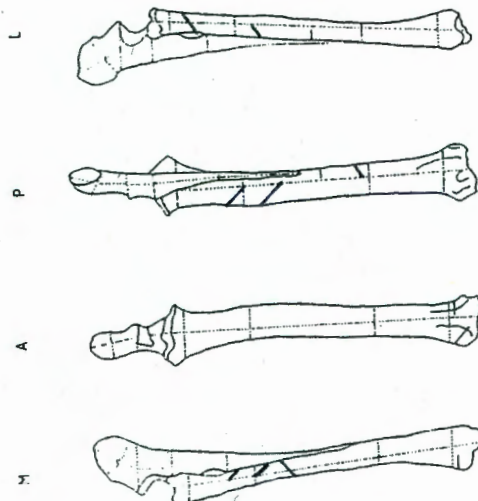
Figure 5.29: Continued.

Figure 5.29: Continued.

MAN 7L

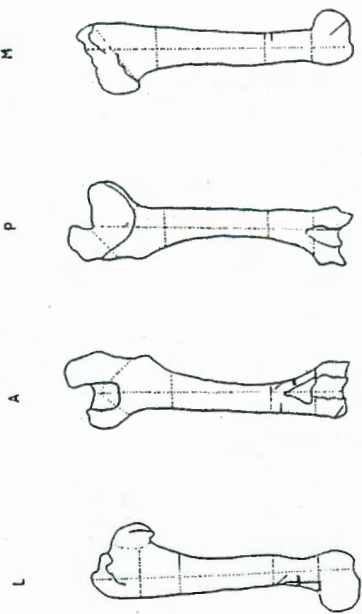


LEFT HUMERUS (5/6)

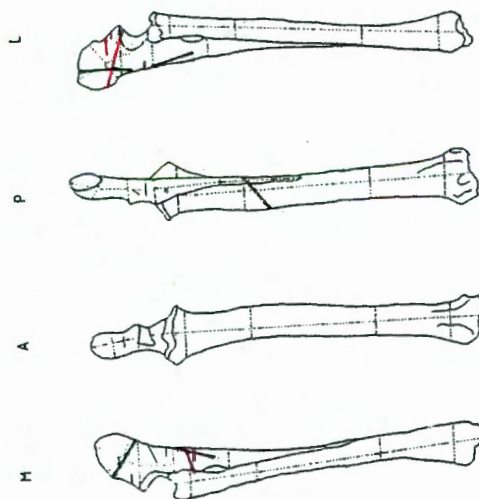


(7/15) RIGHT RADIUS AND ULNA (7/3)

MAN 4L



LEFT HUMERUS (2/4)



(11/2) RIGHT RADIUS AND ULNA (4/7)

Figure 5.29: Continued.

Figure 5.29: Continued.

instances where chop or saw marks are found at the proximal end of the humerus (see especially JAM 7L), they relate either to an act of butchery through the scapula which has taken the head of the humerus with it, or alternatively the loss of the proximal end to the scapula as a butchering unit. The proximal end of the humerus has a number of muscle attachments to either the greater or lesser tubercle, and the crest of the humerus both medially and posteriorly (see Getty 1975: 833-837). It may therefore be that dismemberment occurred distal of the proximal end, where numerous attachments occurred. Distally this may also be so above the radia fossa, with a number of shorter and longer attachments between the distal humerus, olecranon of the ulna and the proximal radius (see below). Primary and secondary butchering marks are almost devoid in the mid-shaft region. Again does the absence of this section not imply a systematic selection pattern for splitting the bone in half and getting access to the marrow (see above)?

Because many chop marks do not result in completely fracturing the bone, the intention may have been the same as that assumed for percussion, viz. the ubiquitous exposure of the marrow cavity (see Woodborne 1994). A similar argument applies to the radius except that chopping is the dominant cause of bone fracture. A further point to be considered, is that humeral mid-shaft absence may be functional. It may have been necessary to intentionally fracture these bones so as to fit them into cooking pots or onto serving plates. The marrow was extracted secondarily after the meat was removed (see Woodborne 1994: 10; and see Binford 1978: 23-32, table 1.9 on marrow index values).

### 13. *The Ulna (see Figure 5.29).*

The "grosser" forms of butchery are mostly confined to the proximal end of the ulna between the olecranon and the semilunar notch, or alternatively the distal shaft of the ulna coinciding with the proximal end of the radius. The olecranon not only has a muscle attached to its medial surface, but also one attached cranio-laterally between it and the distal third of the humerus (see Getty 1975: 840). Where the former is the case, it is often the result of dismemberment either through the antero-distal humerus or alternatively through the proximal ulna posteriorly. These actions result in either catching the humerus around the coronoid fossa or at the base of the condyles. A derivative of this may be the removal of the proximal ulna (see JAM 4L, JAM 7L and MAN 4L) by butchering along the posterior distal plane of the humerus. The second alternative is severing the distal ulna by butchering through the proximal radius anteriorly or posteriorly. The cut marks on the ulna either occur at the processus anconaeus and semilunar notch or along the posterior border. These cut marks either relate to disarticulation of the radius from the distal humerus, or the removal of various tendons or muscles which connect the two skeletal elements. For example, a particular muscle, the deep fascia of the antebrachial region, fuses medially with the periosteum of the radius, while proximally it is attached to the olecranon and collateral ligaments of the elbow joint (see Getty 1975: 831).

### 14. *The Radii (see Figure 5.29).*

Interpretation of butchery patterns here is more difficult as both primary and secondary butchery is thought to be found throughout the whole skeletal element. If there is a general pattern, it is that all types of butchery marks are more concentrated between the proximal end and the distal mid-shaft regions.

The absence, or lesser representation of, either type of butchery mark in the distal region of the radius, may imply that this section is ending up as part of another butchering unit below (see data on MAN 3AL and MAN 4L above). The randomness of the cut marks on the bones are interpreted as meat removal prior to cooking or during consumption.

The "grosser" types of butchery along the upper two-thirds of the radius, either facilitated the dismemberment of one butchering unit from another, or alternatively access to the marrow cavity, as many samples were partially chopped, sawn chop or sawn-snapped medially, laterally, anteriorly or posteriorly. The complete radius and ulna probably formed a single unit of acquisition which was processed for its marrow after the meat had been removed.

15. *The Pelvis (see Figure 5.30).*

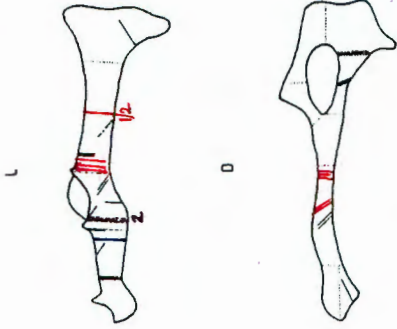
As suggested in the absence/presence data above, certain patterns seem to hold true. As with other skeletal elements, cut marks cluster around articulations and the borders of bone. Here most prominently on both medial and lateral sides of the acetabulum, around the obturator foramen (especially near the pubis and dorsal and ventral sides of the lesser sciatic notch) or to a much lesser degree on the dorsal and ventral borders of the ilium shaft. These cut marks are interpreted as post-cooking attempts at meat removal from either a leg of lamb or mutton. Many of the chop, chop snap and less frequently, saw marks, also occur in these three regions; most often along the ilium shaft so as to separate the hindlimb from the rest of the vertebral column. The sagittal saw marks on the sacrum and chop marks on the pubis may provide evidence that the pelvic girdle was split.

16. *The Femur (see Figure 5.31).*

Although cut marks on the femur may be related to secondary or tertiary acts of butchery, especially those in the anterior mid-section zones, they also relate to particular muscle disarticulation at either proximal or distal ends. Cut marks are either near or around the head, along the neck, both anteriorly or posteriorly, along the minor or major trochanter. Both lesser and greater trochanter, and adjacent neck of the femur are also responsible for a number of tendon and muscle attachments between it and the iliacus (Getty 1975: 846). Alternatively cut marks can be seen in the region of the lateral supracondyloid crest or supracondyloid fossa, near the medial and lateral epicondyles or on the trochlea (see all units). The fibularis longus, for example, attaches itself to the lateral condyle of the tibia and the lateral collateral ligament of the femoro-tibial joint (Getty 1975: 857). The cut marks in this region may therefore pertain to disarticulation of tibia from the femur at the femoro-tibial joint.

The chop, saw, chop- and saw-snap marks are predominantly at the distal and proximal ends of skeletal element, although mid-chops do occur. In the former case, the incidence of intentional fracture on the proximal and distal ends of both the femur and tibia are dominated by chop marks. Femoral fragments with both cut marks overprinted by chop marks support the notion that the opening of the marrow cavity took place after the meat had been processed (see Binford 1978: 27, table 1.9, for marrow index values). In the later case, where mid-shaft breakage took place, it might mean that the longbone was intentionally

JAM 7L



M



MEDIO-VENTRAL

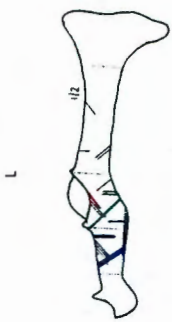


V



INNOMINATE/PELVIS (B/91)

JAM 4L



D



M



MEDIO-VENTRAL



V

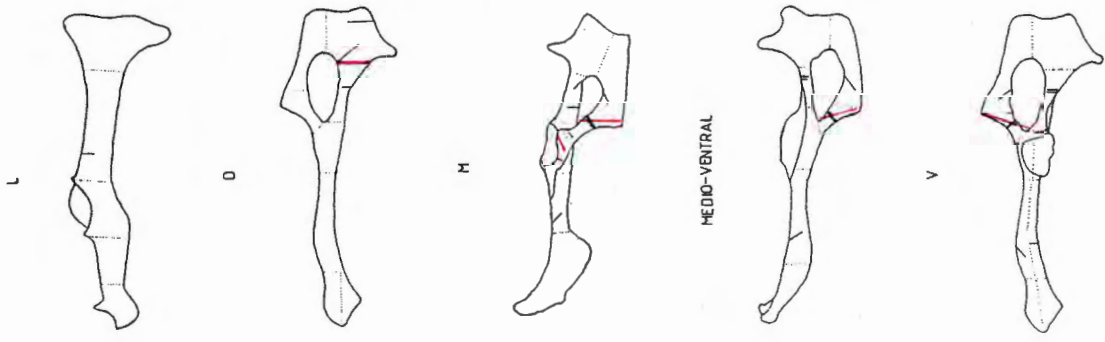


INNOMINATE/PELVIS (I24/32)

Figure 5.30: Continued.

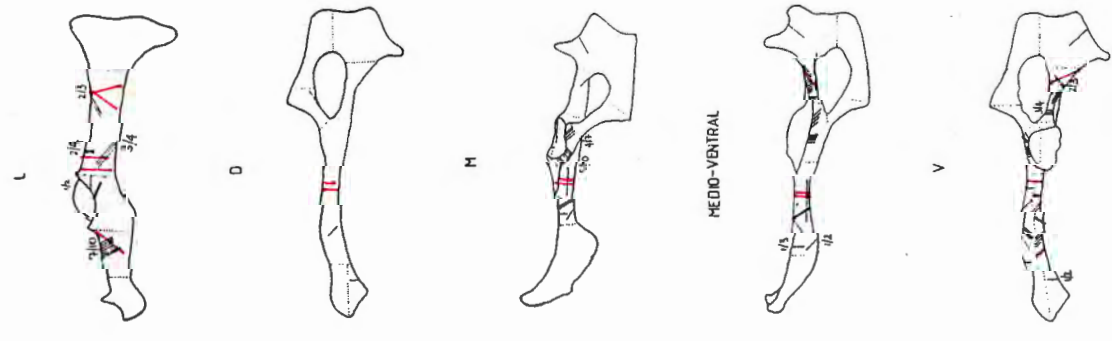
Figure 5.30: Butchery marks on the innominate/pelvis.

MAN 3AL



INNOMINATE/PELVIS (16/8)

JAM 8L

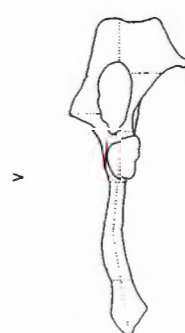
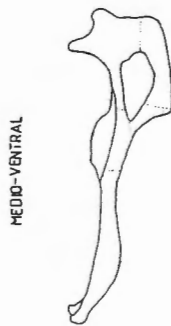
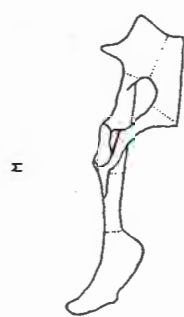
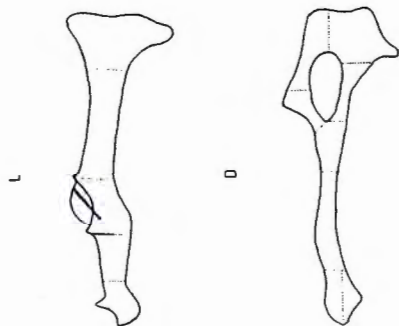


INNOMINATE/PELVIS (7/10)

Figure 5.30: Continued.

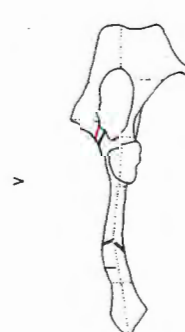
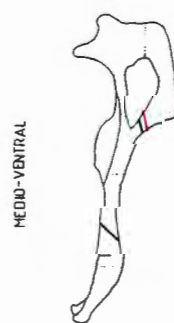
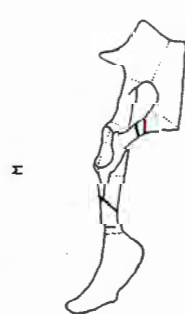
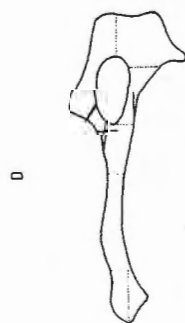
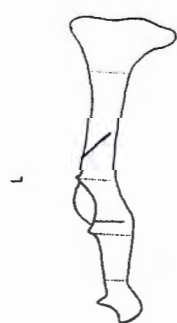
Figure 5.10: Continued.

MAN 4L



INNOMINATE/PELVIS (2/2)

MAN 4AL



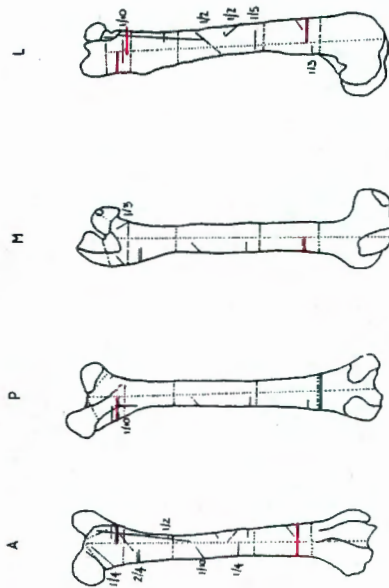
INNOMINATE/PELVIS (2/4)

Figure 5.30: Continued.

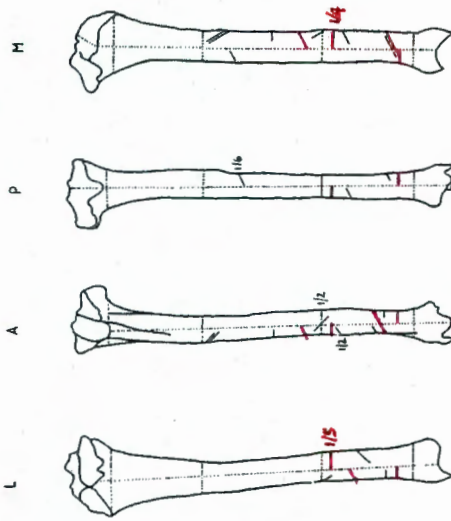
Figure 5.30: Continued.



JAM 8L

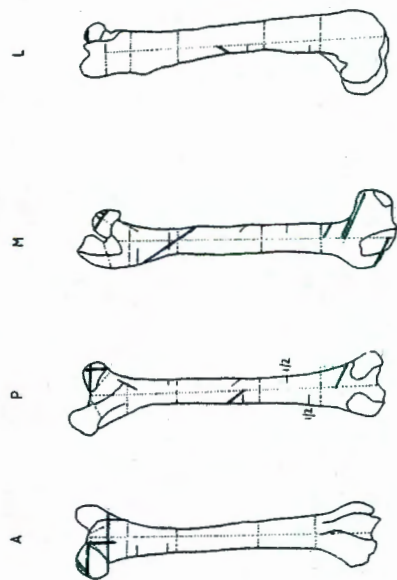


LEFT FEMUR (7/11)

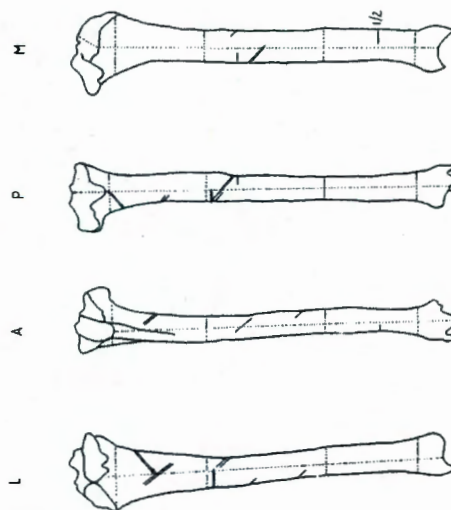


LEFT TIBIA (6/10)

JAM 7L



LEFT FEMUR (8/10)

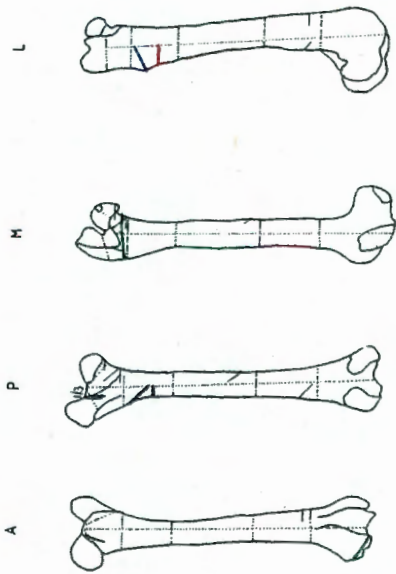


LEFT TIBIA (4/5)

Figure 5.31: Continued.

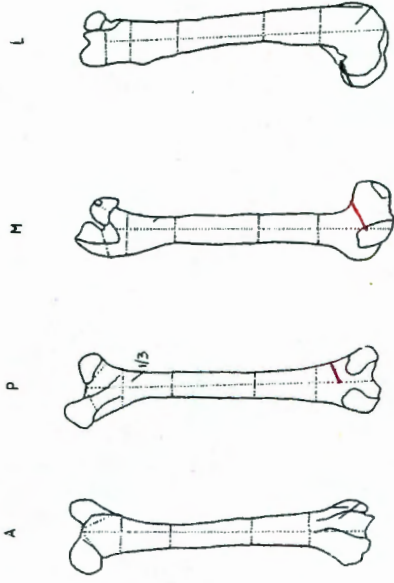
Figure 5.31: Continued.

MAN 3AL

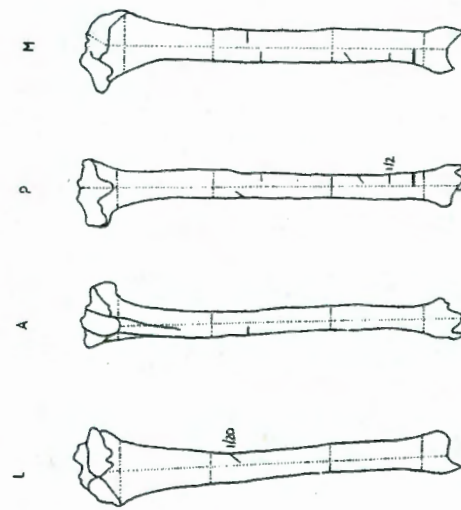


LEFT FEMUR (8/17)

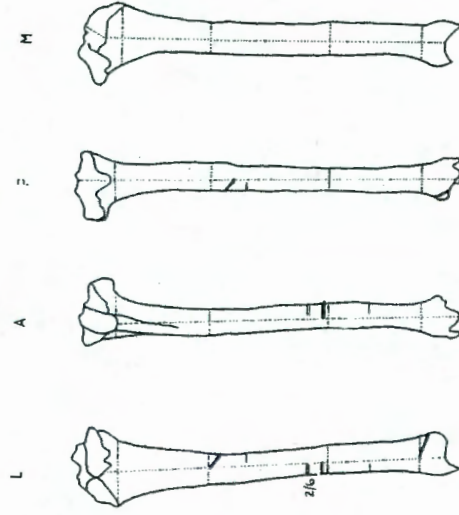
MAN 4AL



LEFT FEMUR (2/5)



LEFT TIBIA (2/3)

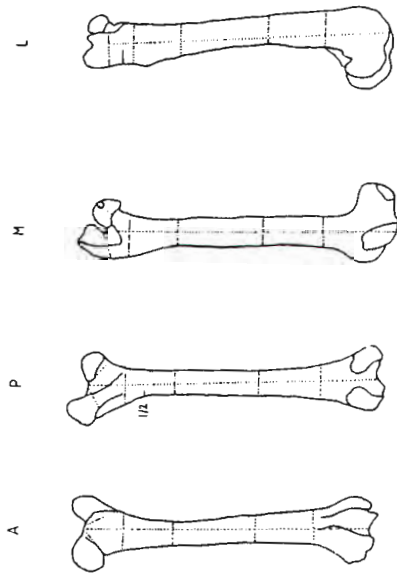


LEFT TIBIA (3/4)

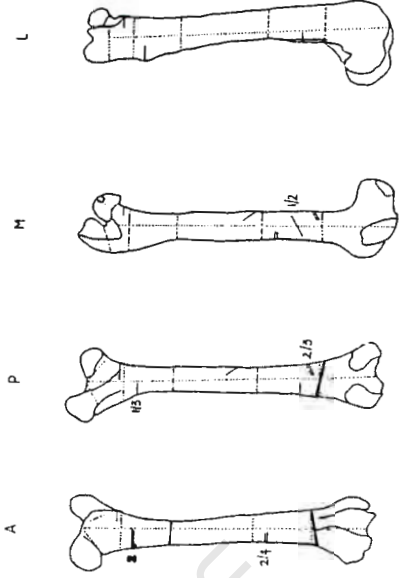
Figure 5.31: Continued.

Figure 5.31: Continued.

MAN 4L

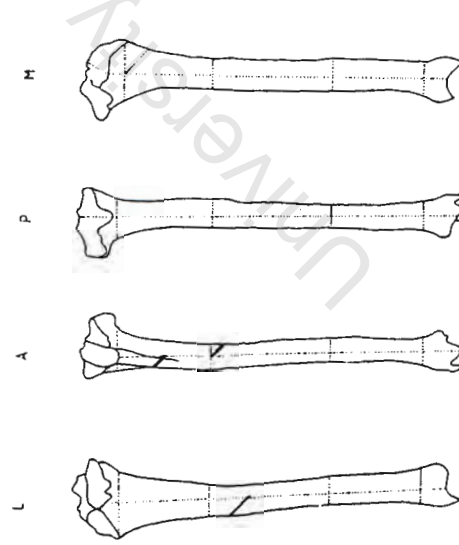


LEFT FEMUR (2/7)

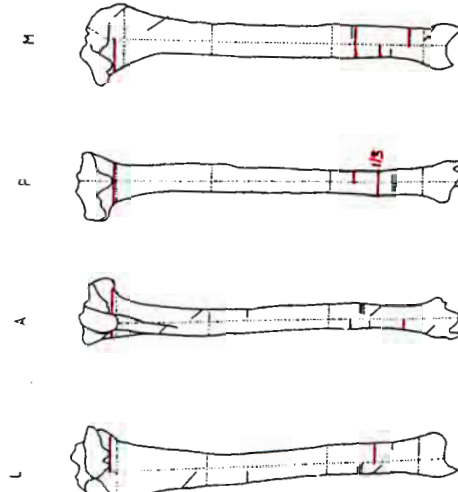


LEFT FEMUR (6/14)

MAN 7L



LEFT TIBIA (2/3)



LEFT TIBIA (5/9)

Figure 5.31: Continued.

Figure 5.31: Continued.

fractured prior to cooking or that this meat bearing unit was cut in two. Both scenarios imply that the meat was left on the bone for cooking (see Woodborne 1994).

In other cases there are clear examples (see JAM 4L, JAM 7L, and MAN 3AL) of saw marks at the base of the trochlea and medial and lateral condyles with the intention of severing the tibia from the femur. A variation on this (see JAM 4L lateral view) was the sawing of the femur laterally longitudinally through the condyles exiting at some point anteriorly to the proximal tibia.

17. *The Tibia (see Figure 5.31).*

As with the femur, cut marks are not haphazardly positioned along the skeletal element. Although some cut marks are probably related to secondary or tertiary butchery, many are transversely or obliquely positioned along either the lateral and medial borders. One must remember that the tibia is shaped by areas of muscular attachment, both proximally and distally. For example, the extensor digiti I longus originates on the lateral border of the proximal end of the tibia, and attaches itself to the proximal end of the metatarsal bone (see Getty 1975: 858). The chop, and to a lesser extent the chop-snap and saw marks, are predominantly along the distal half of the bone (see especially JAM 8L and MAN 7L). Does this suggest that the proximal end or a greater portion of the proximal half is ending up with a butchering unit above it, or alternatively that the distal portion ends up with the metatarsals as another butchery unit? One should also remember that the proximal tibia has a high bone marrow index.

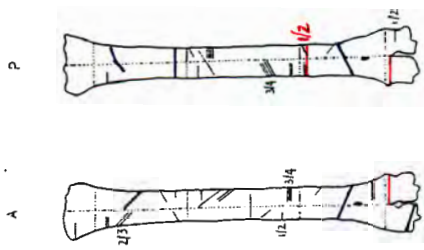
18. *Metacarpals (see Figure 5.32).*

Cut marks and "grosser" forms of butchery marks are more difficult to interpret as they occur both proximally and distally. If there is a pattern, it is that the chop, chop-snap and saw marks are mostly confined distally of the proximal mid-shaft. Far fewer chop and chop-snap marks are found near the proximal end, with saw marks exclusively around the medial and lateral condyles. It may be that the saw marks, (and some chop marks) at the condyles represent primary butchery to separate one butchering unit from another; while chop and chop-snap marks may refer to secondary or tertiary butchery of the butchering unit around the mid-shaft region. Similarly some of the butchering marks also intended to get access to the marrow cavity of the bone (see JAM 8L).

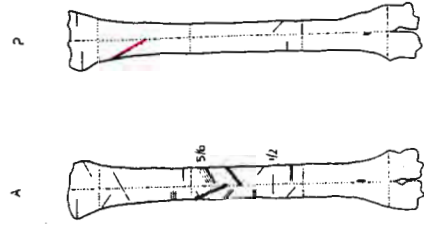
Although some of the cut marks are at the proximal and distal ends where articulation occurs, a number are also placed on the mid-shaft. Three examples from JAM 8L suggest that we are dealing with more than simple meat removal. At the proximal medial end and at the lateral mid-shaft region (posterior view) there are two "acts of butchery" in each zone which contribute 27 and 26 cut marks respectively. In addition, a number of units have scrape marks on the shaft. These three examples suggest deliberate attempts to remove muscle, tendon and/or meat from the shaft by repeating a particular action at a point or by getting between the surface of the bone and the meat bearing flesh.

19. *Metatarsals (see Figure 5.32).*

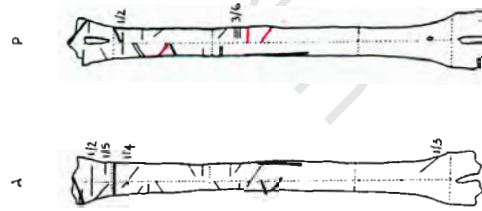
Do the metatarsals follow the same pattern as the metacarpals? Yes and no. Instead of a saw, an ax/cleaver/chopper is being used to sever the condyles from the rest of the skeletal element. Where saw



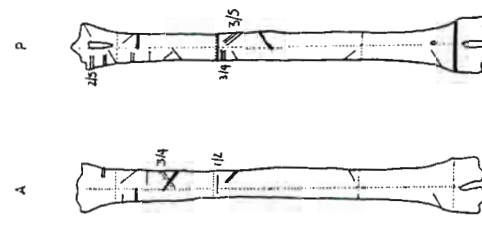
LEFT METACARPAL (112/117)



LEFT METACARPAL (5/6)



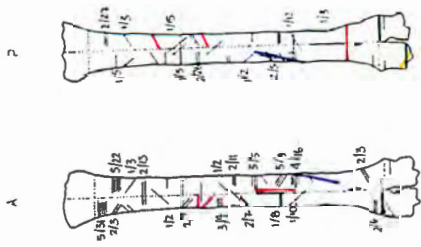
LEFT METATARSAL (9/12)



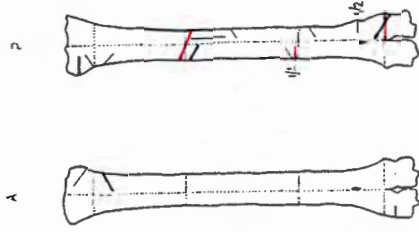
LEFT METATARSAL (7/8)

Figure 5.32: Butchery marks on the metacarpal and metatarsal.

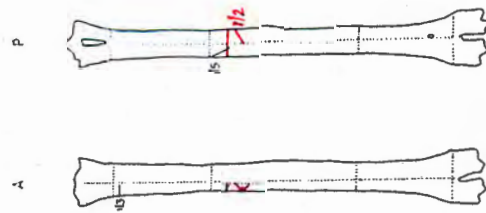
Figure 5.32: Continued.



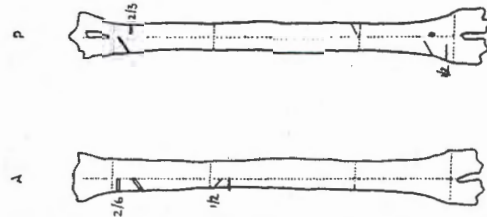
LEFT METACARPAL (16/16)



LEFT METACARPAL (18/18)



LEFT METATARSAL (1/2)



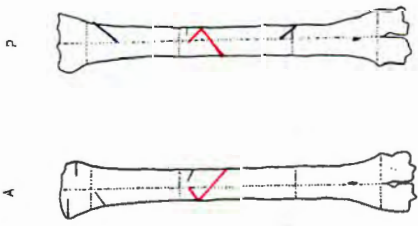
LEFT METATARSAL (7/7)

Figure 5.32: Continued.

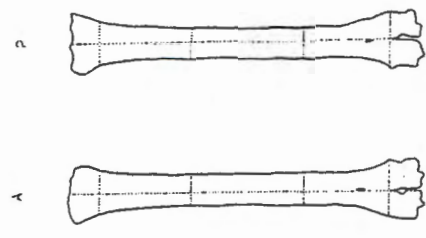
Figure 5.32: Continued.

MAN 4AL

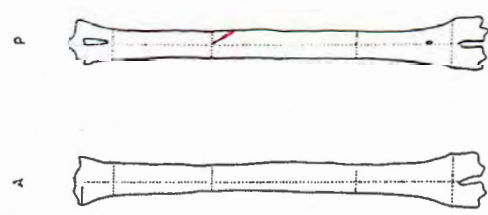
MAN 4L



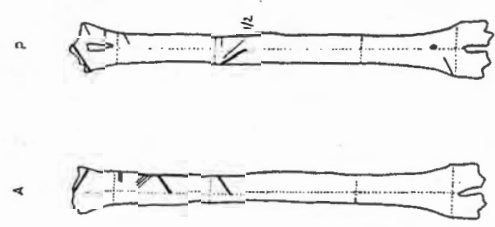
LEFT METACARPAL (II/5)



LEFT METACARPAL (I/1)



LEFT METATARSAL (IV/1)



LEFT METATARSAL (VII/7)

Figure 5.32: Continued.

Figure 5.32: Continued.

marks do occur at the proximal end (see JAM 4L and MAN 4L), they are interpreted as facilitating the dismemberment of the metatarsal from the tarsals. In addition most forms of marks are proximal rather than distal. The exact importance of this is unclear at the moment, but it may similarly have to do with the removal of muscles, tendons and/or meat from the bone, as scrape marks are present (see JAM 4L). I similarly contend that the chop and chop-snap marks may relate to secondary and tertiary butchery away from the market place.

20. *Carpals, Tarsals and Patella (see Figure 5.33 and 5.35).*

Nearly all the cut-marks on any of the smaller carpals and tarsals (including naviculo-cuboid) is transverse to the long axis of the bone (see JAM 4L and Fig. 5.33). Two possible "acts of butchery" may be responsible for these cut marks. Facilitating fore- and hindlimb disarticulation at the point of the carpals and tarsals may have been responsible for these characteristic patterns. Alternatively when the skinning of the carcass took place, the animal may well have been hung up by its feet, with transverse incisions around the carpals and tarsals to facilitate the stripping of the skin/hide from the rest of the animal.

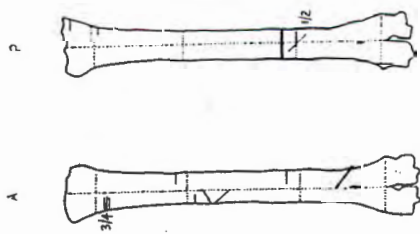
The fact that no mark was found on the patella may imply that they were part of a whole butchering unit, that the distal femur and proximal tibia remained mostly intact. In addition, one must remember that the patella is almost encased or surrounded by a number of muscles (see Getty 1975: 852) protecting it from direct access from various implements.

The cut marks at the distal end of the calcaneum and those on the astragalus probably relate to disarticulation. Similarly cut marks also relate to the removal of the deep flexor tendon at the medial distal end. The chop, chop-snap and saw marks that can be seen are exclusively proximal of the groove for the deep flexor tendon, possibly implying removal of the proximal end to get access to either the tarsals or the distal tibia.

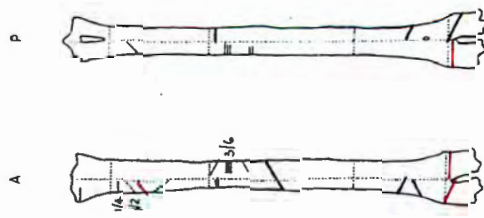
21. *The Phalanges (see Figure 5.34).*

Before considering possible butchery patterns, the cut marks found on these skeletal elements hold particular information. Cut marks were more often than not found on the first phalanx. These may relate to the processing of the feet. Among the Drostdy sample, Woodborne (1994: 7) similarly noted that cut marks orientated perpendicular to the axis of both the phalanges and proximal metacarpals can be attributed to skinning. These often encircle the bone and are situated where there is little to cut except the skin, and thus likely relate to skinning the carcass.

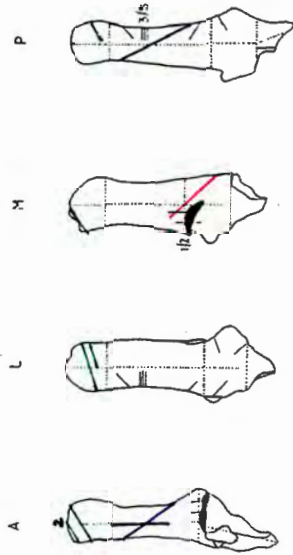
Among these skeletal elements three patterns are discernible. Here I consider both the frequency of marks in a given region, as well as the relationship of those skeletal elements which have marks on them to the total number (NISP) for that skeletal element, i.e. the degree of completeness. The relationship between those that have been split and those that have not, may respectively lie in the extraction of marrow as the only resource from these bones, or throwing the whole lot into the cooking pot.



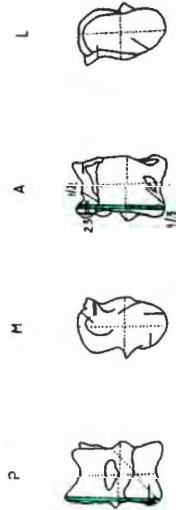
LEFT METATARSAL (7/1)



LEFT METATARSAL (7/2)



RIGHT CALCANEUM (4/8)



LEFT ASTRAGALUS (7/5)



LEFT NAVICULO-CUBOID (4/2)

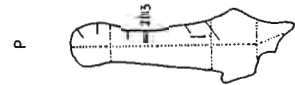
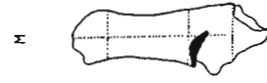
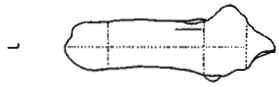
LEFT PATELLA (7/1)

Figure 5.32: Continued.

Figure 5.33: Butchery marks on the calcaneum, astragalus, naviculo-cuboid and patella.

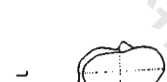
JAM 7L

JAM 8L



RIGHT CALCANEUM (2/4)

RIGHT CALCANEUM (3/4)



LEFT ASTRAGALUS (1/2)

LEFT ASTRAGALUS (4/6)



LEFT NAVICULO-CUBOID (-7/2)

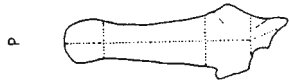
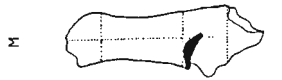
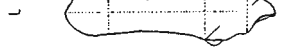
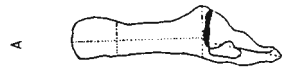
LEFT PATELLA (-7/1)

LEFT NAVICULO-CUBOID (-1)

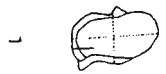
LEFT PATELLA (-1)

MAN 3AL

MAN 4AL



RIGHT CALCANEUM (3/4)

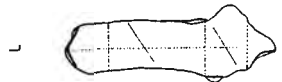
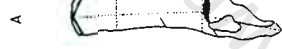


LEFT ASTRAGALUS (1/3)

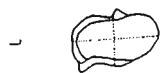


LEFT NAVICULO-CUBOID (1/4)

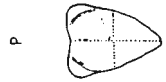
LEFT PATELLA (1/3)



RIGHT CALCANEUM (4/8)



LEFT ASTRAGALUS (1/1)



LEFT NAVICULO-CUBOID (2/4)

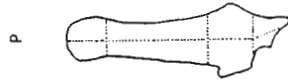
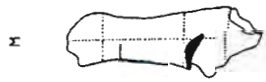
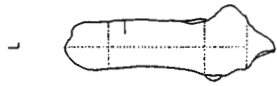
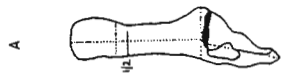
LEFT PATELLA (1/1)

Figure 5.33: Continued.

Figure 5.33: Continued.

MAN 4L

MAN 7L

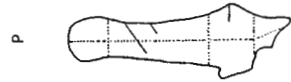
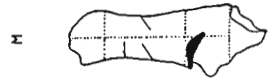


A

L

M

P



A

L

M

P

RIGHT CALCANEUM (-/1)

RIGHT CALCANEUM (3/4)

P

M

A

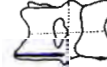
L

P

M

A

L



LEFT ASTRAGALUS (-)

LEFT ASTRAGALUS (2/10)

D

V

A

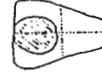
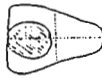
P

D

V

A

P



LEFT NAVICULO-CUBOID (-/1)

LEFT PATELLA (-)

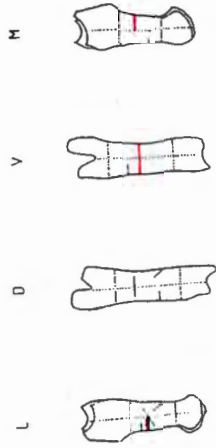
LEFT NAVICULO-CUBOID (2/11)

LEFT PATELLA (-/1)

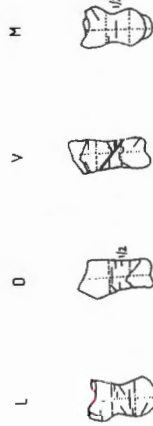
Figure 5.33: Continued.

Figure 5.33: Continued.

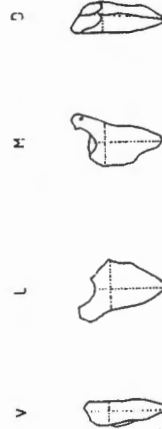
JAM 7L



1st PHALANX (4/13)

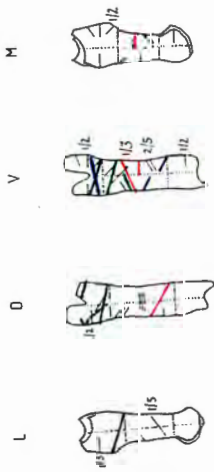


2nd PHALANX (8/17)

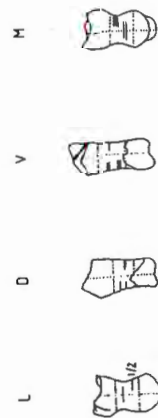


3rd PHALANX (1-7/9)

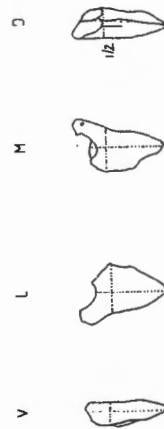
JAM 4L



1st PHALANX (18/35)



2nd PHALANX (5/29)

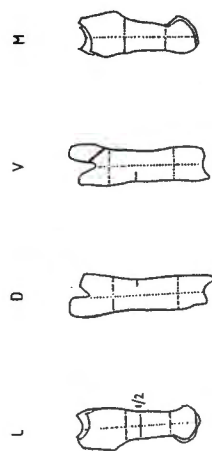


3rd PHALANX (1/13)

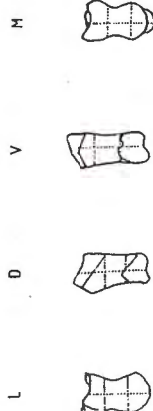
Figure 5.34: Butchery marks on the first, second and third phalanges.



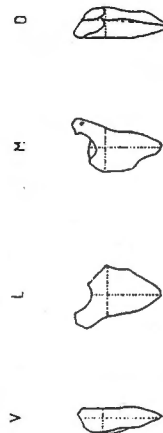
MAN 4L



1st PHALANX (1/6)

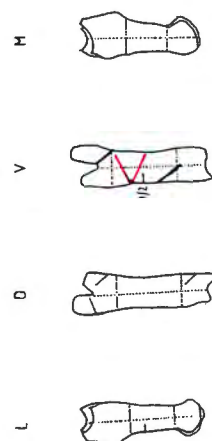


2nd PHALANX (1/7)

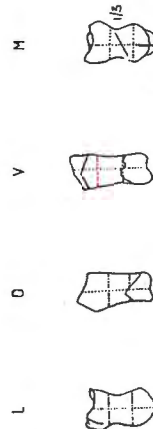


3rd PHALANX (1/2)

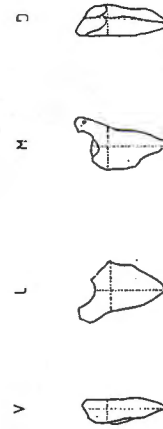
MAN 4AL



1st PHALANX (1/9)



2nd PHALANX (1/7)



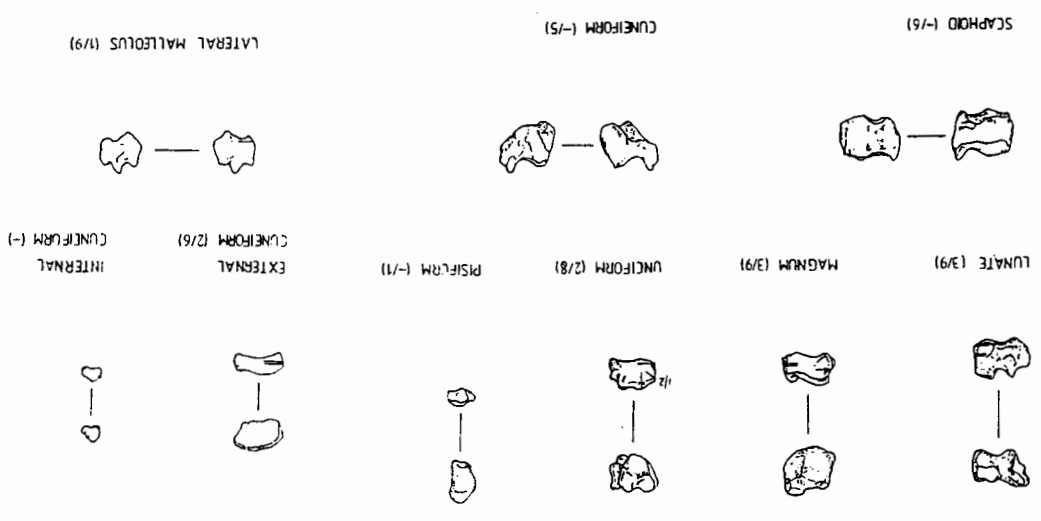
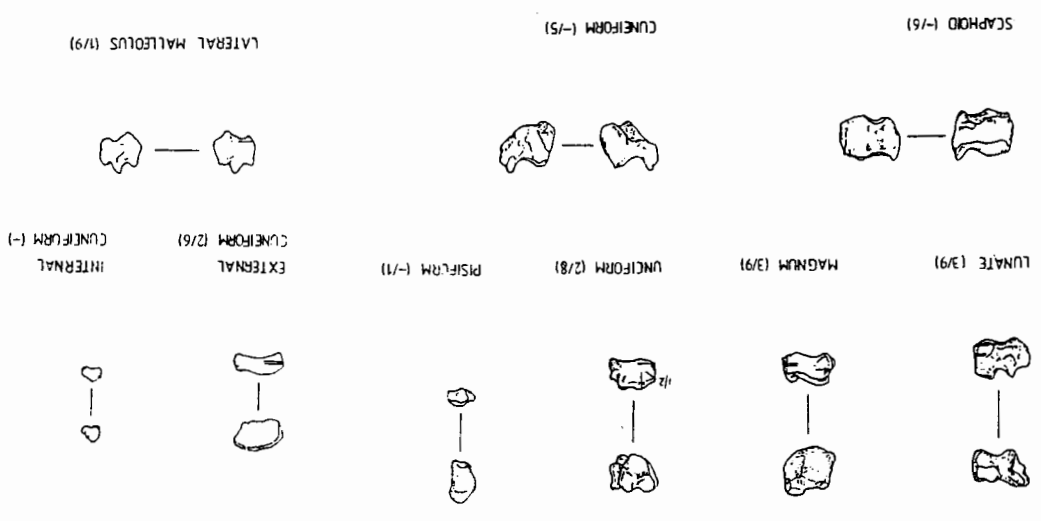
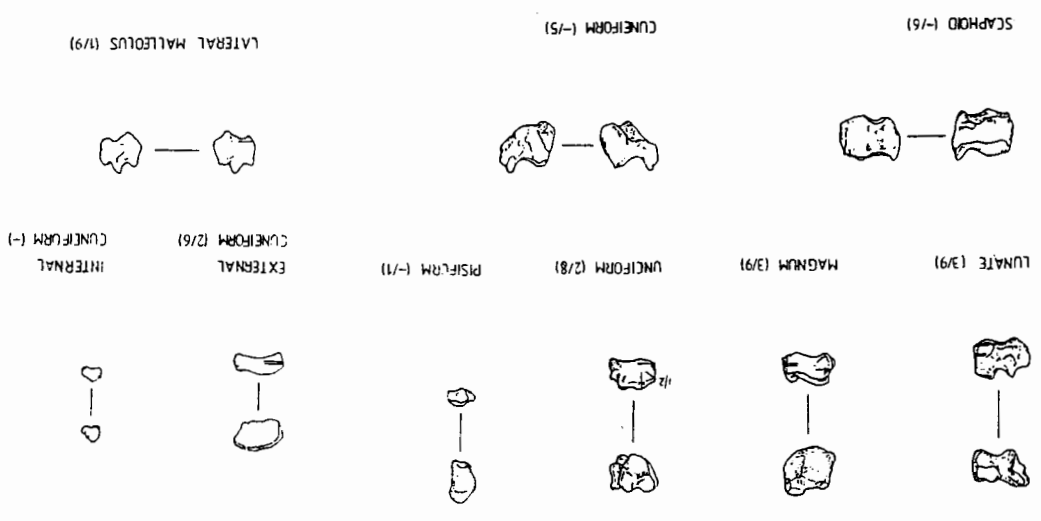
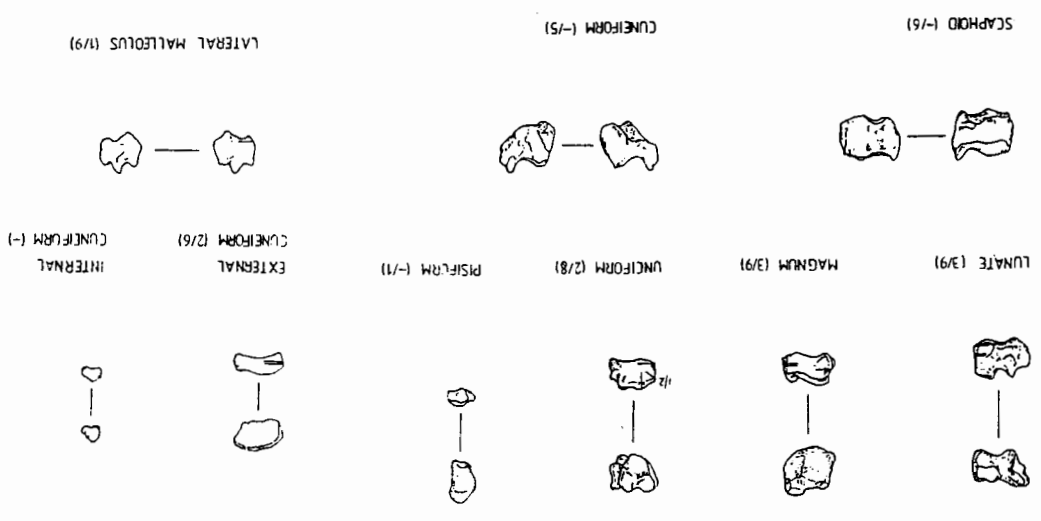
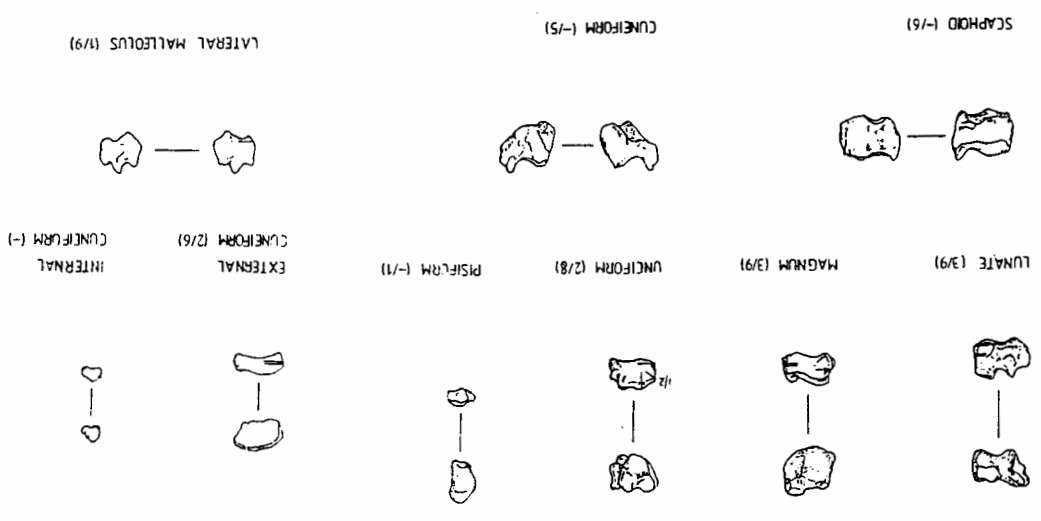
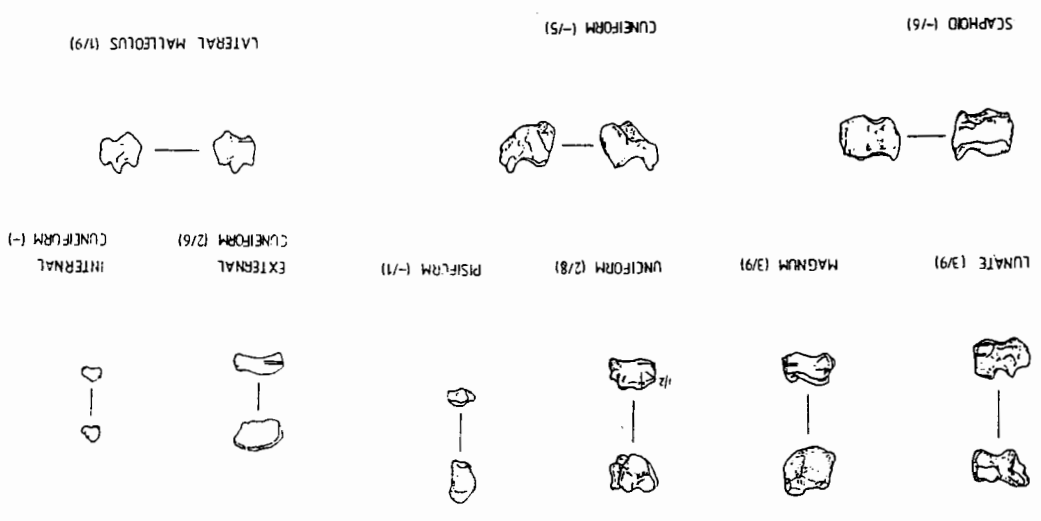
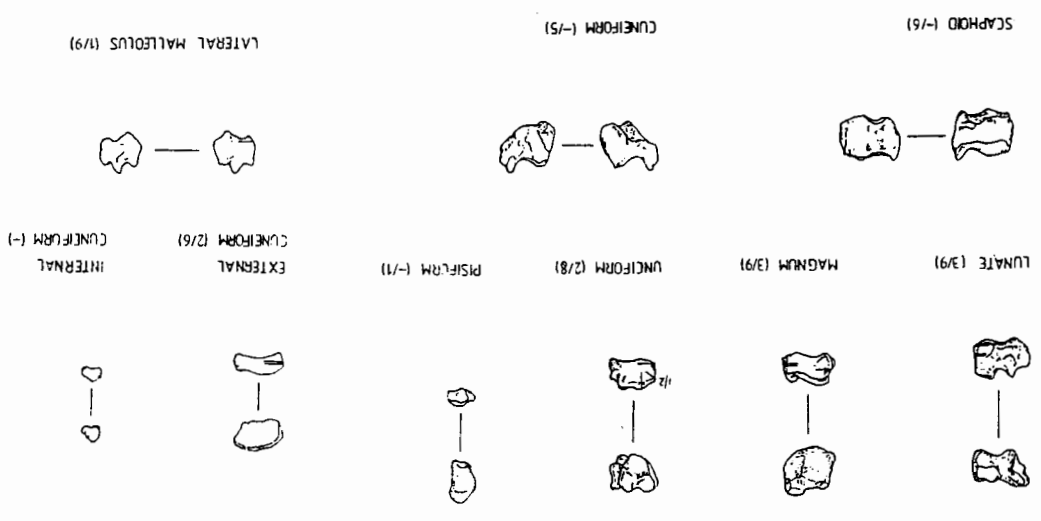
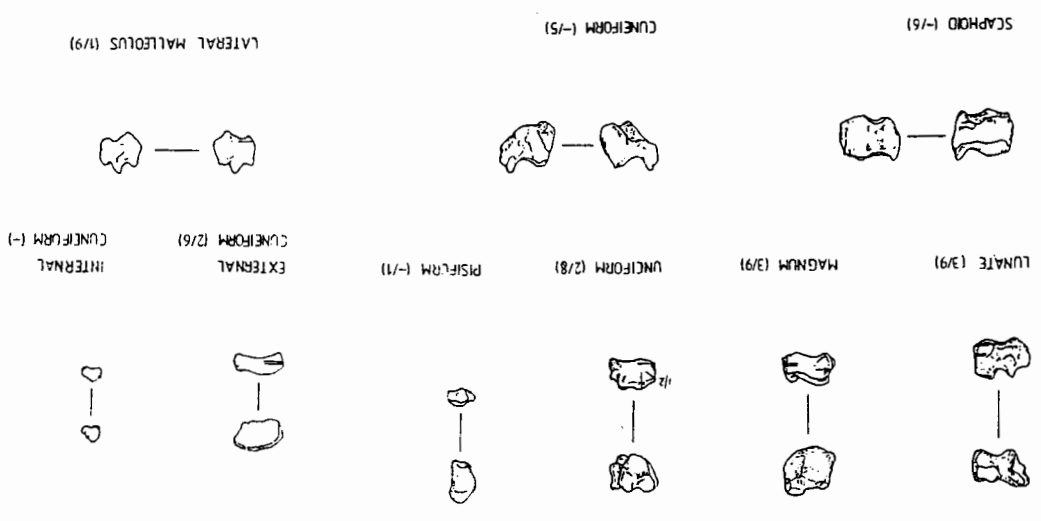
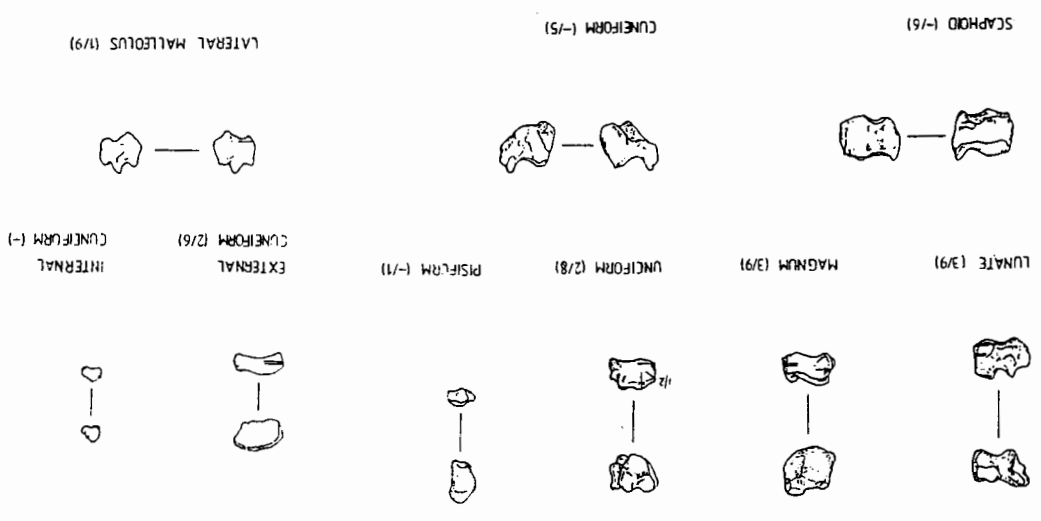
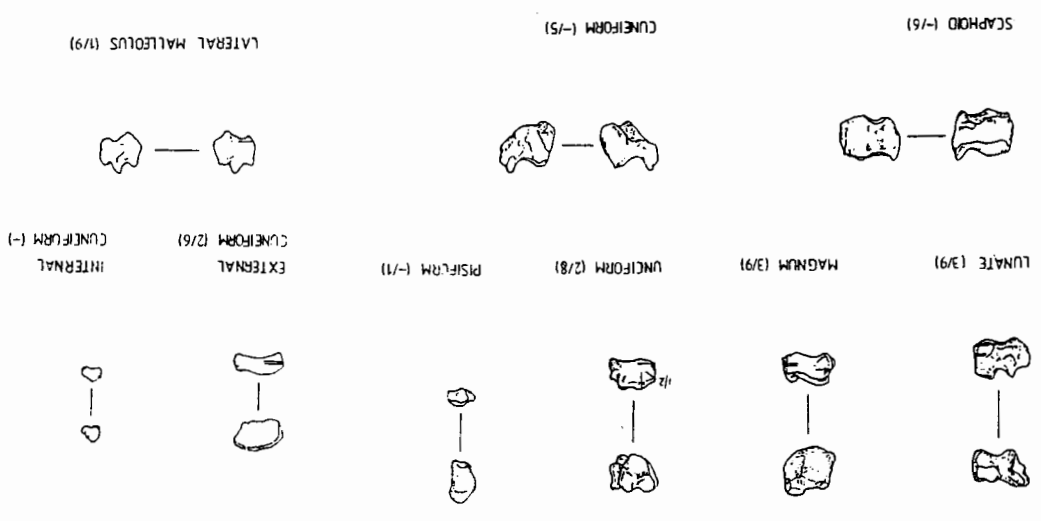
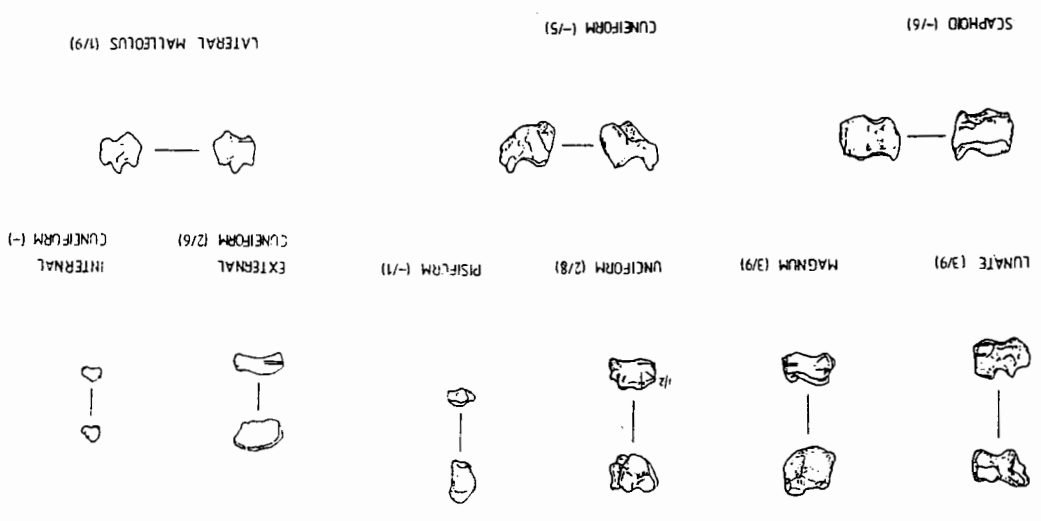
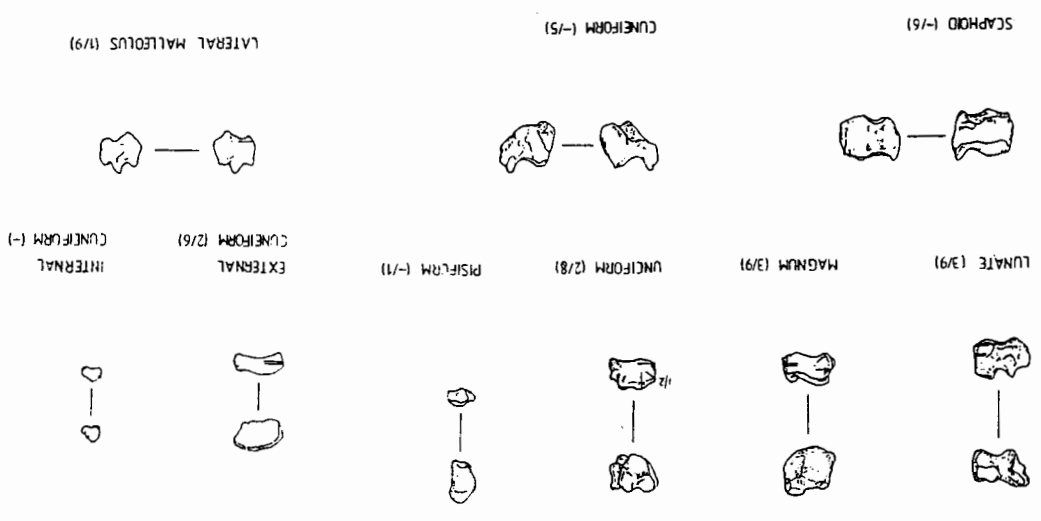
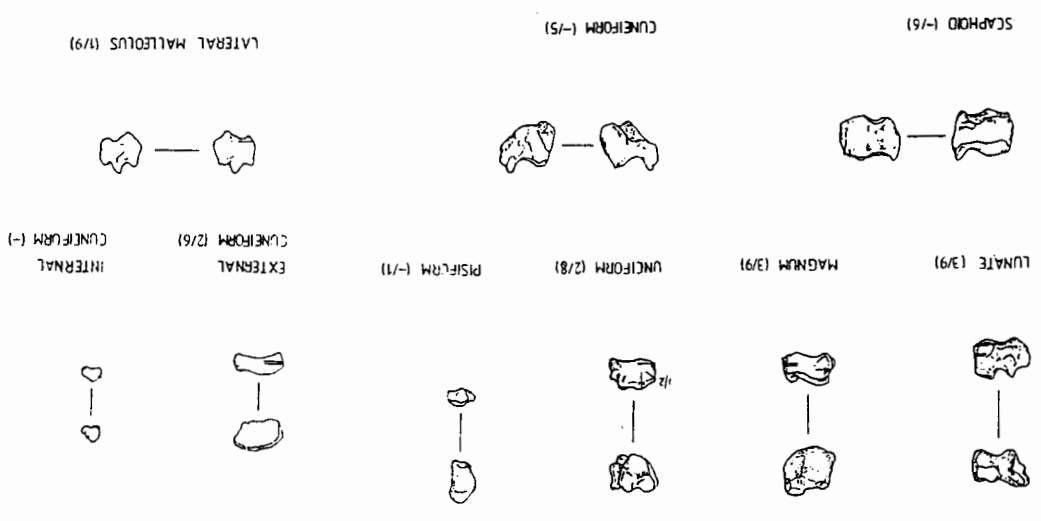
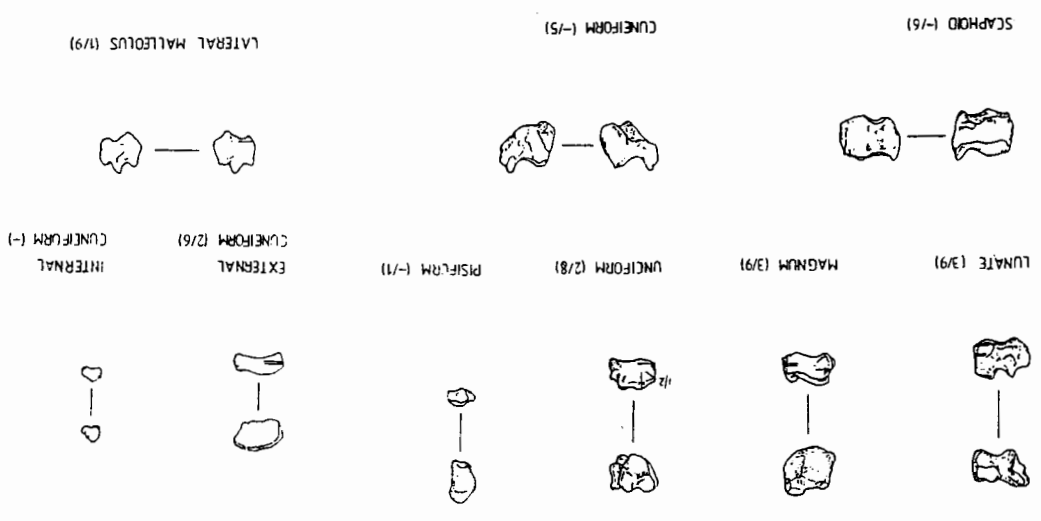
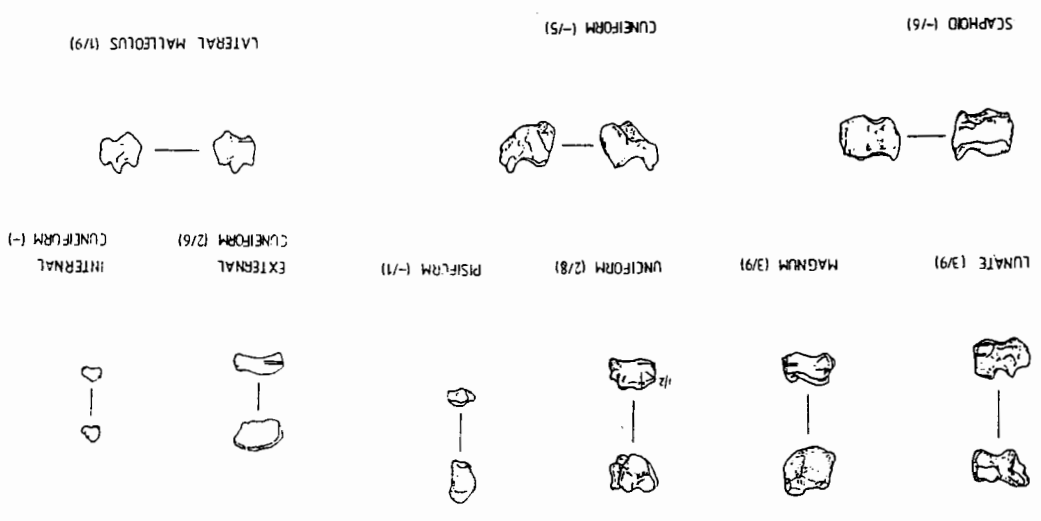
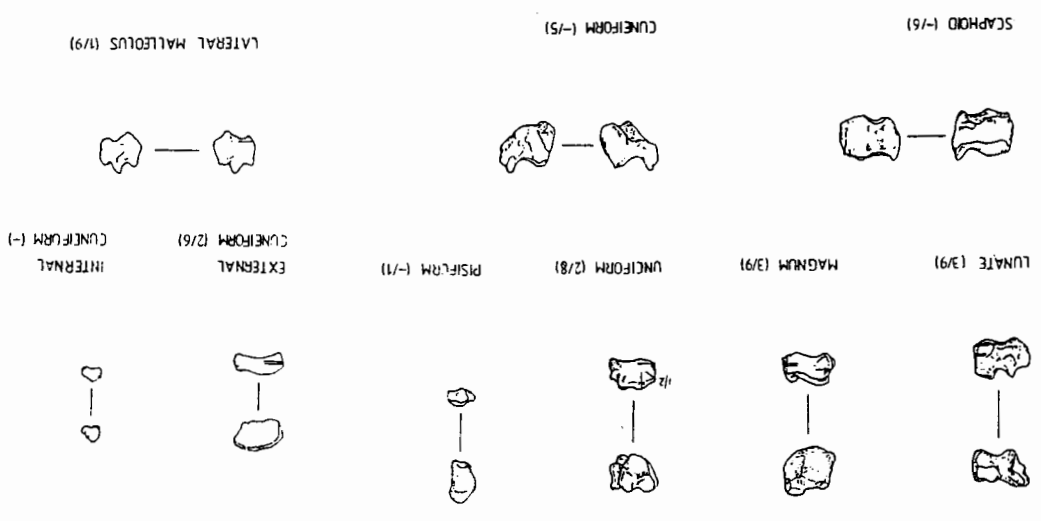
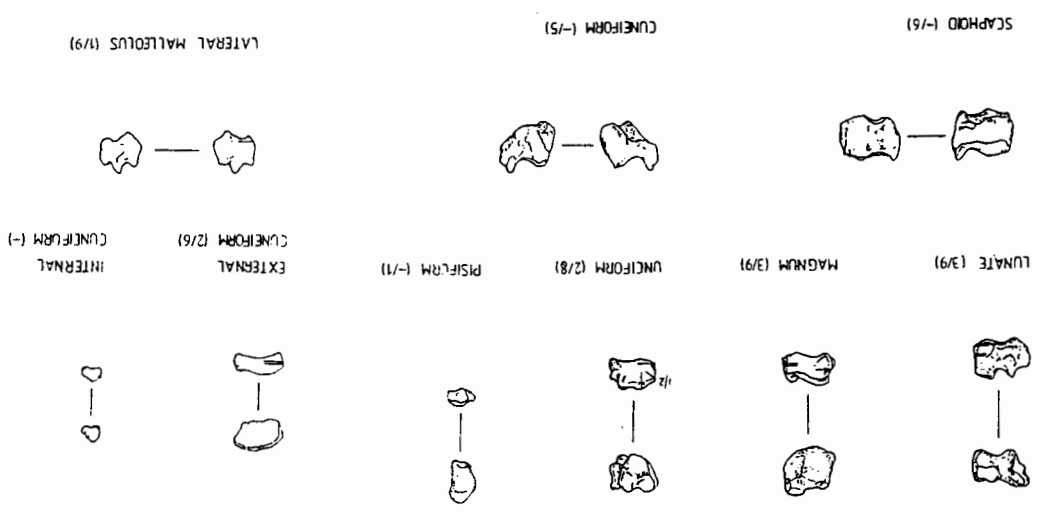
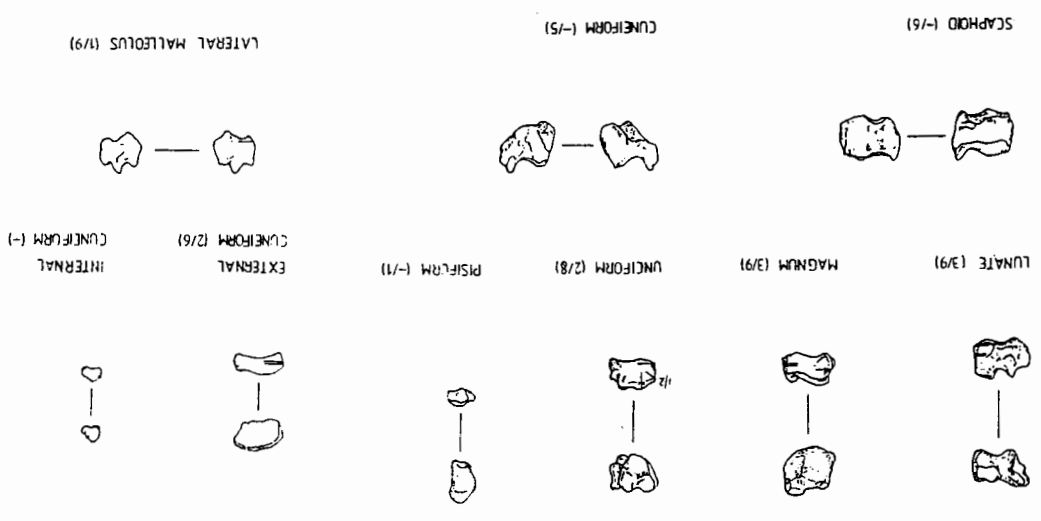
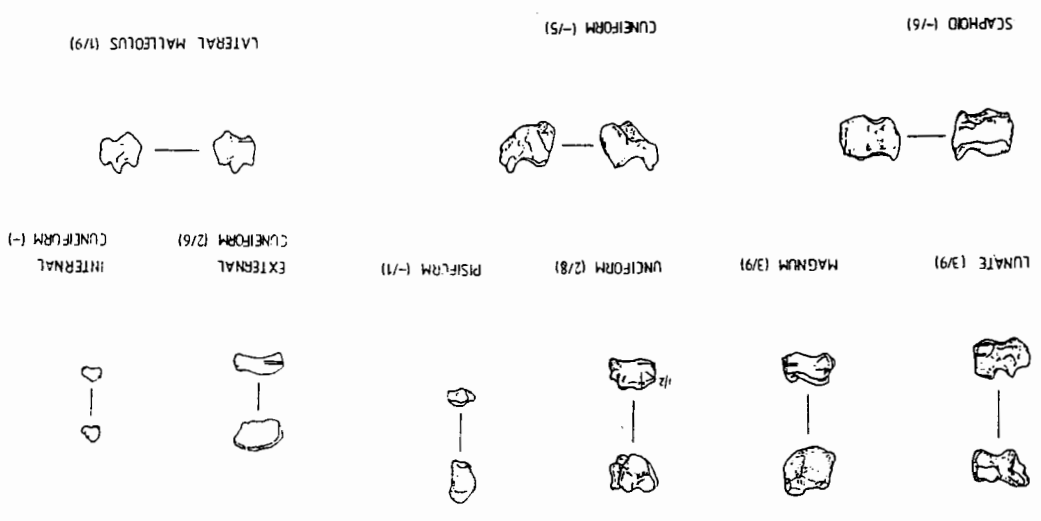
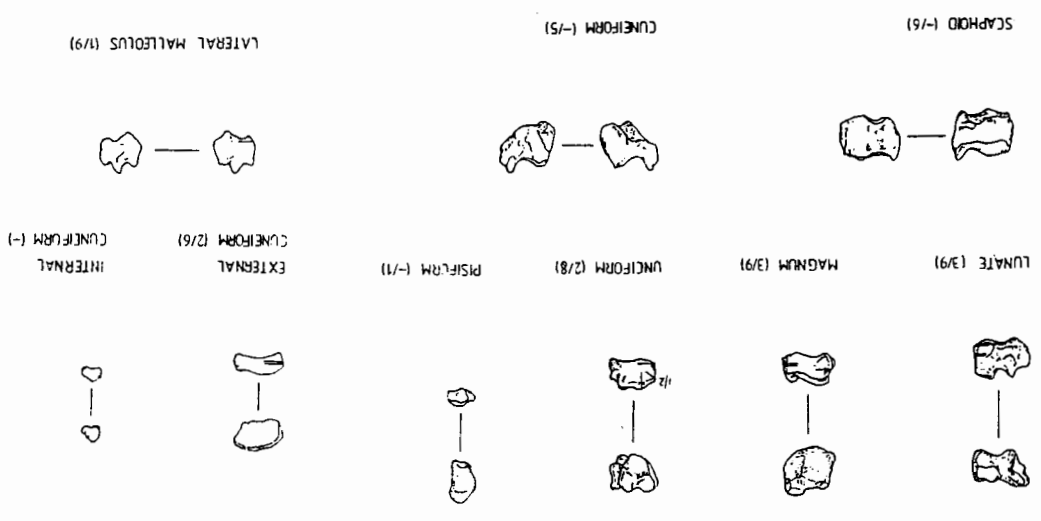
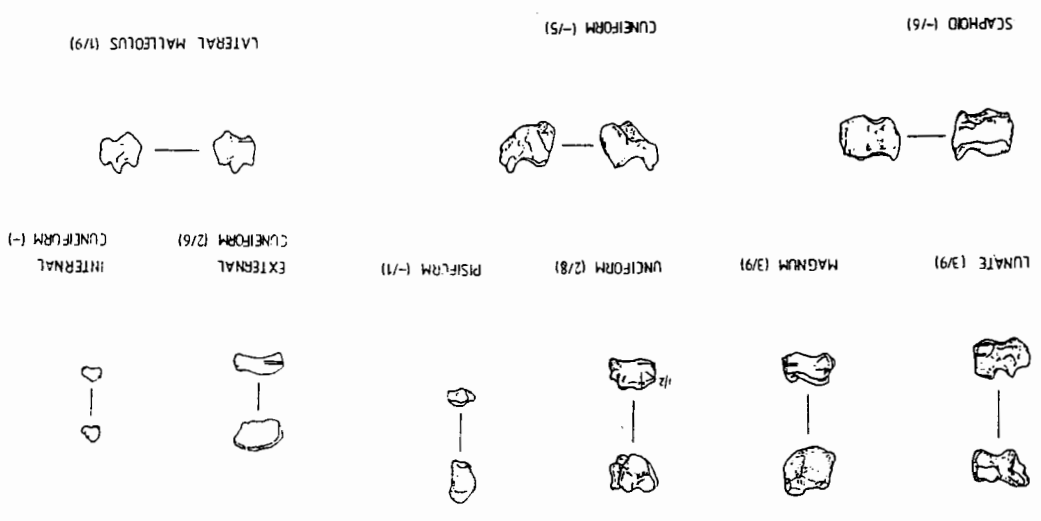
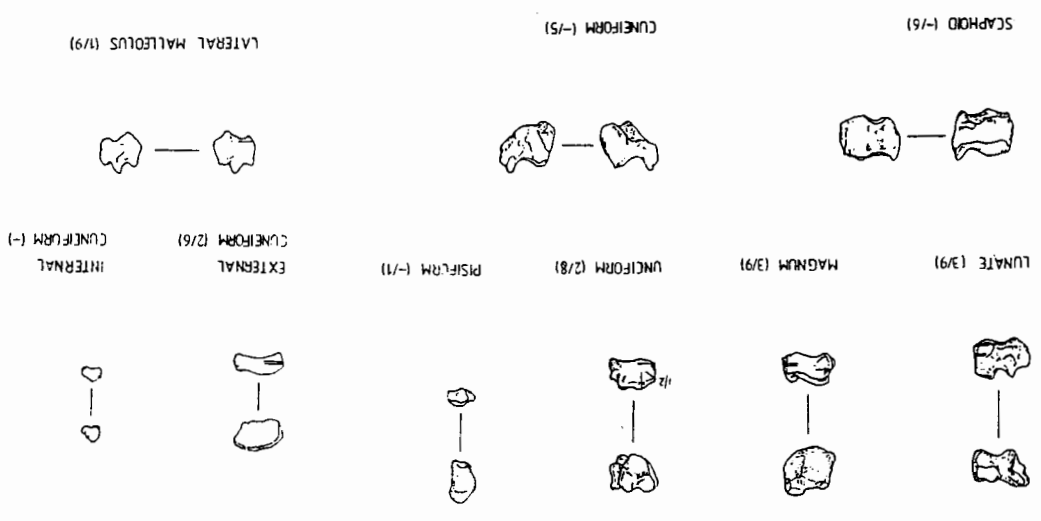
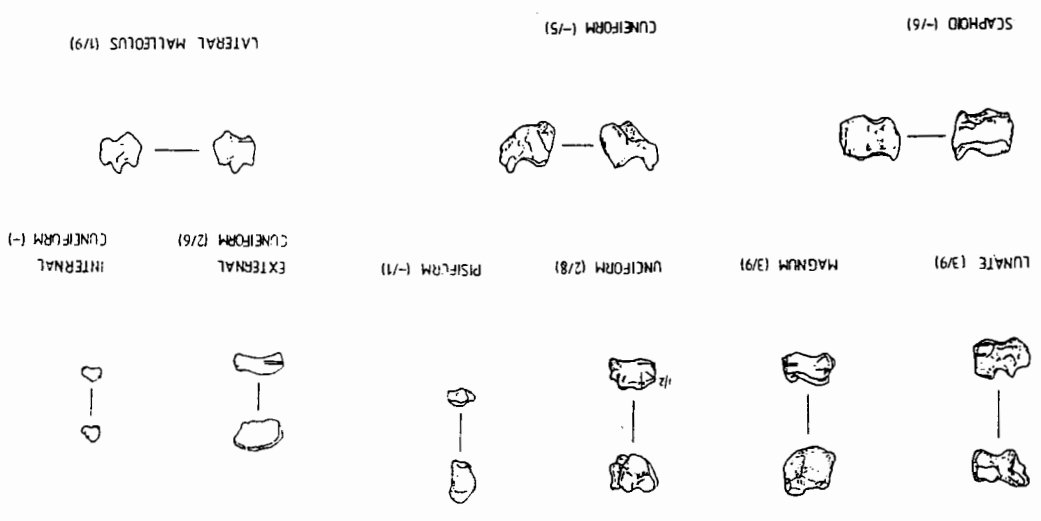
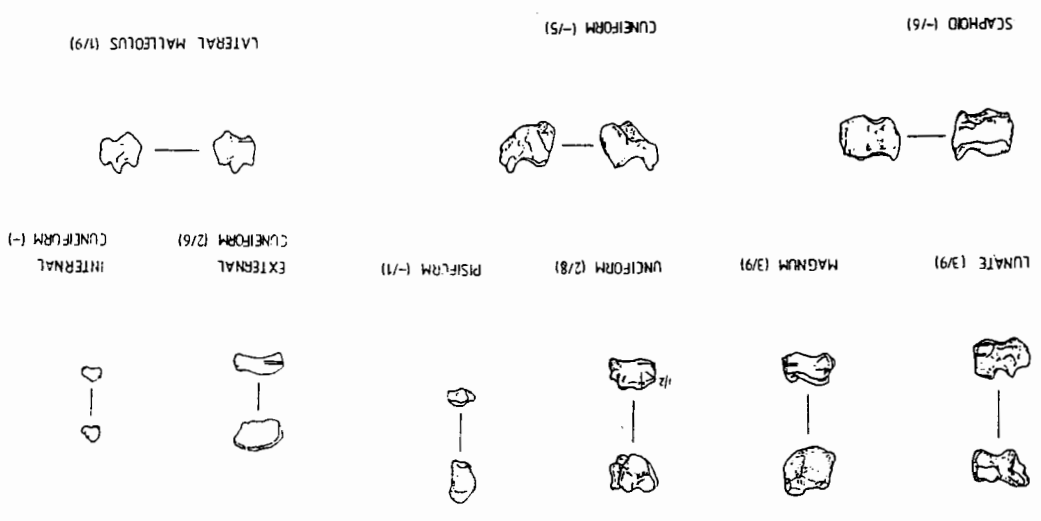
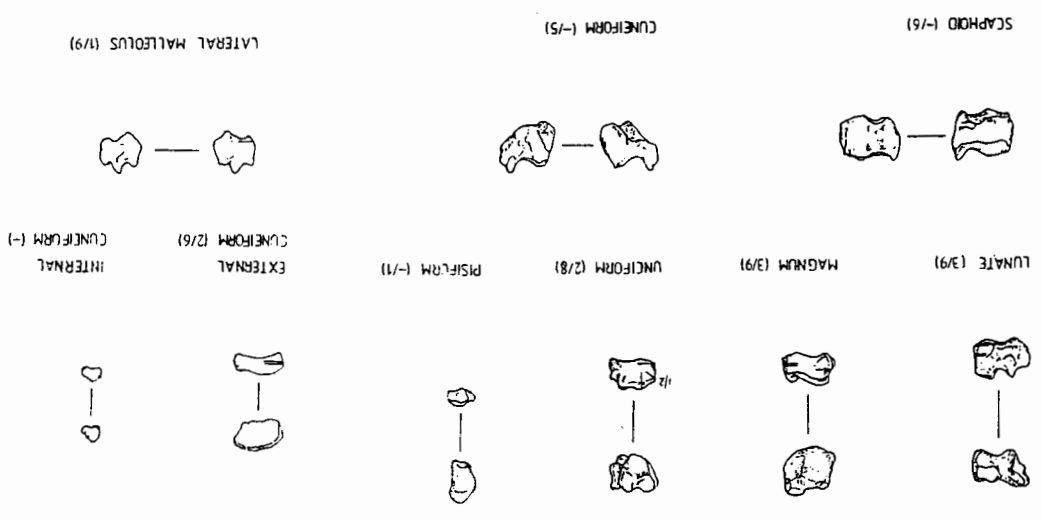
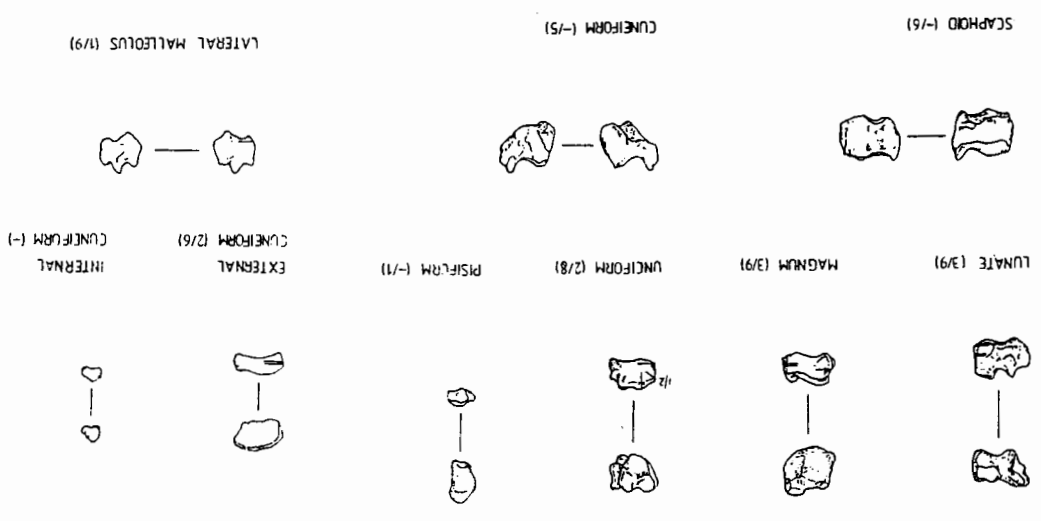
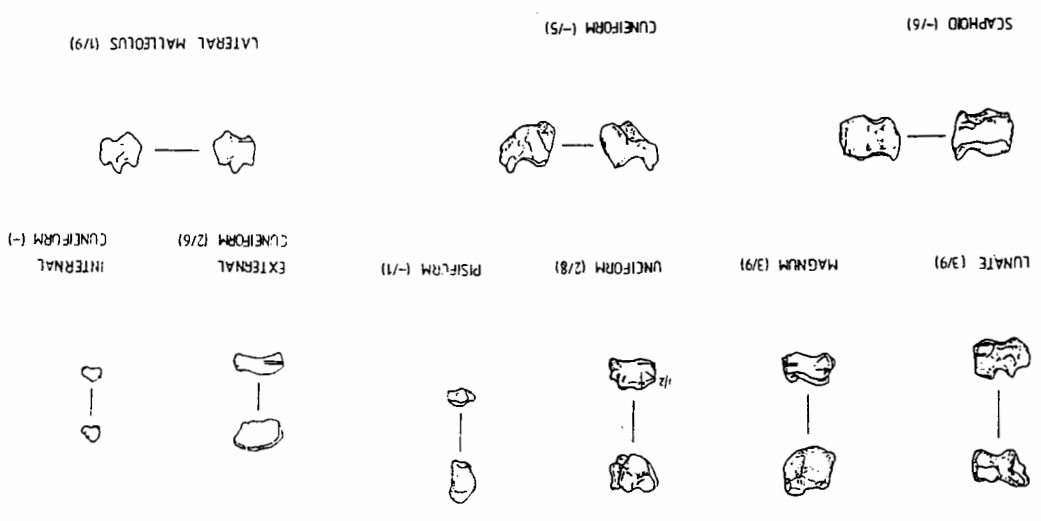
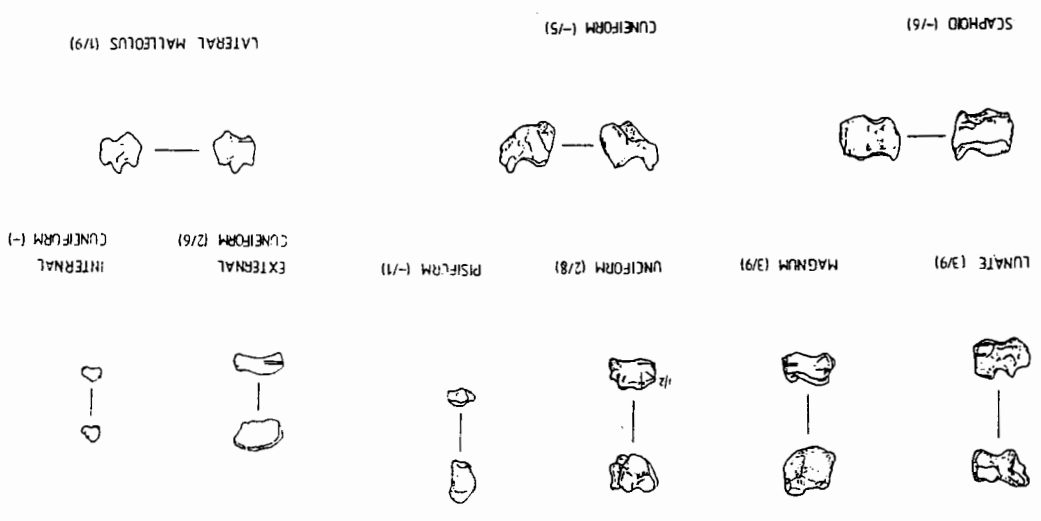
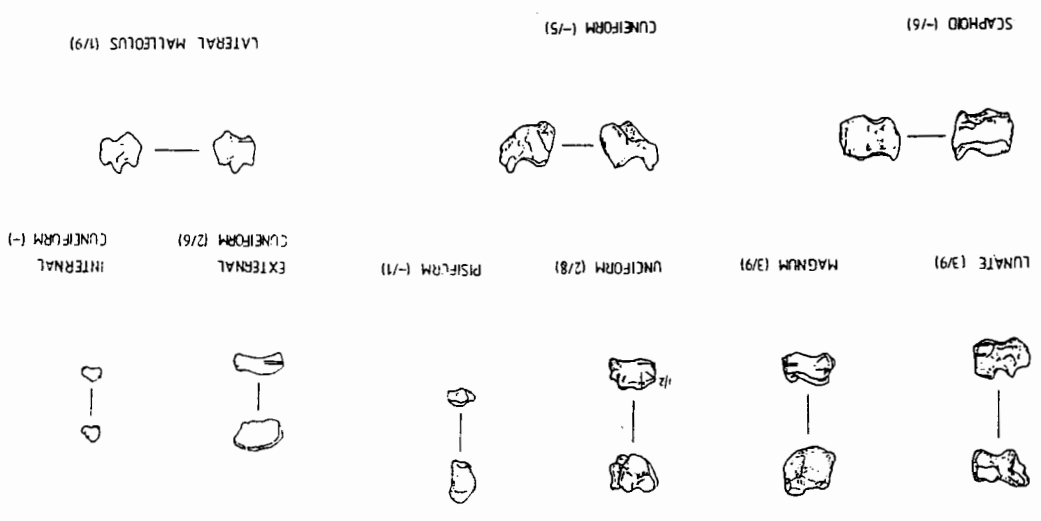
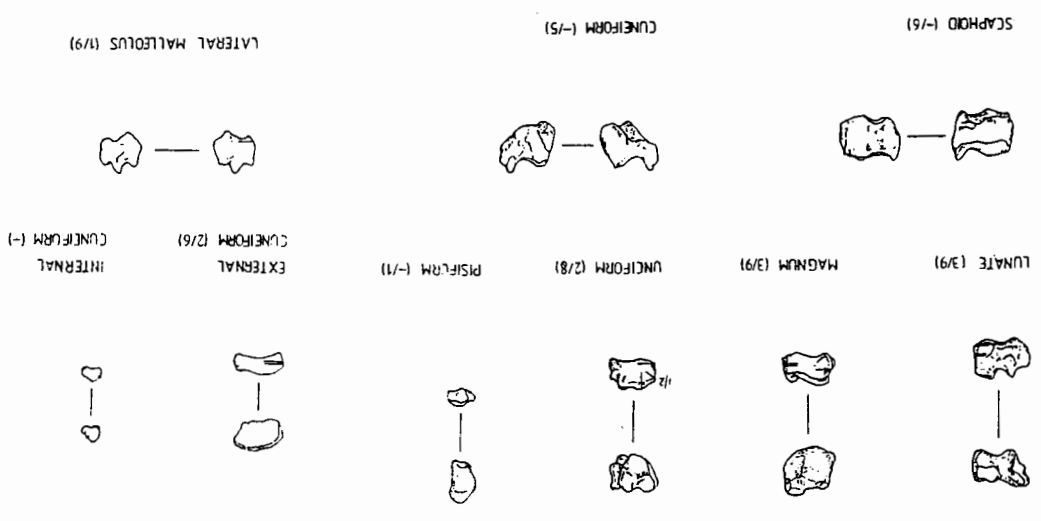
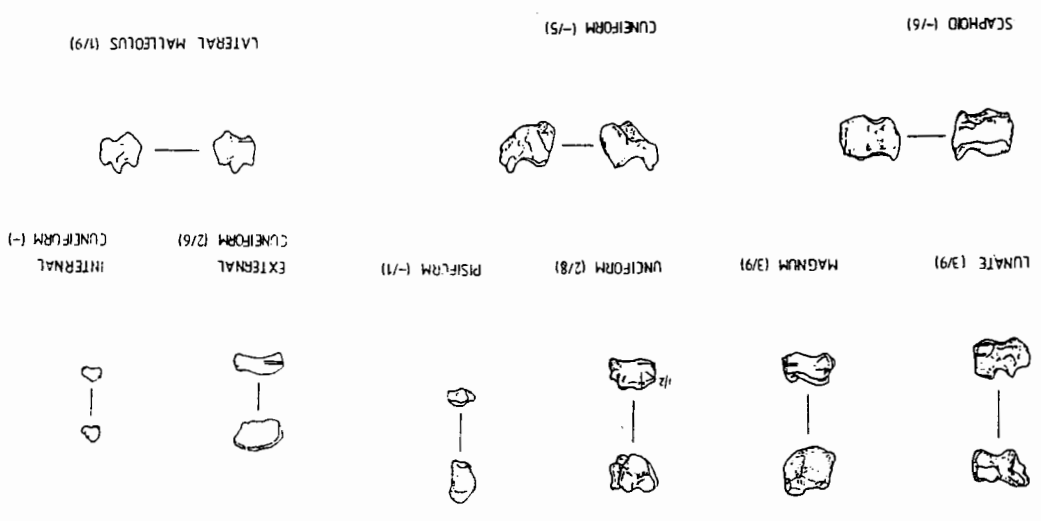
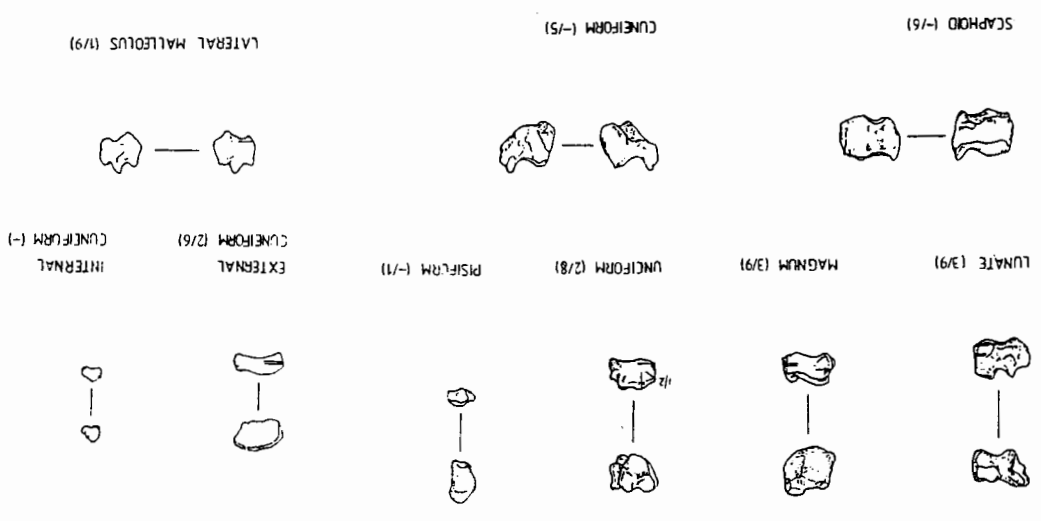
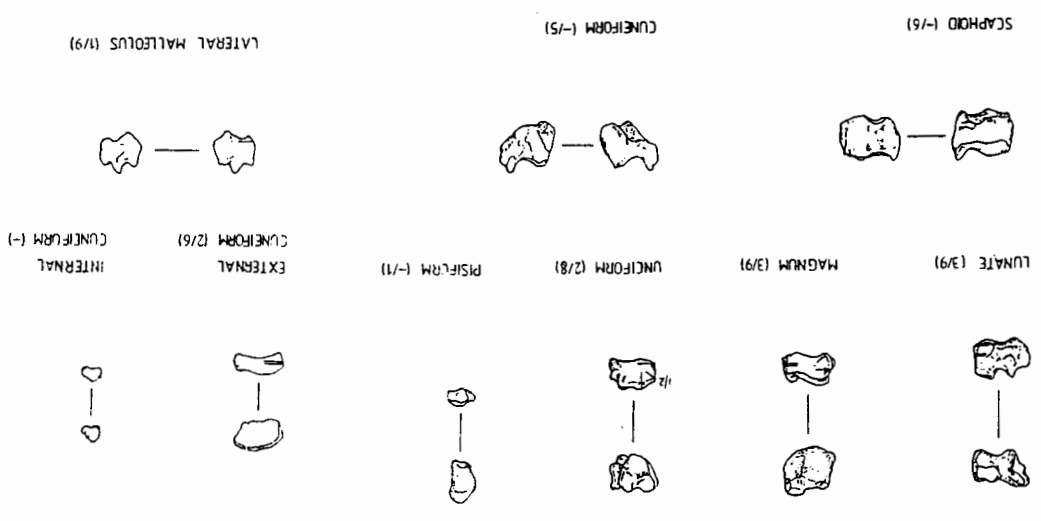
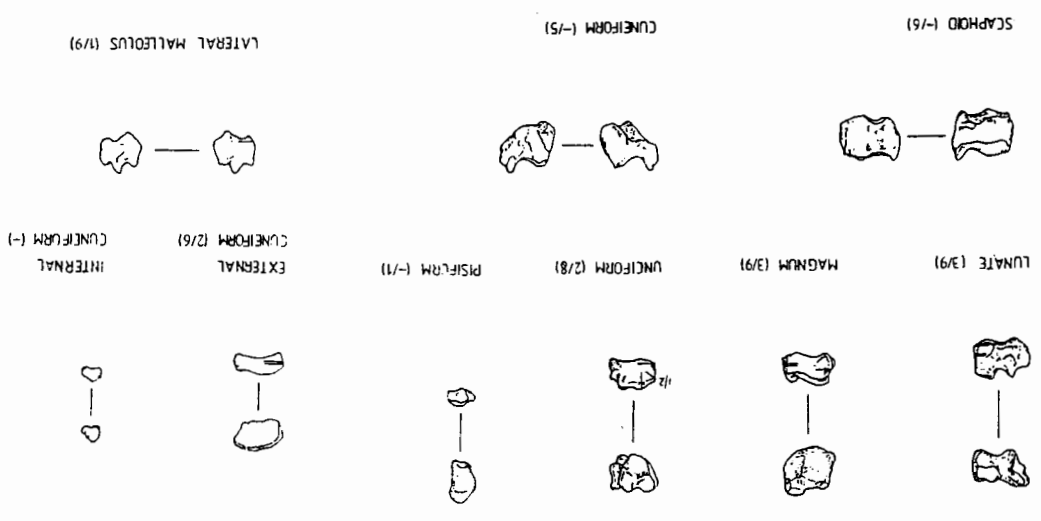
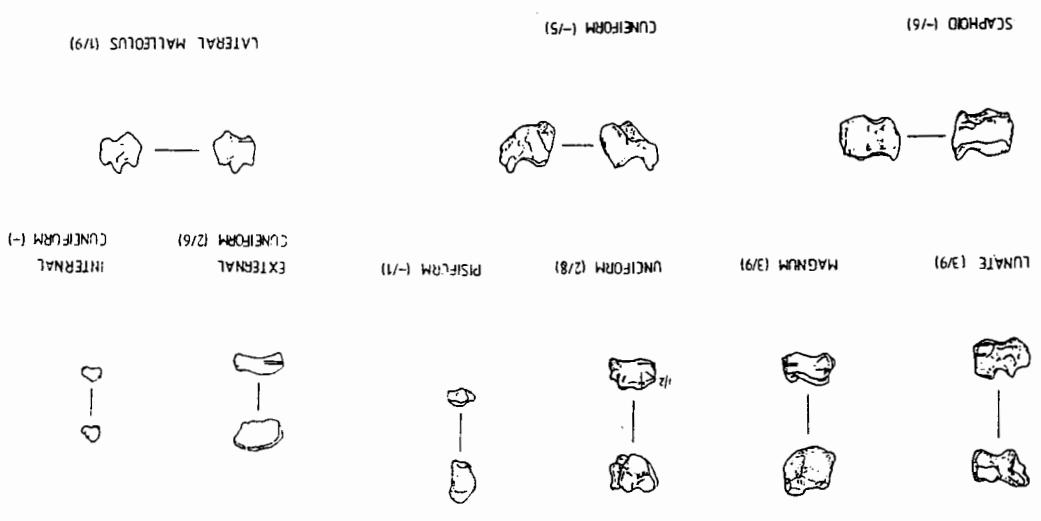
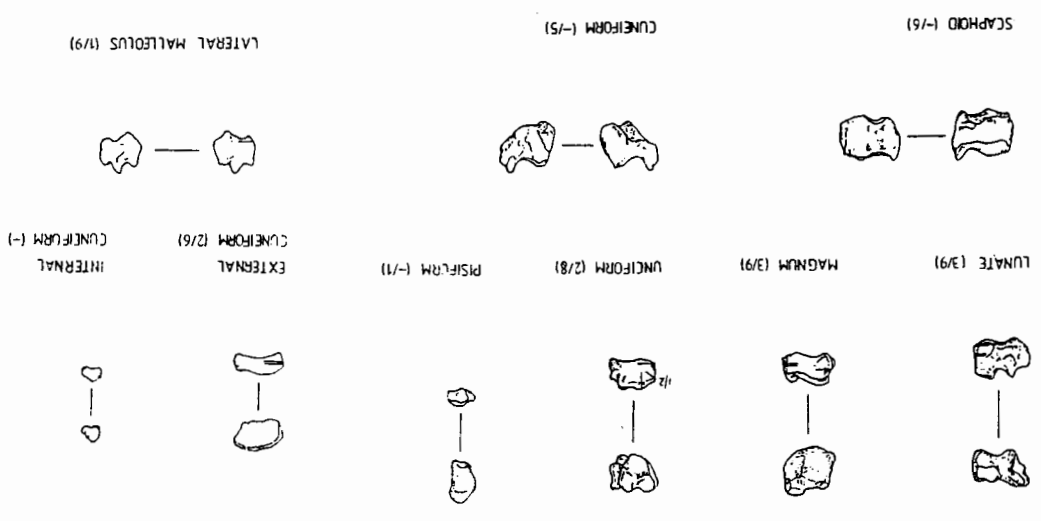
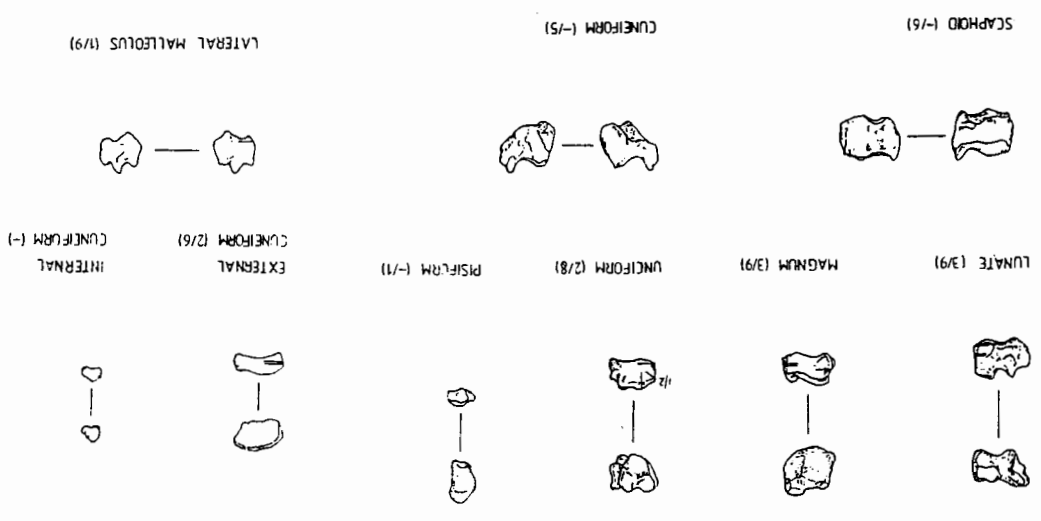
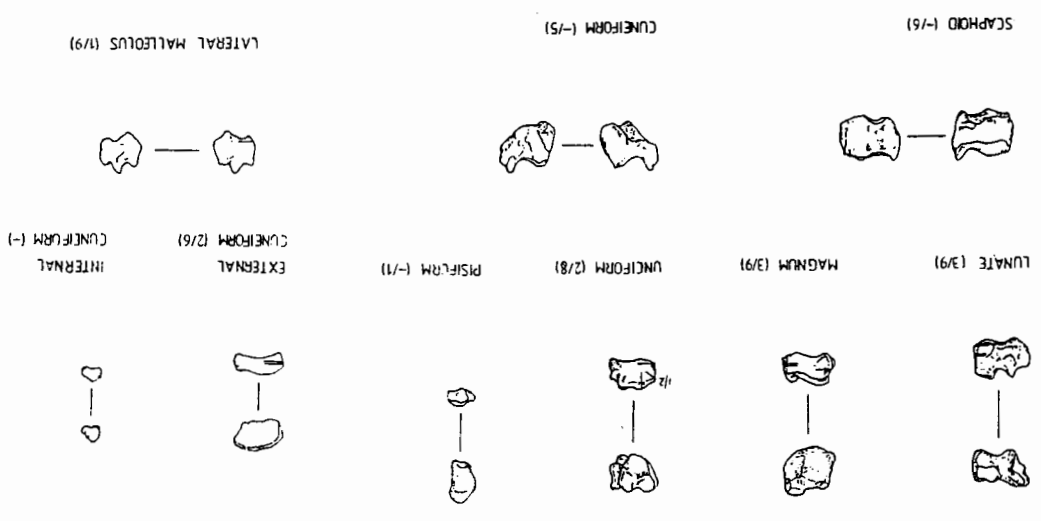
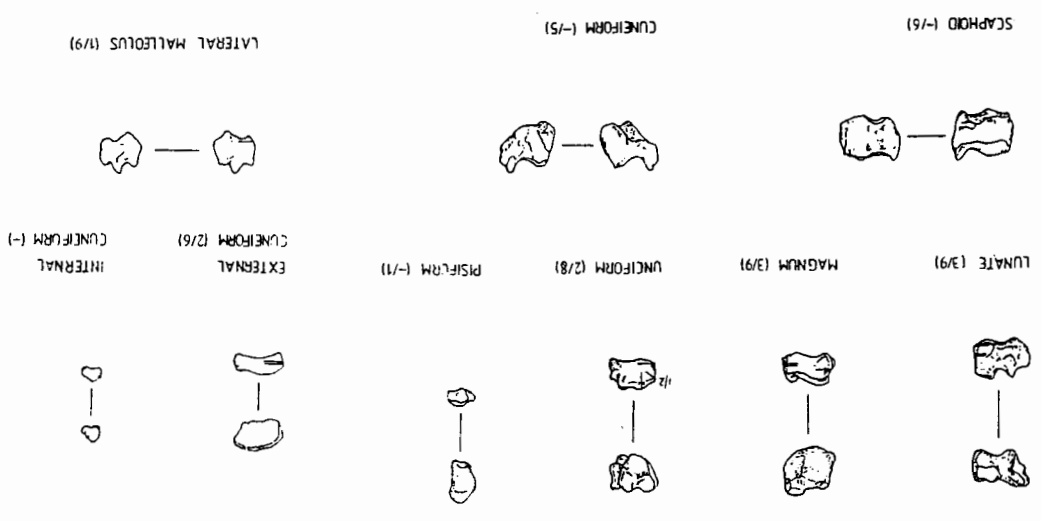
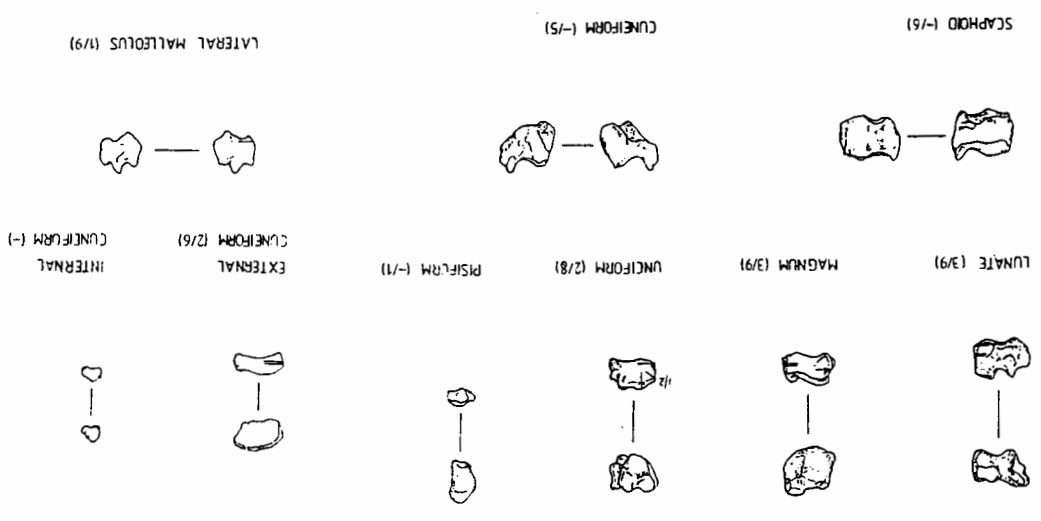
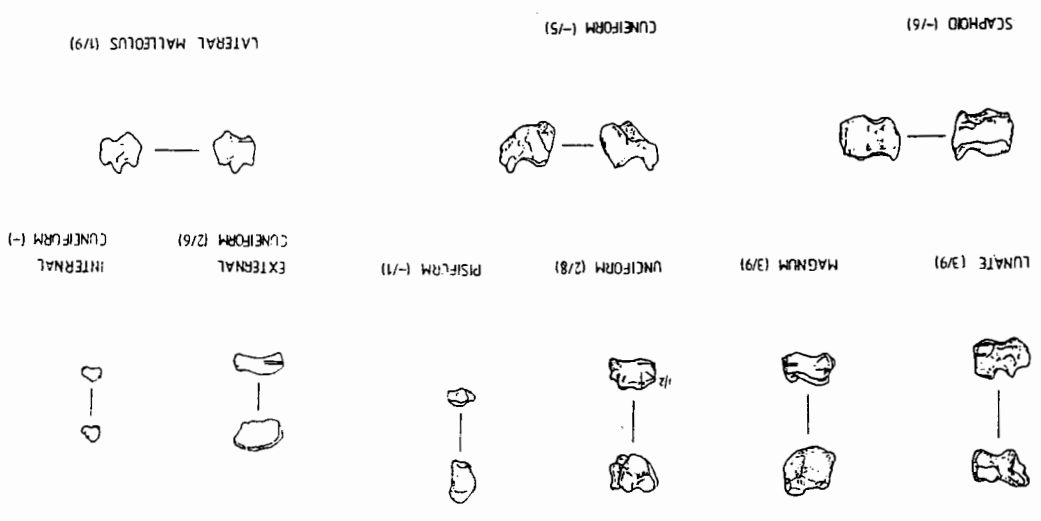
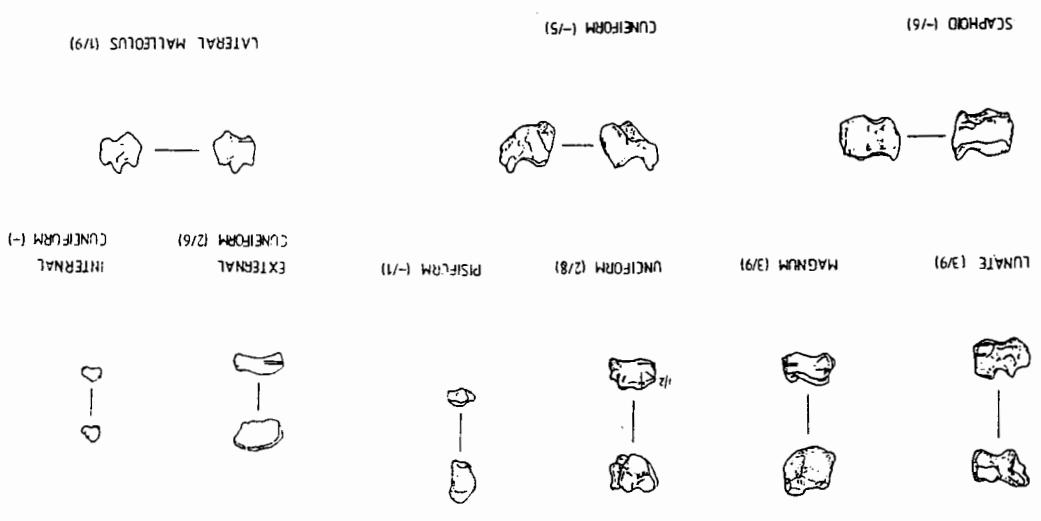
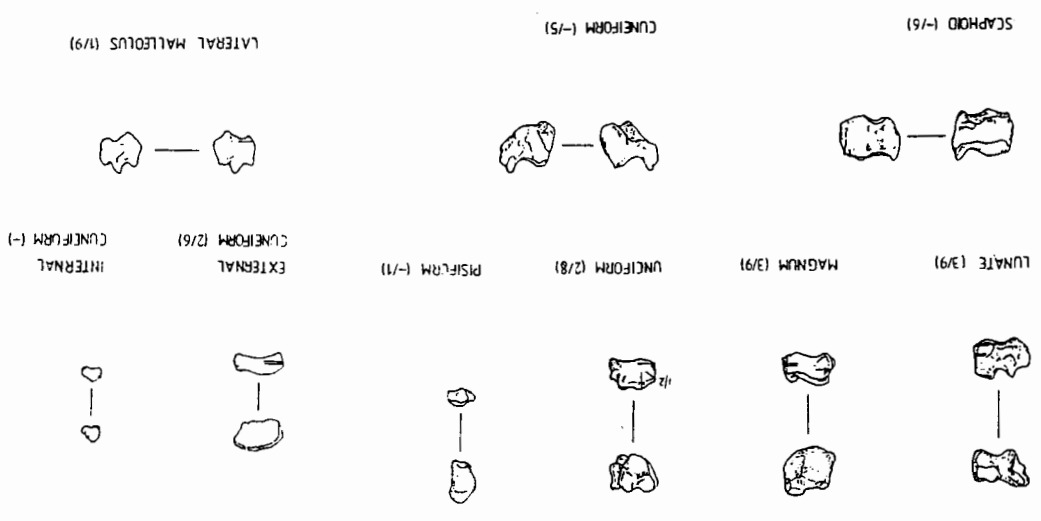
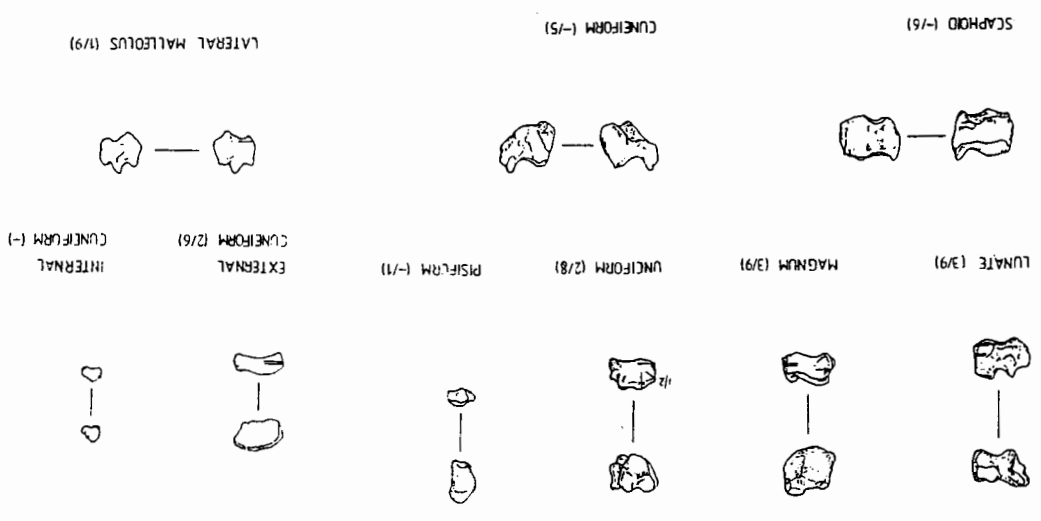
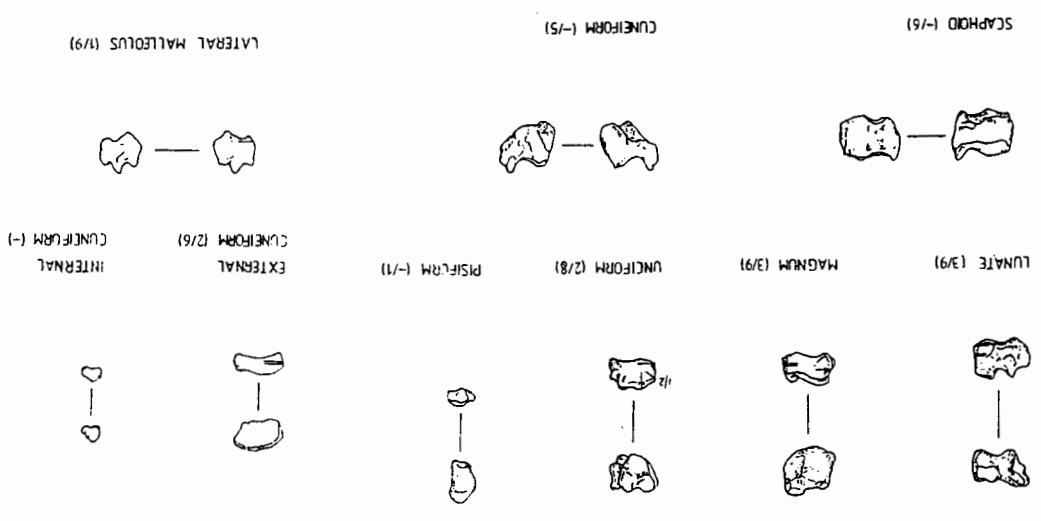
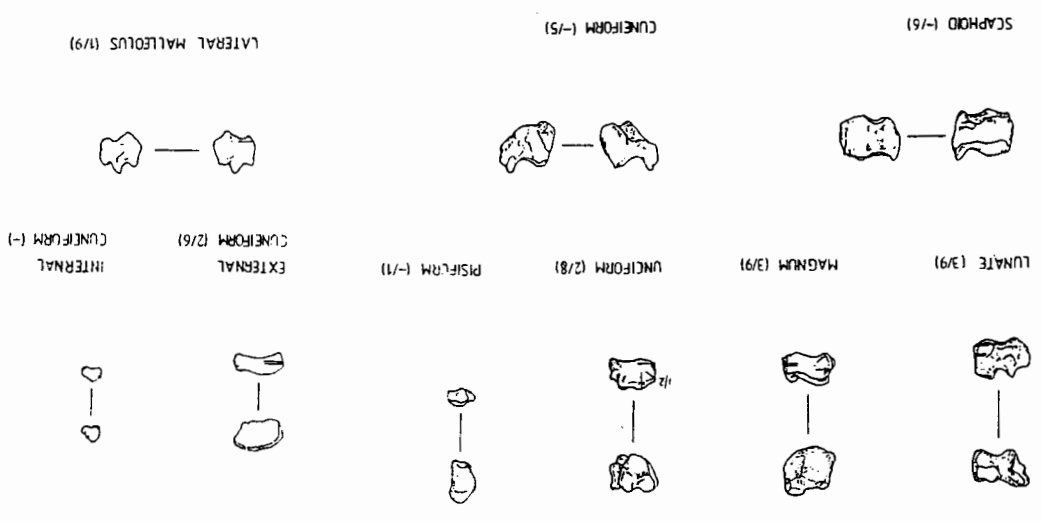
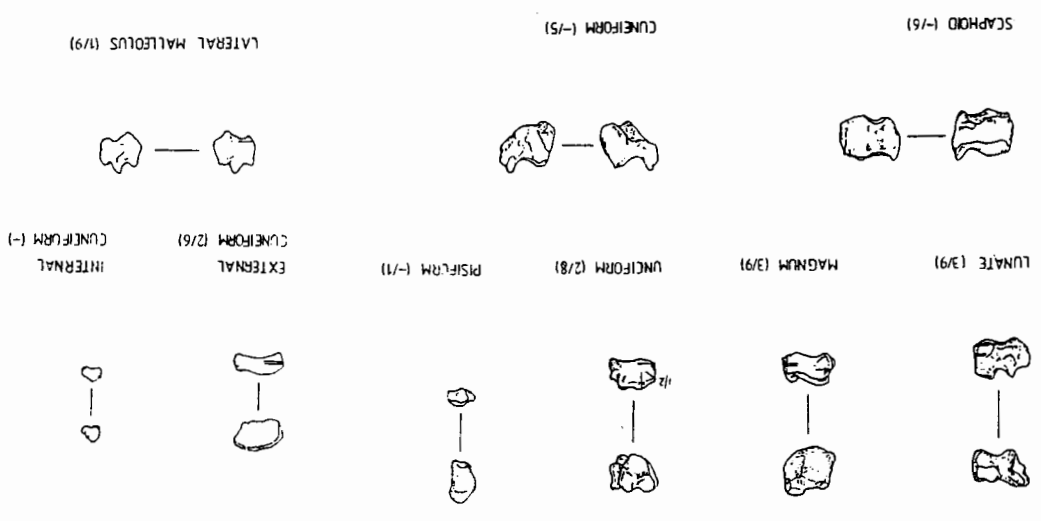
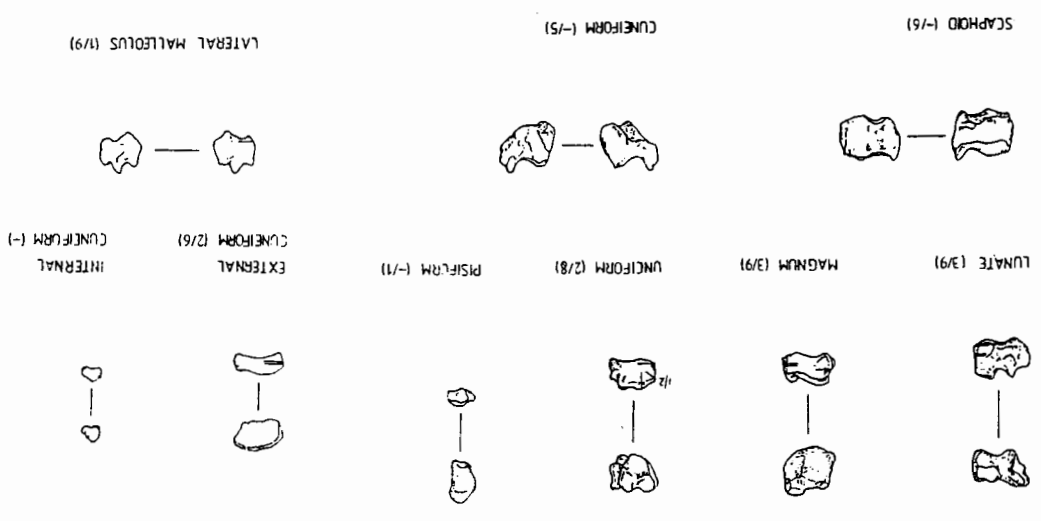
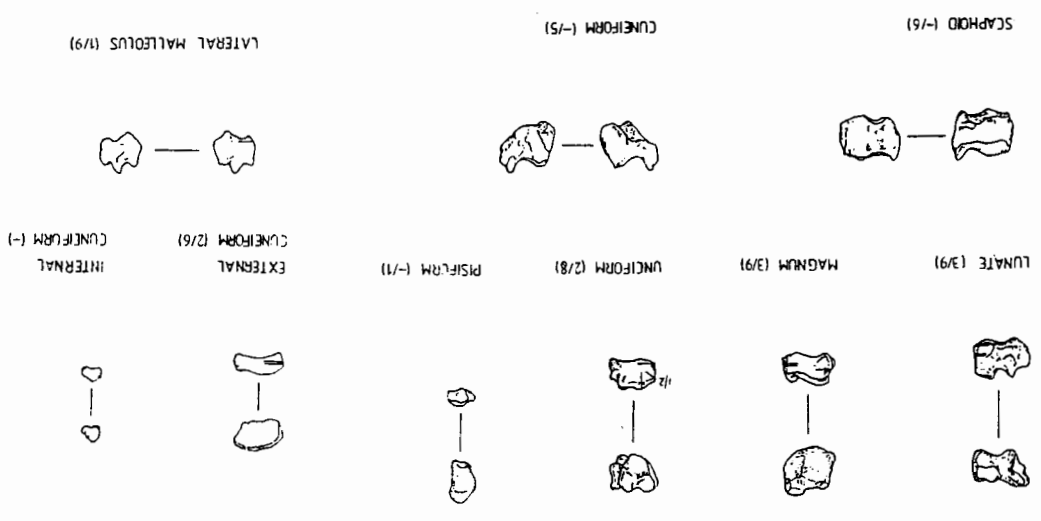
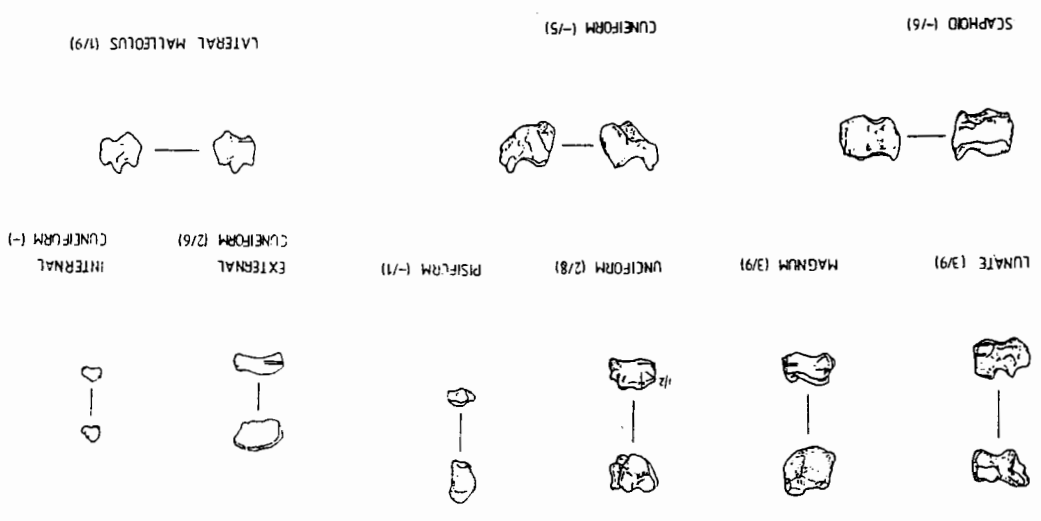
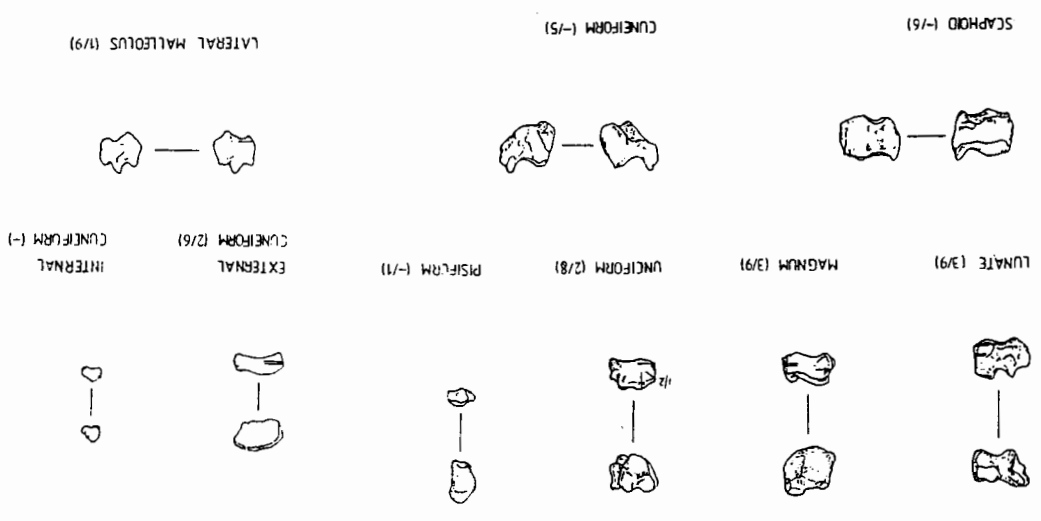
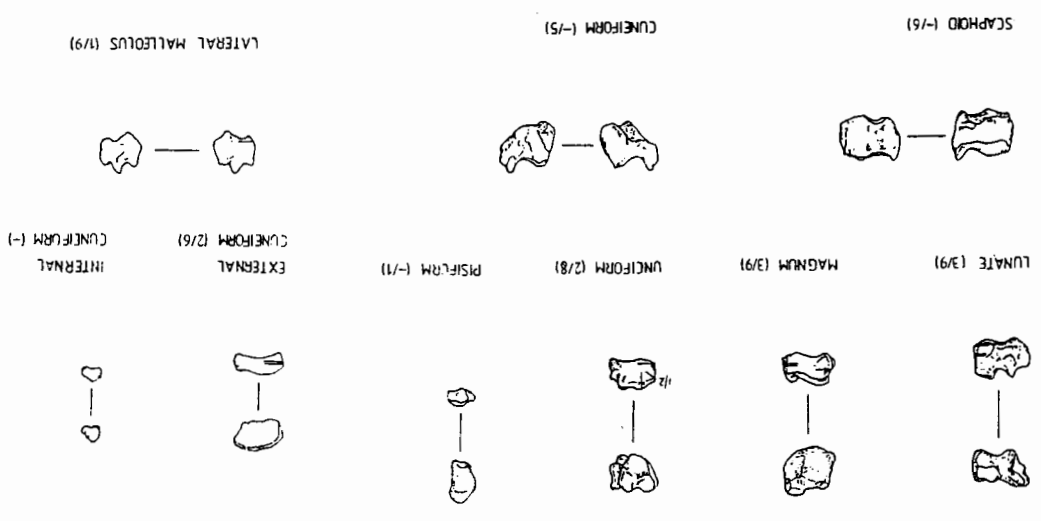
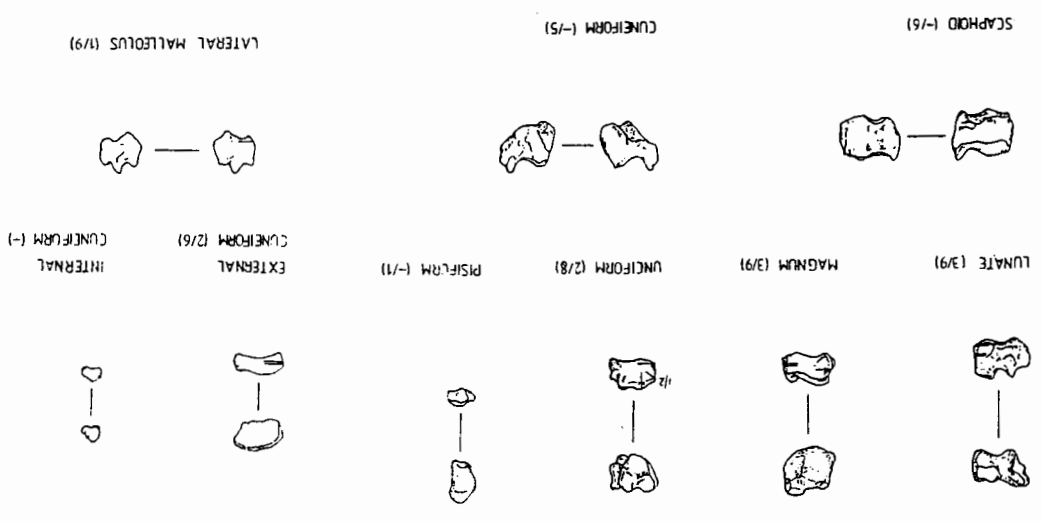
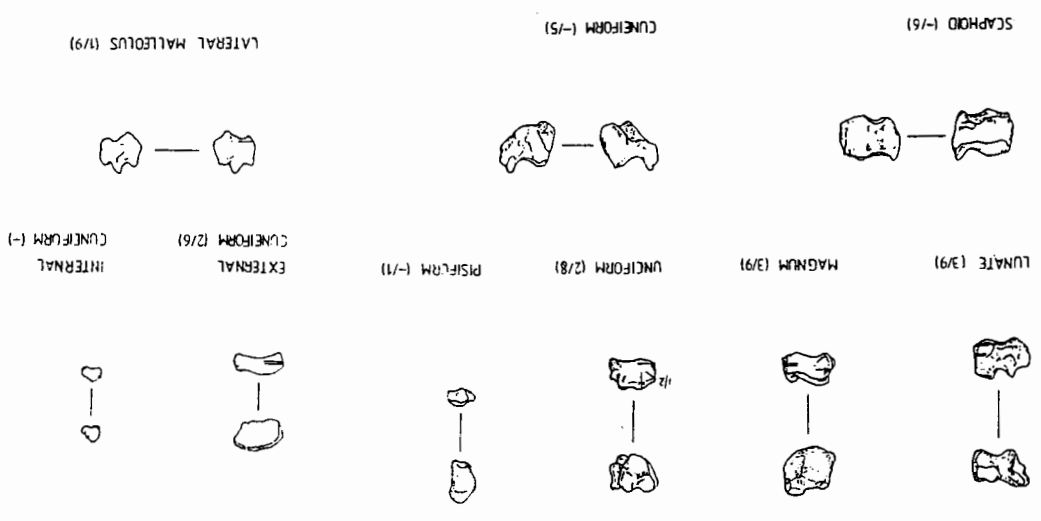
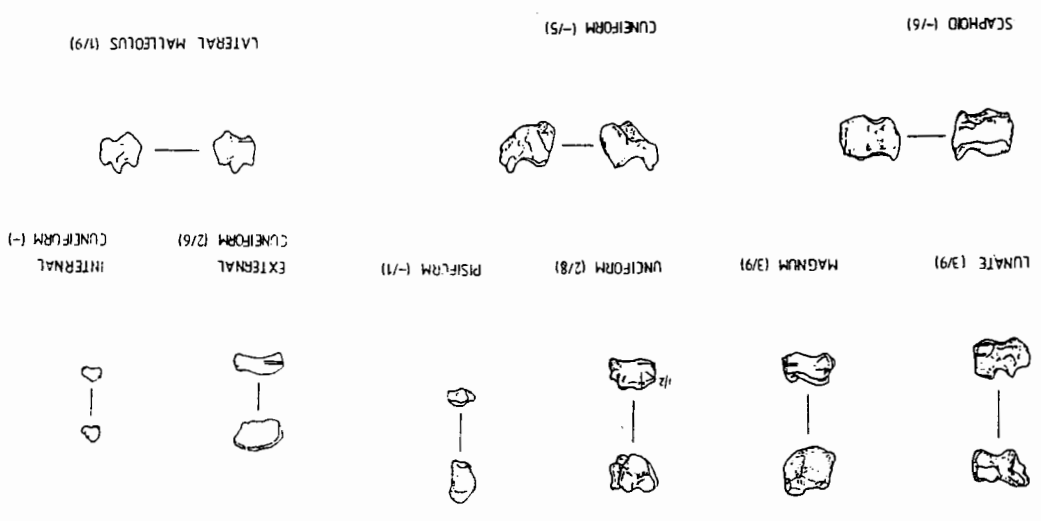
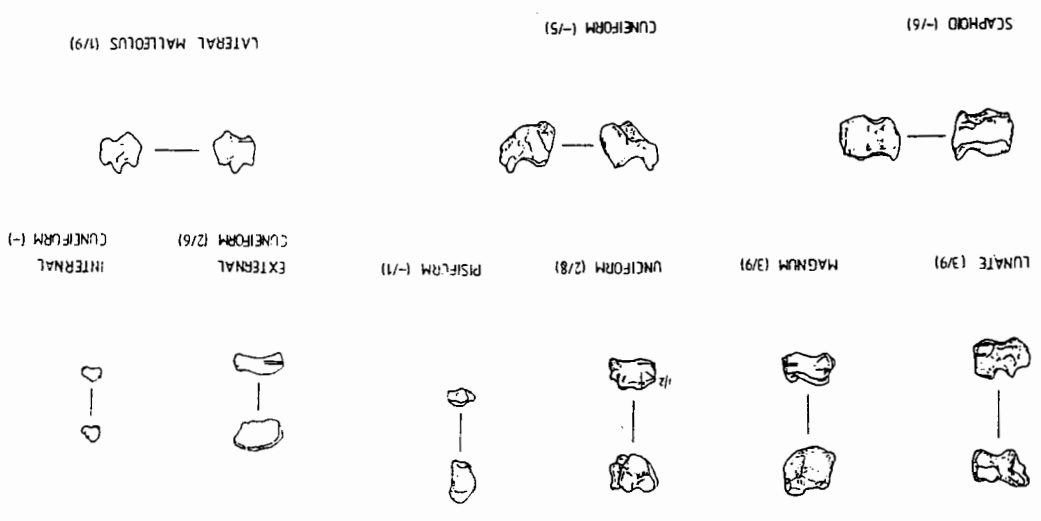
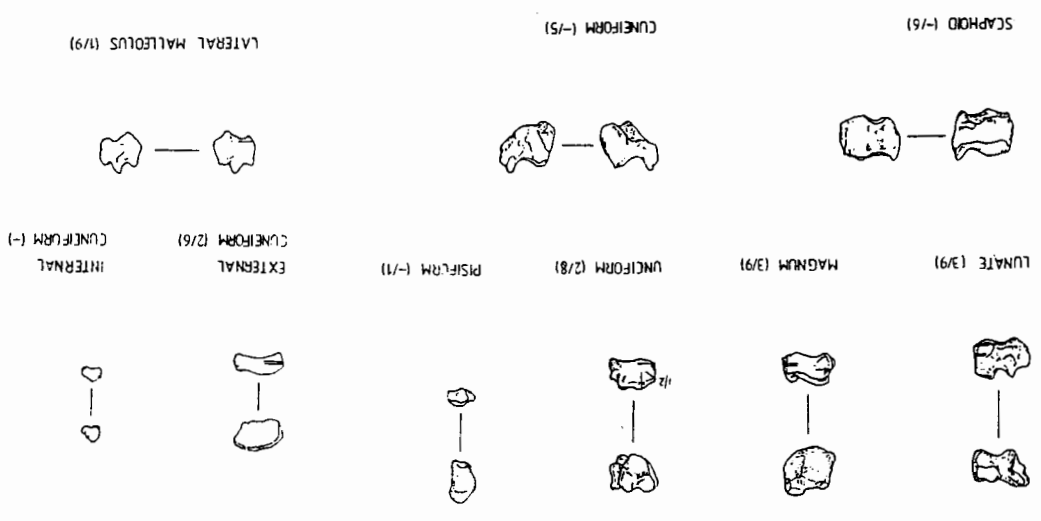
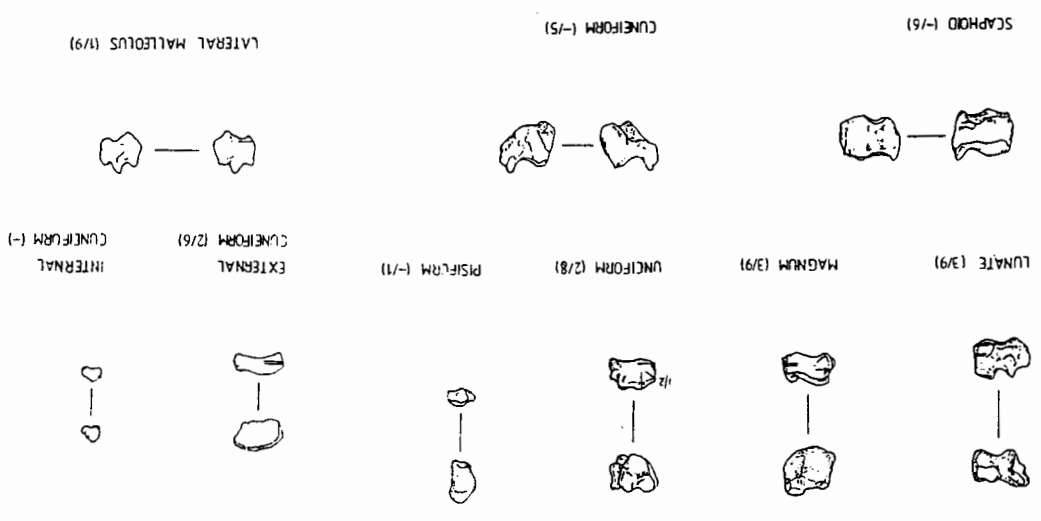
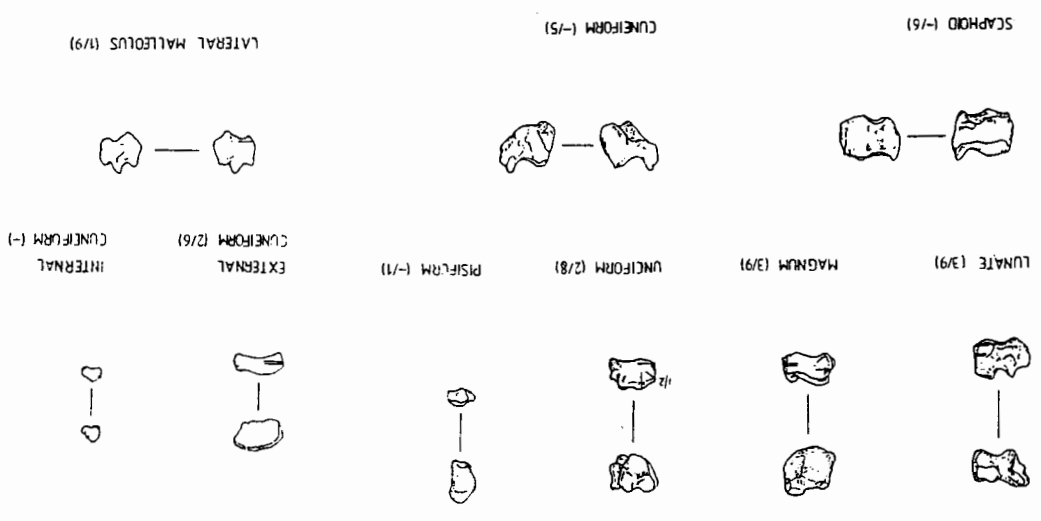
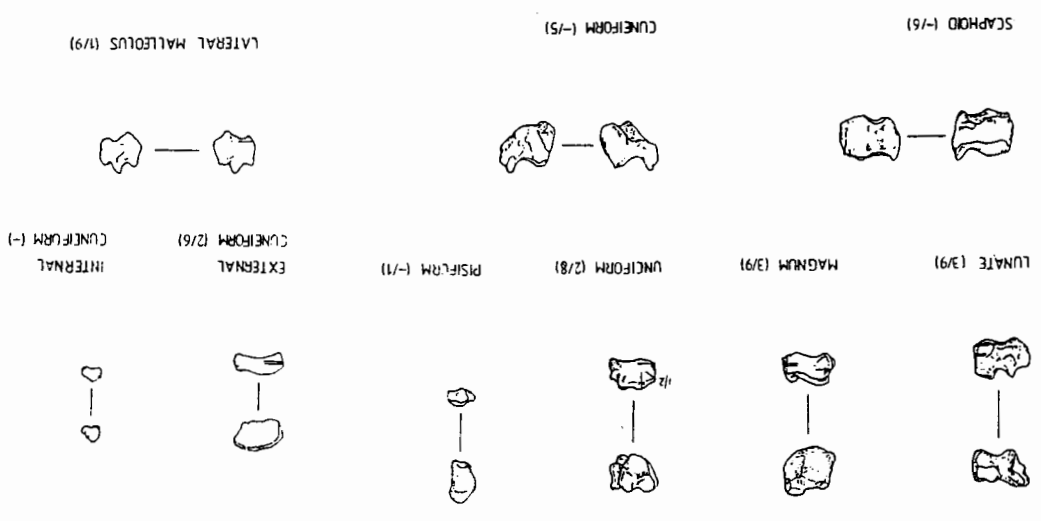
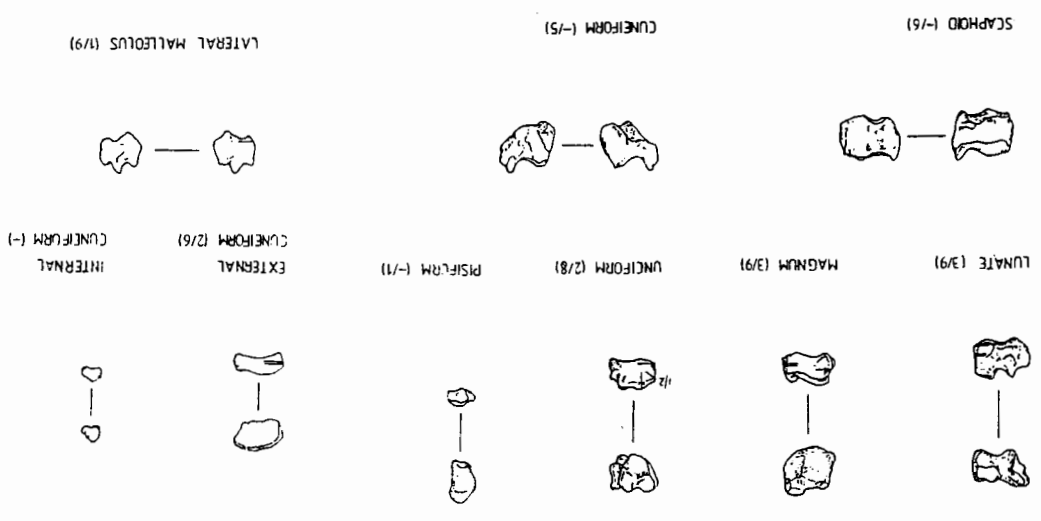
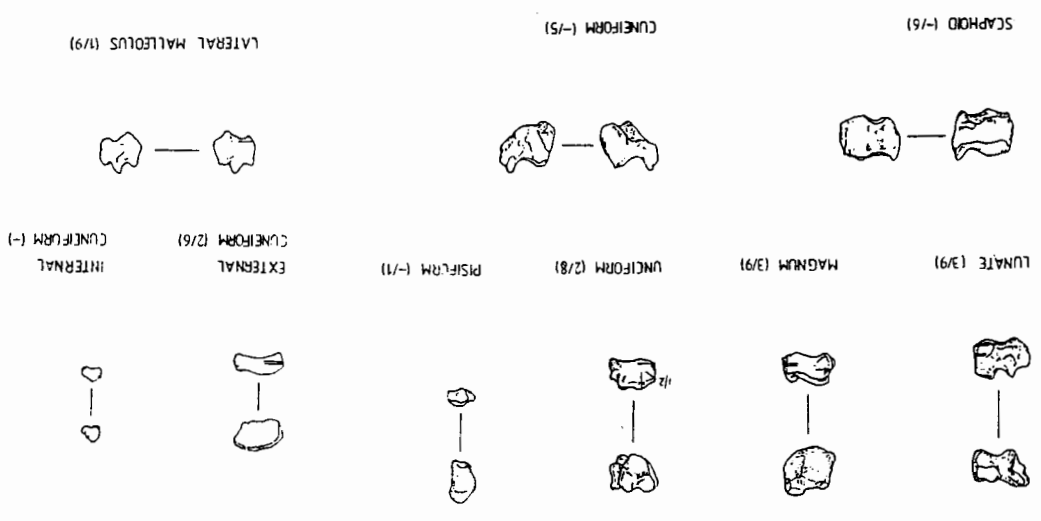
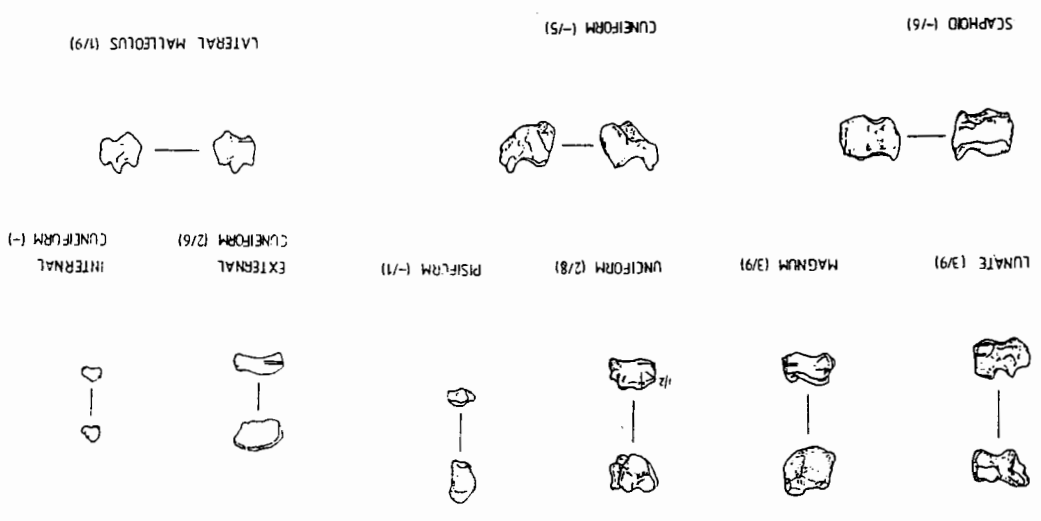
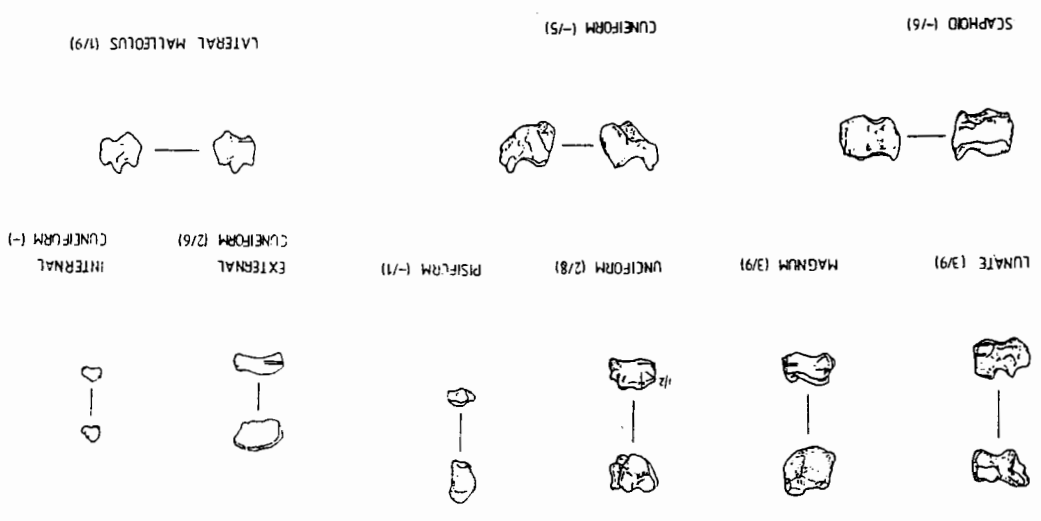
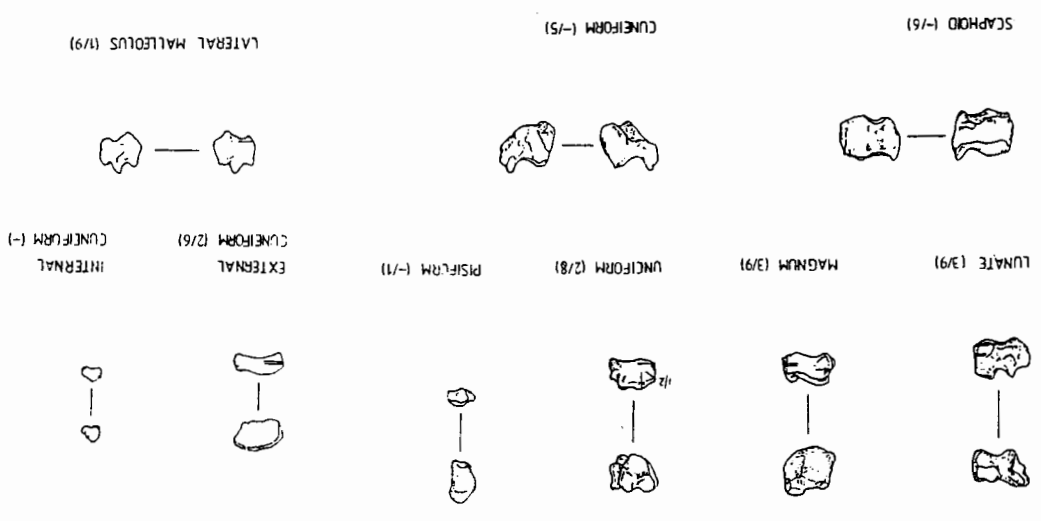
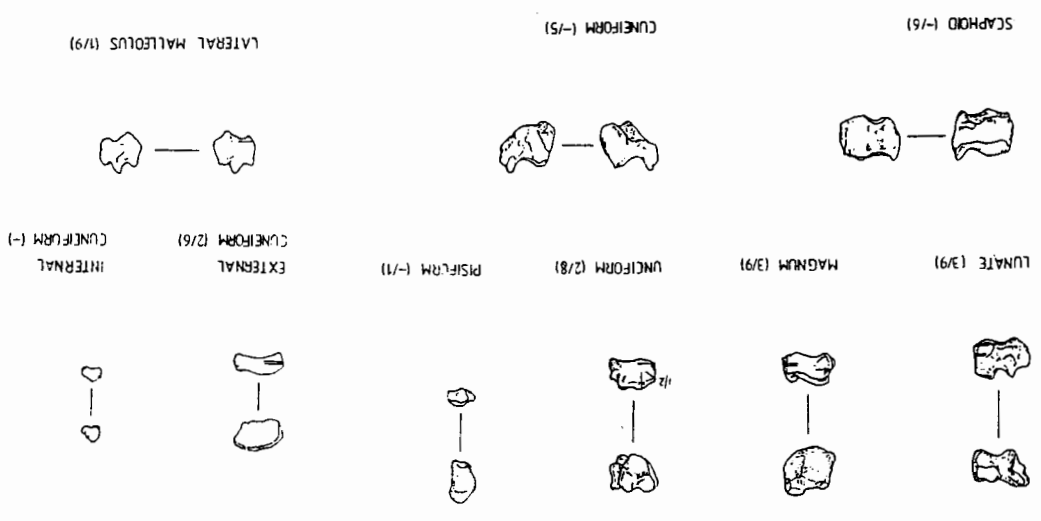
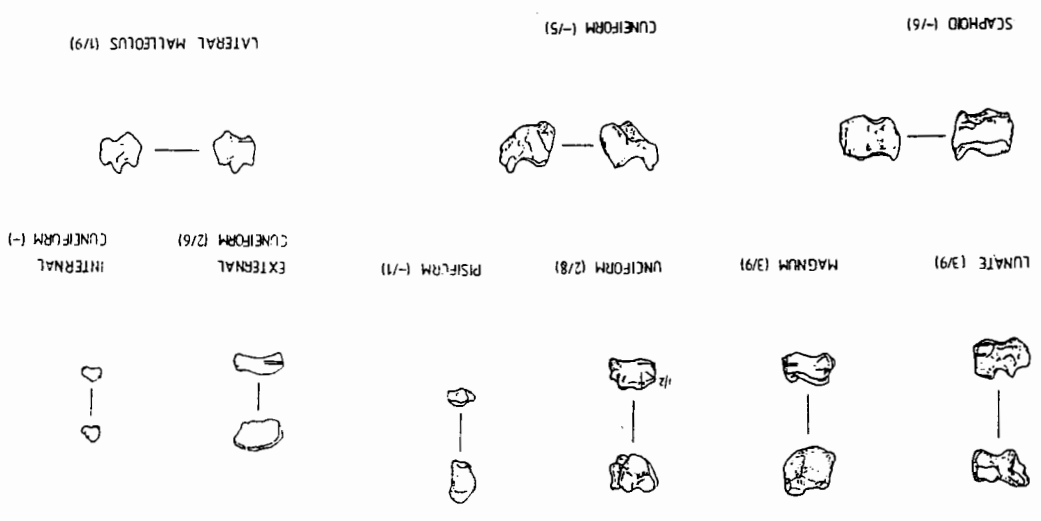
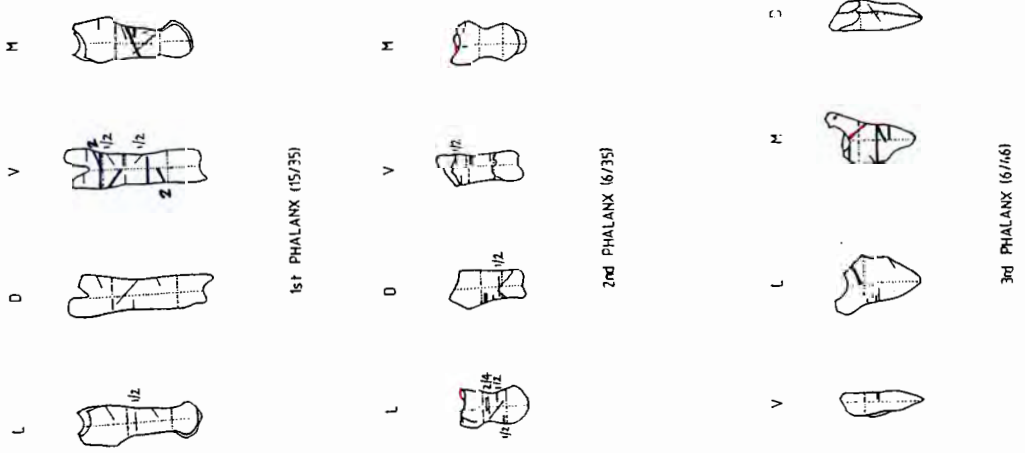
3rd PHALANX (1/4)

Figure 5.34: Continued.

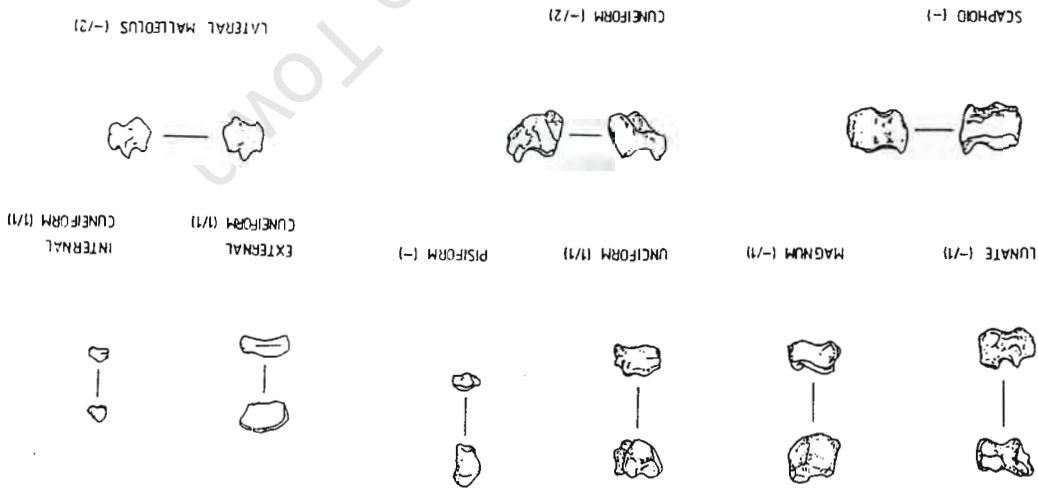
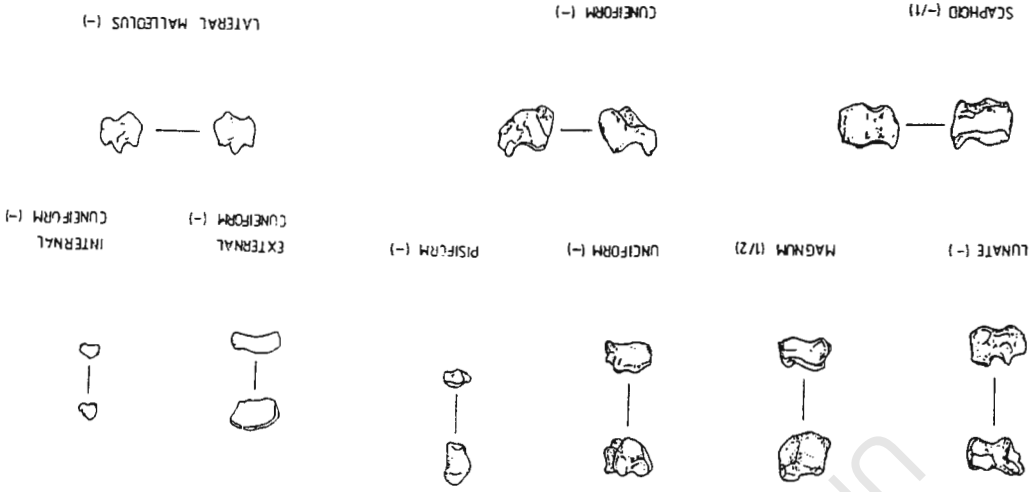
Figure 5.34: Continued.

MIAN 7L

JAM 4L



MAN 3AL



MAN 8L

Figure 5.35: Continued.

Figure 5.35: Continued.

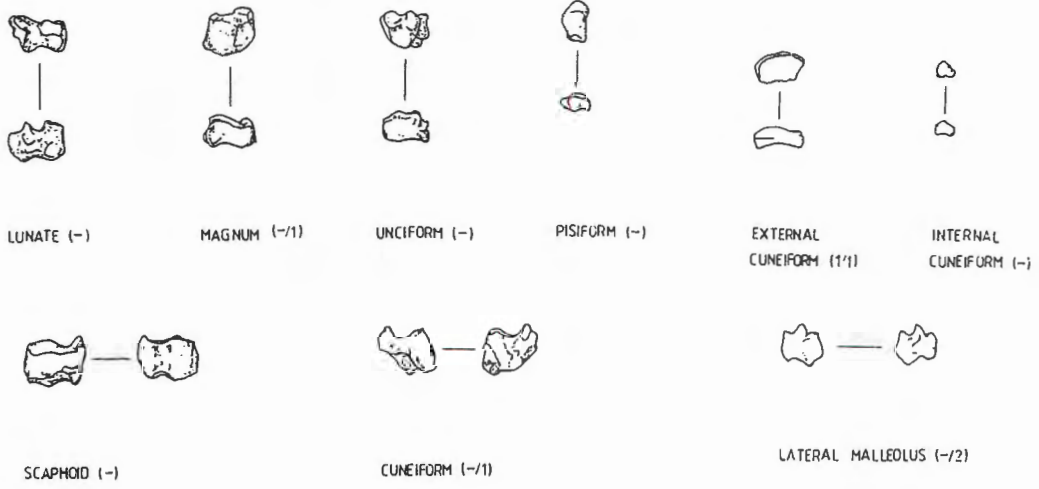


Figure 5.35: Continued.

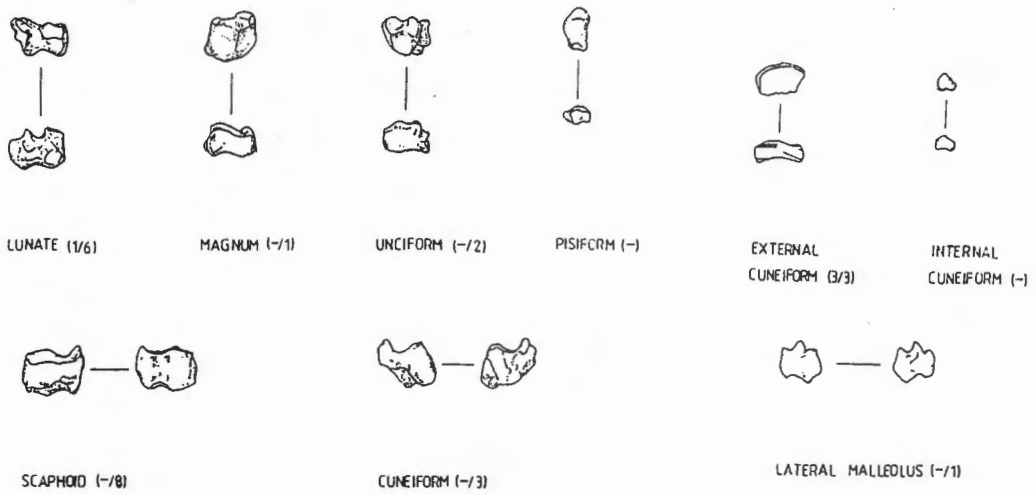


Figure 5.35: Continued.

In cases where there is a low frequency of marks on any one of the three phalanges, as well as a low incidence of these elements having any marks on them, it would suggest that they are part of another butchering unit, i.e. were acquired attached to the metacarpals or metatarsals.

The second pattern is one where there is a greater frequency of cut and other marks on the 1st phalanx, with a lower frequency or absence on the 2nd and 3rd phalanx, as well as a low incidence of these two elements having any marks on them in relation to their total NISP. This suggests that either the phalanges were acquired distally of the proximal 1st phalanx as a butchering unit or were acquired as part of a larger butchering unit, but were dismembered at this particular point.

The third pattern is a high incidence of cut and other marks on all three skeletal elements. This may suggest active attempts to recover all forms of nutrients available from the feet - a butchering unit with a low ranking and a corresponding "high availability" and cheapness, as they were often discarded by butchers, who considered them of little monetary value (see Wilson n.d.a.; n.d.b.; 1975; Woodborne 1994).

#### 5.4. THE GENERAL BUTCHERY PATTERN.

Although the pattern described below is considered to be general, there are variations on either dismemberment or disarticulation at certain points along the length of various skeletal elements. This variation that has been noted may not necessarily relate to variations on a general butchering pattern, but rather imprecise or 'sloppy' butchering, as Woodborne (1994: 6) notes. For example, although there is clear evidence for chopping and sawing through the scapula/humerus articulation and the humerus/radius/ulna articulation; the partitioning was carried out without excessive concern for cutting precisely at each joint. There is evidence, for example, of sawing through the proximal humerus, the humerus/scapula articulation, and the distal scapula. Similarly, the pattern may seem very blurred, as evidence of primary, secondary, and tertiary butchery are all present on one skeletal fragment. For example, primary butchery may have been done at a "centralized butchery where the carcass was completely processed, mostly using a saw, to the extent described above. Alternatively the carcass may only have been dressed into larger units, and further processing was necessary at the domestic unit. In this case chopping may represent primary butchery at the domestic unit and sawing at the centralized supply point" (Woodborne 1994: 10, emphasis added).

The only evidence of skinning comes from the medial and lateral condyles of the metapodials, carpals and tarsals, where transverse cut marks are found to the long-axis of the fore- and hindlimb. After the skin had been stripped from the carcass, how had butchery occurred? Although we do not have any contemporary historical records on sheep butchering, although limited evidence exists on what different sections of meat were used for (see Chapter 6 below), we do have contemporary evidence of cattle slaughtering from both South Africa and North America. Both sets of evidence are quoted below. Among oxen Mentzel (1944: 202) noted that after the animal had been killed, the nape of the neck was cut with

an ax, close to the head, whereupon the neck was ripped open and the blood drawn off. Other evidence of butchery patterns is rather scarce; for this reason we have to turn to complementary bits of information.

The North American evidence provides further insights into carcass utilization, despite the suggested "patterns of utilization" presented above. From North America we have two sets of information. Firstly, data presented by Crass and Wallsmith (1992) shows that the butchery pattern as practiced at Cantonment Burgwin appears to conform to the normal 19th-century American butchering practices for both cattle and sheep. They state that:

"After gutting and skinning, the limbs were removed at the joints, in most cases with the saw. Often, femoral heads, pelvis, and humeri were cut into or completely removed during this process. The carcass was turned into 'sides' of meat, primarily by sawing down either side of the vertebral column, often resulting in the inadvertent (*sic*) removal of [the] vertebral processes. Once the carcass was turned into sides, commercial cuts of meat were removed. Bones such as scapulae were often nicked by knives or cleavers; presumably this occurred during the removal of meat from the bones. No noticeable (*sic*) preference for use of a particular butchering tool (i.e. knife, saw, [or] cleaver) was noted. Standard cuts of meat for both mutton and beef are represented in the faunal assemblage. These include beef short loin, sirloin, round, chuck, and short plate, as well as lamb or mutton trimmed loin, leg, breast and shoulder. These cuts appear to have been turned into stew meat, as opposed to other standard retail cuts of meat such as steaks and roasts. The most common cut was the short rib, consisting primarily of medial rib fragments, approximately 10-12 cm long, and exhibiting cut or saw marks on either end. Also common are short segments of long bone which with short ribs, could be turned into soups or stew [...]" (Crass and Wallsmith 1992: 16-17).

Secondly, information provided by Clonts (1983) on the dismemberment of the carcass at a butcher's shop which provided meat for the market place is equally revealing.

"[...] The head and tail of cattle are removed. The head provides such items as brains and tongue, and the tail yield[s] the basic ingredient of 'oxtail-soup'. [...] Today's power equipment allows the vertebrae to be sawn in such a manner that the dorsal spines are evenly split leaving one half on each side. In the late nineteenth century, sawing often left the dorsal spines whole and on one side or the other. [...] The front quarter is further divided into the chuck and the rib. The chuck contains the following: (a) the neck, which is used for soup; (b) the humerus and scapula area, which produces chuck steaks and roasts or boneless meat for corn condille or hamburgers. The rib area is divided into three sections: (a) the distal ends of the ribs; (b) the mid section of the ribs, which commonly becomes "short ribs"; and (c) the articulating heads and vertebrae. This section produces rib steaks and roasts. [...] In the chuck, the humerus and scapula are sawn transversely on parallel planes across the long axis. [...] The hindquarter is divided into the loin and the round. The loin is further divided into the short loin and the sirloin. The short loin produces steaks exclusively, the T-bone and porterhouse being two popular examples. The New York cut and the fillet mignon are produced by removing the bone (lumbar vertebra) from the short loin. The sirloin produces the sirloin steak and the Chateaubriand. The round produces the rump roast and various cuts of round steaks. This should explain why the hind is more expensive than the front; the expensive choice steaks come from it" (Clonts 1983: 350-351).

Despite known sets of information on what is considered to be the norm in butchering animals, we nevertheless have to ask ourselves how similar or dissimilar is the butchery pattern resulting from the acquisition and sale of meat from the butchers shambles' in Cape Town?

To provide some insights into the butchery pattern practiced in Cape Town, a descriptive approach has been adopted to convey my reading of how the sheep's carcass was utilized.

John Barrow's sketch of the slaughter poles outside the abattoir of Cape Town in the year 1800 (see Figure 5.36, Boucher and Penn 1992: 115, plate 34) would imply that the animals were firstly killed, then the carcasses were strung up, and their hides and/or whatever else were firstly removed.

The butchery pattern is more specific. Firstly, the skull and mandible were severed from the vertebral column at the atlas or axis. More often than not the axis was severed from the atlas with the use of a saw and to a lesser degree with an ax. Cut marks are found on both the anterior atlas and on the occipital condyles of the skull, although disarticulation could also have occurred between the atlas and axis. The mandible was removed from the skull by chopping through the muscles in the region of the ascending ramus, mandibular condyle and coronoid process which attached it to the skull between the zygomatic process and the temporal bone. Hereafter the skull may have been sawn open posterior-anteriorly through the occipital and parietal bone to get access to the brain.

The forelimb was severed from the carcass by chopping through the cartilaginous region of the scapula and/or lateral spine, proximally or distally of the acromion. The next bone which was chopped through was the humerus. This was either done in the mid-shaft region or proximally or distally of the radial fossa. By chopping through the distal humerus, the olecranon of the ulna may also have been removed. Either in addition or alternatively to this point of butchery, the ulna was chopped through distally of its mid-shaft region below the semi-lunar notch, removing the proximal extremity of the radius with it. If neither of these "acts of butchery" had taken place, the following point of dismemberment would have been the distal mid-shaft region of the radius. The carpals show no evidence of "gross" forms of butchery. The following set of marks, are chop, chop-snap and saw marks distally of the proximal mid-shaft of metacarpal. Although the metacarpals were also found whole, disarticulation of the medial and lateral condyles from the set of phalanges is found. The phalanges themselves were either chopped through distally or proximally of their mid-shaft section or alternatively they remained attached to the distal metacarpals.

The hindlimb was severed in one of two places. The sacrum was removed from the 6th lumbar vertebra by sawing through the anterior articular processes. Alternatively or in addition the sacrum was chopped longitudinally between the wings and the sacral tuber of the pelvis. Alternatively the hindlimb was severed slightly posteriorly, through the ilium shaft. The femur was severed dorsally or ventrally of the acetabulum of the innominate, often resulting in the femoral head and/or neck remaining attached at the ball-and-socket articulation of the innominate. Alternatively, the femur was severed both distally and proximally of its respective ends, with evidence of disarticulation of the femur from the tibia as well. The

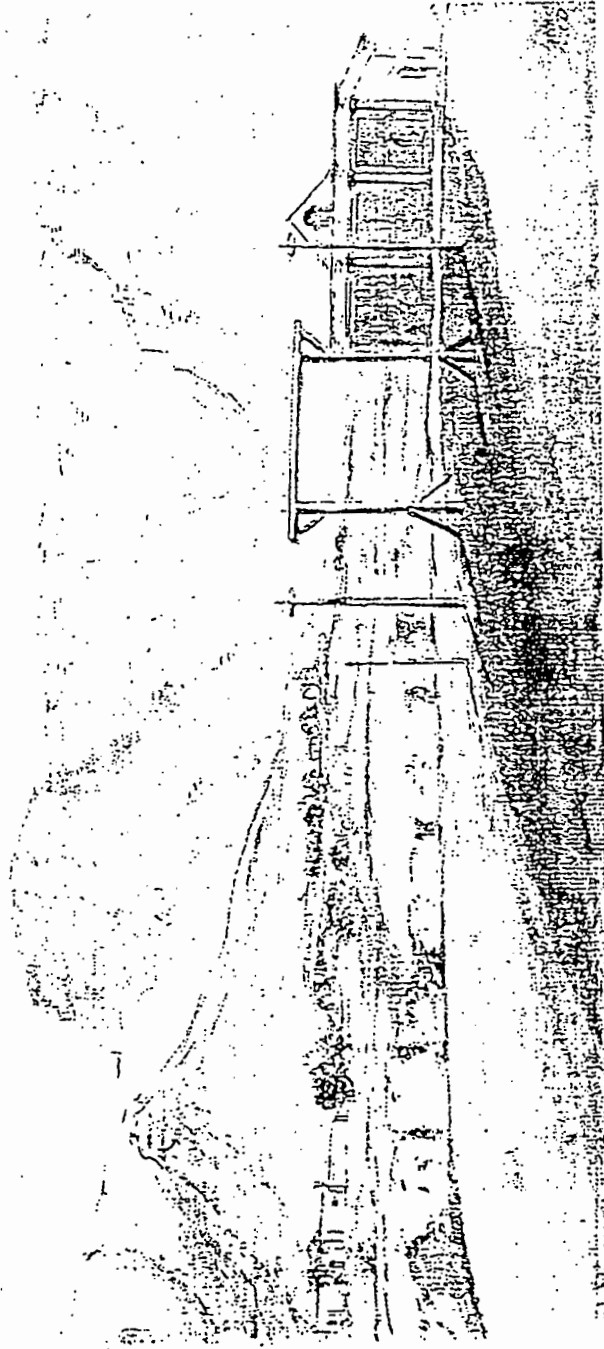


Figure 5.36: Slaughterer poles outside the abattoir, Cape Town, c. 1800 by John Barrow (after Boucher and Penn 1992: plate 34).

tibia was in turn severed both proximally and distally of its mid-shaft region. The attachment of the metatarsal proximally to the tarsals and tibia, results in the dismemberment of the metatarsal distally. In addition, the skeletal element was severed distally from the medial and lateral condyles, through the use of an ax/chopper/cleaver. Lastly, as with the forelimb, the phalanges were most likely utilized in a similar fashion.

The torso of the body, the vertebrae and ribs were also dealt with in a systematic way. The vertebrae (the cervical, thoracic and lumbar) were exclusively sawn through the centrum and dorsal spines. Evidence of saw marks extend into the posterior articulations of the atlas through the 3rd cervical vertebra and axis. In addition, the dorsal spines of the thoracic and lumbar vertebrae were removed, either above the arches or above the body of the vertebrae. (This may not have been the case in all phases, but a variation on the pattern). The transverse processes were either sawn or chopped through. Not all samples show evidence of disarticulation or dismemberment through the transverse processes. Sawing or chopping through these processes in the thoracic vertebrae resulted in corresponding marks to or through the head, neck and/or tubercle of the dorsal ribs. In addition, the ribs were severed proximally of the sternal end, either half or three-quarters of the way along the medial lateral surfaces.

This completes a general overview of how butchering may have occurred within the category sheep. Of interest to note here, is that this is a general pattern, with a number of the butchery patterns noted occurring not only across similar phases from JAM and MAN, but also across different phases from each of the houses. This interpretation carries with it two associated implications. Firstly, that there is no significant difference between each of the phases and that the pattern of butchery may similarly not have changed "significantly" within this time period for changes to be noted archaeologically. Although there are no significant differences between the phases from Sea Street, when one compares the body part profiles from two earlier sites of Oudepost and Paradise (compare Avery 1989: table 2; Cruz-Urbe and Schrire 1991: table 7 with Table 5.15) with Sea Street, one notes that there is very little similarity between the two aforementioned and Sea Street. The greatest similarity is between Paradise and Oudepost. These results are not unexpected as the sites are not temporally related, nor are they dump sites, with Oudepost geographically isolated far up the west coast. Secondly, in contrast to American zooarchaeology with emphasis placed on discerning cultural patterns, no patterns have been found within the faunal collection. If there were any, they may be submerged in the dominant general utility pattern, and form part of the background noise around the general pattern.

##### **5.5. CUT, CHOP AND SAW MARK DISTRIBUTIONS.**

To evaluate more closely specific butchery patterns, it was decided to test the hypothesis as to whether there is a clear correlation between the frequencies of particular butchery marks and anatomical body parts (after Milo 1994). In the foregoing section, I described the degree of butchery on each of the skeletal elements. We are nevertheless still engaged at looking at skeletal elements which may have a

combination of butchery patterns on one element - primary, secondary, or tertiary. Not only to test the above hypothesis, my aim here was to see if one could gain a clearer impression of the extent and purpose of the various butchery categories utilized in the faunal analysis. Tables 5.1 to 5.4 show a detailed breakdown of the frequencies of the various categories of butchery types by skeletal regions or groups, i.e. proximal, distal, shaft or vertebrae. To simplify the number of categories, chop-snap, cut-snap and saw-snap were collapsed into chop, cut and saw categories. Equally so the category 'other' incorporated scrape, percussion, indeterminate marks, and rodent gnaw or carnivore tooth marks. The category 'other' was, however, ignored in the later analysis of the material, as counts for this group were very low (see Tables 5.5 to 5.8). In addition the number of joint categories were also simplified (see description above), whereby frequencies of a butchery type around a particular joint was summed. For example, the cut marks on the distal humerus, proximal radius and proximal ulna were summed to establish the number of cut marks around the humero-radius/ulna joint (see Tables 5.5 to 5.8). To further restrict the number of variations, the data was summed on the phase level between the two houses, and not on unit level.

As alluded to above, the values placed adjacent to each of the regions or groups are a percentage of the total number of that mark under study for the whole phase. In addition, the total number of marks per axial skeleton, hind- and forequarters are also given. These totals by themselves also point to certain trends which will be described below. The Figures 5.37 to 5.48 have been grouped according to cut, chop and saw marks per phase for each of the houses. Lastly, a rank order correlation was drawn between each of the phases to test the statistical similarity or non-similarity between samples. As statistical analyses form a significant part of this section and later in Chapter 5, it is best that the reader is aware of the significance of the test, before the results are discussed.

### 5.5.1. NON-PARAMETRIC STATISTICAL ANALYSIS.

Spearman's coefficient ( $r_s$ ) of rank order correlation is one of many non-parametric test. More recently this statistical test has been used by historical archaeologists, Nan A. Rothschild and Darlene Balkwill (1993), in a paper entitled "The Meaning of Change in Urban Faunal Deposits". It has also be utilized successfully by others (Lyman 1992; 1994c).

The best-known methods of statistical inference, assume that we know the shape of the probability distribution that the measurements take. Frequently however, we cannot confidently make such an assumption about the shape of the distribution of measurements. We may therefore wish to use methods whose strengths do no depend much on the precise shape of the distribution. We may want to compare "properties" of distributions even when we know little about their shapes (Mosteller, Fienberg and Rourke 1983: 474), i.e. they are distribution-free tests (Zar 1974: 109), and do not depend on any possibly unwarranted assumptions about the frequency distributions of the variables (Ebdon 1988: 99). Non-parametric methods help us to do this, with Spearman's coefficient ( $r_s$ ) of rank correlation being one example. Non-parametric tests can be done on either the nominal, ordinal, interval or ratio scales of measurements (Conover 1971: 94). The Spearman's test can be applied to data which are inherently ordinal, such as preference data, or to interval data converted to the ranked form (Ebdon 1988: 98).



	cut	cut-snap	chop	chop-snap	saw	saw-snap	scrape	percussion	indeterminate	rodent/carnivore	Total
JAM PH3	7			3		1					11
JAM PH3	23	3	1			3					30
JAM PH3	11										11
JAM PH3	19	3		4		2		1			29
JAM PH3	7			1							8
JAM PH3	1										1
JAM PH3	3	1									4
JAM PH3	4	1		1							6
JAM PH3	70	9	3	1	1	19			1		104
JAM PH3	3	7		1		4					15
JAM PH3	52	29	1	5		29	1	2			126
JAM PH3	9	11		3		2					25
JAM PH3	39	19		3		8		1			70
JAM PH3				1							1
JAM PH3											0
JAM PH3	30	1				5		1			37
JAM PH3	6	1		28							35
JAM PH3	8	7									15
JAM PH3	12	4	1	3		2					22
JAM PH3	3										3
<b>TOTAL</b>	<b>531</b>	<b>147</b>	<b>16</b>	<b>191</b>	<b>2</b>	<b>92</b>	<b>1</b>	<b>15</b>	<b>3</b>	<b>1</b>	<b>999</b>

Table 5.2: Frequencies of defined butchery marks per skeletal elements for JAM Phase 2.

	cut	cut-snap	chop	chop-snap	saw	saw-snap	scrape	percussion	indeterminate	rodent/carnivore	Total
JAM PH2	AST	4						4			8
JAM PH2	ATa	2		1		1					4
JAM PH2	ATp			2		1					3
JAM PH2	AXa	1									1
JAM PH2	AXp	1		1							2
JAM PH2	CAL	14									14
JAM PH2	CAV	1									1
JAM PH2	CV			8							8
JAM PH2	EXT.CUN.										0
JAM PH2	FEMd			4							4
JAM PH2	FEMp	7	2	3		1					13
JAM PH2	FEMs	21	1	1		2					25
JAM PH2	HUMd	1	2	5		1					9
JAM PH2	HUMp	1	2	1							4
JAM PH2	HUMs										0
JAM PH2	HY										0
JAM PH2	INNa	21	12			3					36
JAM PH2	INNp	35	2			4	3				44
JAM PH2	LUNATE										0
JAM PH2	LY	10	6		45	1		1			63
JAM PH2	MAGNUM										0
JAM PH2	MCd	4		2			1				7
JAM PH2	MCp	3									3
JAM PH2	MCS	90	6	1		4					101
JAM PH2	MNBd	186	3			3					192
JAM PH2	MNC	5									5
JAM PH2	MTd	6				1					7

	cut	cut-snap	chop	chop-snap	saw	saw-snap	scrape	percussion	indeterminate	rodent/carnivore	Total
JAM PH2	MTp					1					1
JAM PH2	MTs	25	5			4					34
JAM PH2	NAV	2									2
JAM PH2	PAT	2									2
JAM PH2	PH1	57	1	2							60
JAM PH2	PH2	14		1		1					16
JAM PH2	PH3	4									4
JAM PH2	RADd	1									1
JAM PH2	RADp	6	4	3		1					14
JAM PH2	RADs	43	9	2		3					57
JAM PH2	RIBd	19	1	1	7	3		1			32
JAM PH2	RIBv	74	16	2	2	43		1			138
JAM PH2	SCd	8	3	1		1					13
JAM PH2	SCp	6	1		1	3					11
JAM PH2	TIBd										0
JAM PH2	TIBp										0
JAM PH2	TIBs	17	6	2		3					28
JAM PH2	TV	1	4		11			1			17
JAM PH2	ULd	3									3
JAM PH2	ULp	6	1								7
JAM PH2	UNCIFORM										0
<b>TOTAL</b>		<b>701</b>	<b>87</b>	<b>9</b>	<b>100</b>	<b>0</b>	<b>85</b>	<b>1</b>	<b>11</b>	<b>0</b>	<b>994</b>



	cut	cut-snap	chop	chop-snap	saw	saw-snap	scrape	percussion	indeterminate	rodent/carnivore	Total
MAN PH3 Mtp	3					1					4
MAN PH3 MTs	22	2				3					27
MAN PH3 NAV	2										2
MAN PH3 PAT											0
MAN PH3 PHI	2	4		1		3					10
MAN PH3 PH2	3					1					4
MAN PH3 PH3											0
MAN PH3 RADd				1							1
MAN PH3 RADp				1							1
MAN PH3 RADS	8	1		1		4	1				15
MAN PH3 RIBd	3	5		5		2					15
MAN PH3 RIBv	51	9		1	1	16				1	79
MAN PH3 SCd	4	4				3					11
MAN PH3 SCp	6	2				1	1				10
MAN PH3 TIBd						1					1
MAN PH3 TIBp											0
MAN PH3 TIBs	11					3					14
MAN PH3 TV	14	8		28		1					51
MAN PH3 ULd	2	1	1								4
MAN PH3 ULp	1	2		2							5
MAN PH3 UNCIFORM											0
<b>TOTAL</b>	<b>254</b>	<b>62</b>	<b>1</b>	<b>104</b>	<b>1</b>	<b>55</b>	<b>0</b>	<b>3</b>	<b>0</b>	<b>1</b>	<b>481</b>

MAN PH3 Mtp, MAN PH3 MTs, MAN PH3 NAV, MAN PH3 PAT, MAN PH3 PHI, MAN PH3 PH2, MAN PH3 PH3, MAN PH3 RADd, MAN PH3 RADp, MAN PH3 RADS, MAN PH3 RIBd, MAN PH3 RIBv, MAN PH3 SCd, MAN PH3 SCp, MAN PH3 TIBd, MAN PH3 TIBp, MAN PH3 TIBs, MAN PH3 TV, MAN PH3 ULd, MAN PH3 ULp, MAN PH3 UNCIFORM

Table 5.4: Frequencies of defined butchery marks per skeletal elements for MAN Phase 2.

	cut	cut-snap	chop	chop-snap	saw	saw-snap	scrape	percussion	indeterminate	rodent/carnivore	Total
MAN PH2 AST						2					2
MAN PH2 ATa											0
MAN PH2 ATp	1			1							2
MAN PH2 AXa											0
MAN PH2 AXp											0
MAN PH2 CAL	6	1				1					8
MAN PH2 CAV											0
MAN PH2 CV	1			11							12
MAN PH2 EXT.CUN.	3										3
MAN PH2 FEMd				1							1
MAN PH2 FEMp	2			1							3
MAN PH2 FEMs	8		2			1					11
MAN PH2 HUMd	3	2	1			2					8
MAN PH2 HUMp											0
MAN PH2 HUMs						1					1
MAN PH2 HY											0
MAN PH2 INN <sub>a</sub>	3					2					5
MAN PH2 INN <sub>p</sub>	5	1		1		3					10
MAN PH2 LUNATE	1										1
MAN PH2 LV	5	1		27							33
MAN PH2 MAGNUM											0
MAN PH2 MCd											0
MAN PH2 MCp	1										1
MAN PH2 MCs	9					1					10
MAN PH2 MNbl	7					1					8
MAN PH2 MNc	2										2
MAN PH2 MTd			2			1					3

	cut	cut-snap	chop	chop-snap	saw	saw-snap	scrape	percussion	indeterminate	rodent/carnivore	Total
MAN PH2	1										1
MAN PH2	8	1				4					13
MAN PH2	2										2
MAN PH2											0
MAN PH2	11	1				8					20
MAN PH2	8										8
MAN PH2	3	1				7					11
MAN PH2											0
MAN PH2	2					5					7
MAN PH2	1										1
MAN PH2	3	1		1							5
MAN PH2	28	5		2	1	7					43
MAN PH2	1										1
MAN PH2											0
MAN PH2	1										1
MAN PH2											1
MAN PH2	9	3									12
MAN PH2	1			17							18
MAN PH2											0
MAN PH2											0
MAN PH2											0
<b>TOTAL</b>	<b>136</b>	<b>20</b>	<b>3</b>	<b>62</b>	<b>1</b>	<b>46</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>268</b>

MAN PH2 UNCIFORM

Table 5.5: Frequencies and relative percentages of defined butchery marks per combined skeletal element regions or joint articulations for JAM Phase 3.

	cut	chop	saw	other	Total
JAM PH3 ATa	9	1	1	0.50%	11
JAM PH3 ATp-AXa	5	3	15	7.46%	23
JAM PH3 AXp	3	2	6	2.99%	12
JAM PH3 CV	7	9	33	16.42%	49
JAM PH3 FEMd-TIBp	3		4	1.99%	7
JAM PH3 FEMp	10	2		0.00%	12
JAM PH3 FEMs	27	9		0.00%	36
JAM PH3 HUMd-pUL/RAD	31	12	10	4.98%	54
JAM PH3 HUMs	2		1	0.50%	3
JAM PH3 INNa	7	3		0.00%	10
JAM PH3 INNp	37	13	7	3.48%	57
JAM PH3 LV	32	11	59	29.35%	106
JAM PH3 MCD-PHI-3	10.5	3.5	3.5	1.74%	18
JAM PH3 MCS	35	6		0.00%	42
JAM PH3 MTd-PHI-3	9.5	2.5	2.5	1.24%	15
JAM PH3 MTs	23	6		0.00%	30
JAM PH3 RADd-MCp	11	1		0.00%	14
JAM PH3 RADs-ULd	78	35	1	0.50%	119
JAM PH3 RIBv	53	58	12	5.97%	126
JAM PH3 SCd-HUMp	9	13	4	1.99%	27
JAM PH3 SCp	39	27	4	1.99%	70
JAM PH3 TIBd-MTp	37	3	9	4.48%	51
JAM PH3 TIBs	30	6	1	0.50%	37
JAM PH3 TV	6	1	28	13.93%	35
<b>TOTAL</b>	<b>514</b>	<b>227</b>	<b>201</b>	<b>100.00%</b>	<b>964</b>

Table 5.6: Frequencies and relative percentages of defined butchery marks per combined skeletal element regions or joint articulations for JAM Phase 2.

	cut		chop		saw		other		Total
	count	percentage	count	percentage	count	percentage	count	percentage	count
JAM PH2	2	0.41%	1	0.41%	1	0.64%	1	0.97%	4
<i>ATa</i>									
JAM PH2	1	0.20%	1	0.20%	2	0.64%	2	1.94%	4
<i>ATp-AXa</i>									
JAM PH2	1	0.20%			1	0.00%	1	0.97%	2
<i>AXp</i>									
JAM PH2					8	0.00%	8	7.77%	8
<i>CV</i>									
JAM PH2	2	0.41%			4	0.00%	4	3.88%	6
<i>FEMd-TIBp</i>									
JAM PH2	7	1.43%	3	1.92%	3	1.92%	3	2.91%	13
<i>FEMp</i>									
JAM PH2	21	4.28%	3	1.92%	1	1.92%	1	0.97%	25
<i>FEMs</i>									
JAM PH2	13	2.65%	9	5.75%	8	5.75%	8	7.77%	30
<i>HUMd-pUL/RAD</i>									
JAM PH2									
<i>HUMs</i>									
JAM PH2	21	4.28%	15	9.58%		0.00%		0.00%	0
<i>INNa</i>									
JAM PH2	35	7.13%	6	3.83%	3	3.83%	3	2.91%	36
<i>INnp</i>									
JAM PH2	10	2.04%	7	4.47%	46	4.47%	46	44.66%	44
<i>LV</i>									
JAM PH2	42.5	8.66%	1	0.64%	3.5	0.64%	3.5	3.40%	47
<i>MCD-PHI-3</i>									
JAM PH2	90	18.33%	10	6.39%		0.00%	1	12.50%	101
<i>MCs</i>									
JAM PH2	43.5	8.86%	0.5	0.32%	1.5	1.46%		0.00%	45.5
<i>MTd</i>									
JAM PH2	25	5.09%	5	3.19%		0.00%		0.00%	30
<i>MTs</i>									
JAM PH2	4	0.81%		0.00%		0.00%		0.00%	4
<i>RADd-MCp</i>									
JAM PH2	46	9.37%	12	7.67%		0.00%	2	25.00%	60
<i>RADs-ULd</i>									
JAM PH2	74	15.07%	59	37.70%	3	37.70%	2	25.00%	138
<i>RIBv</i>									
JAM PH2	9	1.83%	6	3.83%	1	3.83%	1	12.50%	17
<i>SCd-HUMp</i>									
JAM PH2	6	1.22%	4	2.56%	1	2.56%		0.00%	11
<i>SCp</i>									
JAM PH2	20	4.07%	1	0.64%	4	0.64%		0.00%	25
<i>TIBd</i>									
JAM PH2	17	3.46%	9	5.75%		0.00%	2	25.00%	28
<i>TIBs</i>									
JAM PH2	1	0.20%	4	2.56%	12	11.65%		0.00%	17
<i>TV</i>									
<b>TOTAL</b>	<b>491</b>	<b>100.00%</b>	<b>156.5</b>	<b>100.00%</b>	<b>103</b>	<b>100.00%</b>	<b>8</b>	<b>100.00%</b>	<b>758.5</b>

Table 5.7: Frequencies and relative percentages of defined butchery marks per combined skeletal element regions or joint articulations for MAN Phase 3.

	cut		chop		saw		other		Total
	1	0.45%	2	0.45%	1	0.00%	1	1.02%	2
MAN PH3	1	0.45%			1	0.00%		1.02%	2
MAN PH3	1	0.45%	2	0.45%	2	1.83%		2.04%	5
MAN PH3		0.00%				0.00%		0.00%	0
MAN PH3	6	2.71%	1	0.92%	22	0.92%		22.45%	29
MAN PH3	2	0.90%	2	1.83%	3	1.83%		3.06%	7
MAN PH3	6	2.71%	1	0.92%	1	0.92%		1.02%	8
MAN PH3	6	2.71%	2	1.83%		1.83%		0.00%	8
MAN PH3	15	6.79%	8	7.34%	5	7.34%		5.10%	28
MAN PH3		0.00%				0.00%		0.00%	0
MAN PH3	3	1.36%	2	1.83%		1.83%		0.00%	5
MAN PH3	10	4.52%	7	6.42%	1	6.42%		1.02%	18
MAN PH3	14	6.33%	7	6.42%	25	6.42%		25.51%	46
MAN PH3	4.5	2.04%	6	5.50%	0.5	5.50%		0.51%	11
MAN PH3	13	5.88%	7	6.42%	1	6.42%		1.02%	21
MAN PH3	2.5	1.13%	4	3.67%	0.5	3.67%		0.51%	7
MAN PH3	22	9.95%	5	4.59%		4.59%		0.00%	27
MAN PH3	6	2.71%			1	0.00%		1.02%	7
MAN PH3	10	4.52%	6	5.50%	2	5.50%	1	2.04%	19
MAN PH3	51	23.08%	25	22.94%	1	22.94%	2	1.02%	79
MAN PH3	4	1.81%	7	6.42%		6.42%		0.00%	11
MAN PH3	6	2.71%	3	2.75%	1	2.75%		1.02%	10
MAN PH3	13	5.88%	2	1.83%	3	1.83%		3.06%	18
MAN PH3	11	4.98%	3	2.75%		2.75%		0.00%	14
MAN PH3	14	6.33%	9	8.26%	28	8.26%		28.57%	51
<b>TOTAL</b>	<b>221</b>	<b>100.00%</b>	<b>109</b>	<b>100.00%</b>	<b>98</b>	<b>100.00%</b>	<b>3</b>	<b>100.00%</b>	<b>431</b>

Table 5.8: Frequencies and relative percentages of defined butchery marks per combined skeletal element regions or joint articulations for MAN Phase 2.

	cut	chop	saw	other	Total
MAN PH2	ATa	0.00%	0.00%	0.00%	0
MAN PH2	ATp-AXa	1	0.00%	1.64%	2
MAN PH2	AXp	0.00%	0.00%	0.00%	0
MAN PH2	CV	1	0.82%	18.03%	12
MAN PH2	FEMd-TIBp	1	0.00%	1.64%	2
MAN PH2	FEMp	2	1.64%	1.64%	3
MAN PH2	FEMs	8	6.56%	0.00%	11
MAN PH2	HUMd-pUL/RAD	5	4.10%	0.00%	15
MAN PH2	HUMs	1	0.00%	0.00%	1
MAN PH2	INNa	3	2.46%	0.00%	5
MAN PH2	INNp	5	4.10%	1.64%	10
MAN PH2	LV	5	4.10%	44.26%	33
MAN PH2	MCd-PHI-3	11	9.02%	0.00%	19.5
MAN PH2	MCs	9	7.38%	0.00%	10
MAN PH2	MTd	11	9.02%	0.00%	22.5
MAN PH2	MTs	8	6.56%	0.00%	13
MAN PH2	RADs-ULd	1	0.82%	0.00%	1
MAN PH2	RIBv	28	22.95%	3.28%	43
MAN PH2	SCd-HUMp	1	0.82%	0.00%	1
MAN PH2	Scp	0.00%	0.00%	0.00%	0
MAN PH2	TIBd	13	10.66%	0.00%	17
MAN PH2	TIBs	9	7.38%	0.00%	12
MAN PH2	TV	1	0.82%	27.87%	18
<b>TOTAL</b>	<b>122</b>	<b>100.00%</b>	<b>64</b>	<b>100.00%</b>	<b>251</b>
			<b>61</b>	<b>100.00%</b>	<b>4</b>
				<b>100.00%</b>	<b>251</b>

The  $r_s$  coefficient measures the strength of the relationship between two variables. It is used when we are working with the rankings of individual values for two variables (see Mendenhall and Ott 1980: 378). Two assumptions which underlie this method is that the observations should be ranked in order of magnitude on both variables, and that there must be at least five pairs of observations to establish significance at a general meaningful level (Norcliffe 1979: 116).

The formula used to establish  $r_s$  is

$$r_s = 1 - 6\sum(X-Y)^2/n(n^2-1)$$

where  $X$  and  $Y$  are the ranks of the variables measured (Lapin 1975: 532; Mendenhall and Ott 1980: 379; Sprent 1989: 136), with  $n$  being the number of paired rank observations.

Frequently or infrequently one encounters ranked data in which two or more observations are tied for a given rank. It is then justified to apply a correction factor when tied rankings occur. The use of the correction factor is recommended when either three or more observations are tied equal, or when the number of pairs of ties is more than one quarter of the total number of observations (Norcliffe 1977: 117).

If the proportion of ties is large, the following equation should be used:

$$r_s = (A-B) + (A-C) - \frac{\sum d^2}{2\sqrt{(A-B)(A-C)}}$$

where  $\sum d^2$  is the sum of the squares of the differences between each  $X$  and  $Y$  ranking; with

$$A = (n^3 - n)/12$$

where  $n$  is the number of paired rankings.

$$B = \sum((t_x^3 - t_x)/12)$$

$$C = \sum((t_y^3 - t_y)/12)$$

where  $t_x$  is the number of values of variable  $X$  tying at a given rank, and  $t_y$  is the same for the variable  $Y$  (Ebdon 1988: 101).

It should be noted that the effect of the correction for ties is to increase the value of  $r_s$ , and therefore makes it easier for the null hypothesis to be rejected. In other words, if the correction is not applied, the significance test errs on the side of caution. For these reasons it is probably unnecessary to use the correction unless there is a very large proportion of tied ranks in the data (Ebdon 1988: 101).

The resulting  $r_s$  value will indicate how strong or weak the correlation is. Values range from +1 (indicating a perfect positive relationship) and -1 (indicating a perfect negative relationship), with a value of 0 indicating that the variables are totally unrelated (Norcliffe 1979: 116). The computed value for  $r_s$  at the 0.05 probability level is compared with the critical values for  $r_s$ , depending on the degrees of freedom

allowed (here seen as the number of paired observations). If the calculated value of  $r_s$  is greater than the critical value at the chosen level of significance, then the null hypothesis must be rejected (see Ebdon 1988). [The critical values for Spearman's *rho* can be found in an appendix, at the back of most statistical books].

The null hypothesis and its alternative can plainly be stated as:

$H_0$ : there is no difference between the two variables that are being measured; and

$H_1$ : there is difference between the two variables that are being assessed (after Shennan 1990).

If there is a difference between the ranked samples, i.e. where  $H_0$  is rejected, it implies that these two samples are dissimilar from one another, and probably arise from two different populations.

Alternatively, where there is a significant positive or negative rank order correlation between the two values that are being measured, e.g. between saw marks and their locational frequency, then there is invariably no difference between the two samples under investigation.

### 5.5.2. THE CUT, CHOP AND SAW MARK RESULTS.

The relative frequencies of cut marks per body parts, do not show any obvious patterns. Although there is a relatively fair distribution of cut marks across the whole carcass, there is generally a slightly higher degree of cut marks on either the fore- or hindlimb, with far fewer on the axial skeleton. (Note that cut marks are found between the occipital condyles of the skull and the atlas; between the atlas and axis; and between the axis and the 3rd cervical vertebra). Otherwise cut marks are more or less evenly spread between the fore- and hindlimbs (see Figures 5.37 to 5.40).

Table 5.9: Frequency of cut marks per skeletal groupings.

	axial skeleton	forelimb	hindlimb
<i>JAM Phase 3</i>	115	216	184
<i>MAN Phase 3</i>	87	59	76
<i>JAM Phase 2</i>	89	211	192
<i>MAN Phase 2</i>	36	27	59

Where cut marks are found on the axial skeleton, they occur most frequently on the ribs and then on the lumbar vertebrae. This is hardly surprising as both skeletal elements undergo a considerable degree of modification either prior to cooking or during consumption. The removal of stewing meat, the thick sirloin and the fillet-steak from the lumbar region may have contributed to the number of cut marks seen there. The separation of ribs into sections and cutting between the intercostal spaces would certainly have added to the number of marks that were counted, despite the fact that many were found on the lateral and medial surfaces and clearly arise during human consumption practices.

The fact that cut marks can occur during primary, secondary or tertiary butchery makes the task of discerning patterns all the more difficult. Equally the presence of cut marks on any of the skeletal elements would not be seen as out of place. Higher frequencies of cut marks at joint articulations would be interpreted as functional butchery marks. Other than cut marks near or at articulating surfaces, their

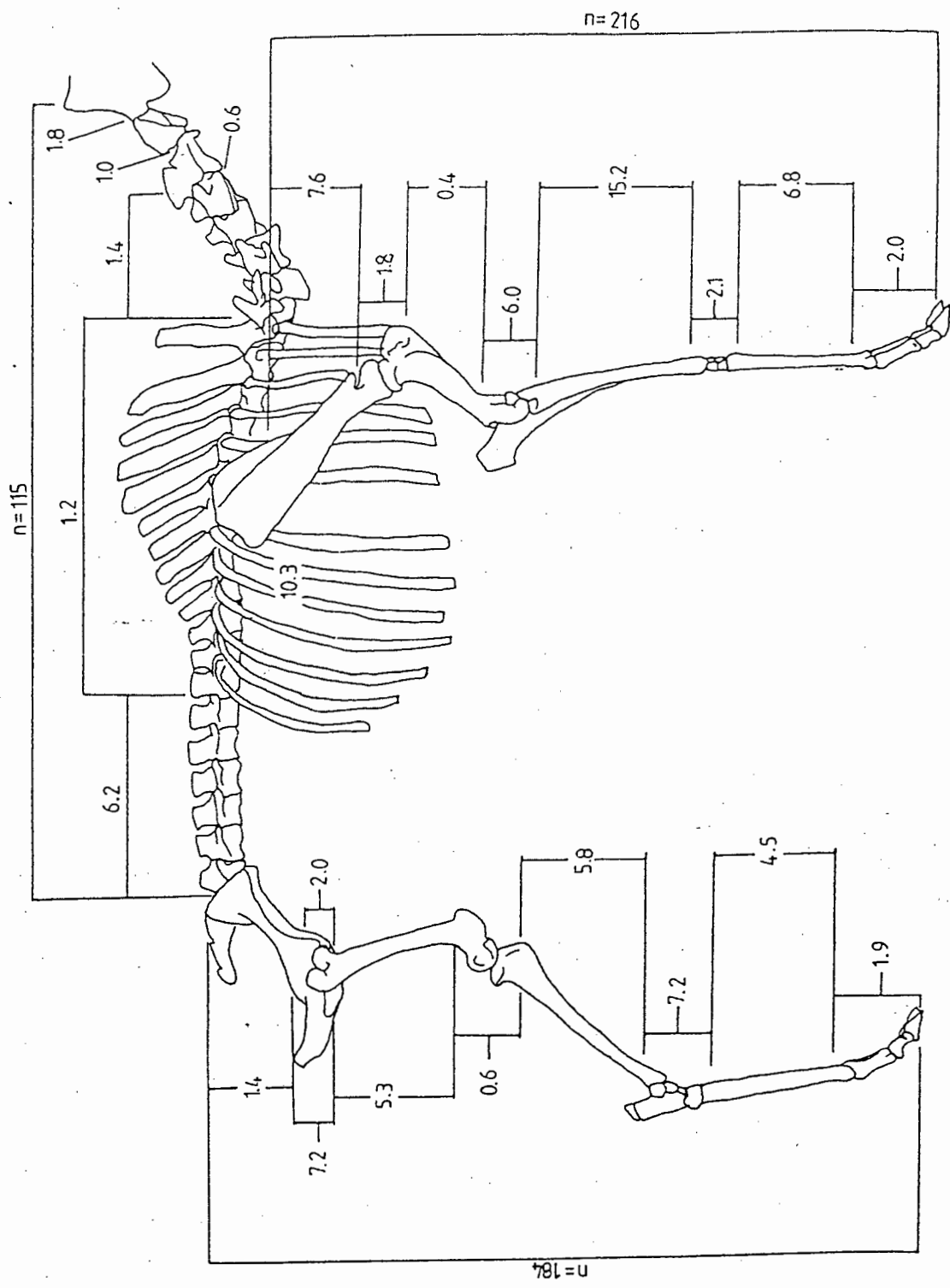


Figure 5.37: Frequency of cut marks per skeletal element, skeletal segment or skeletal grouping for JAM Phase 3..

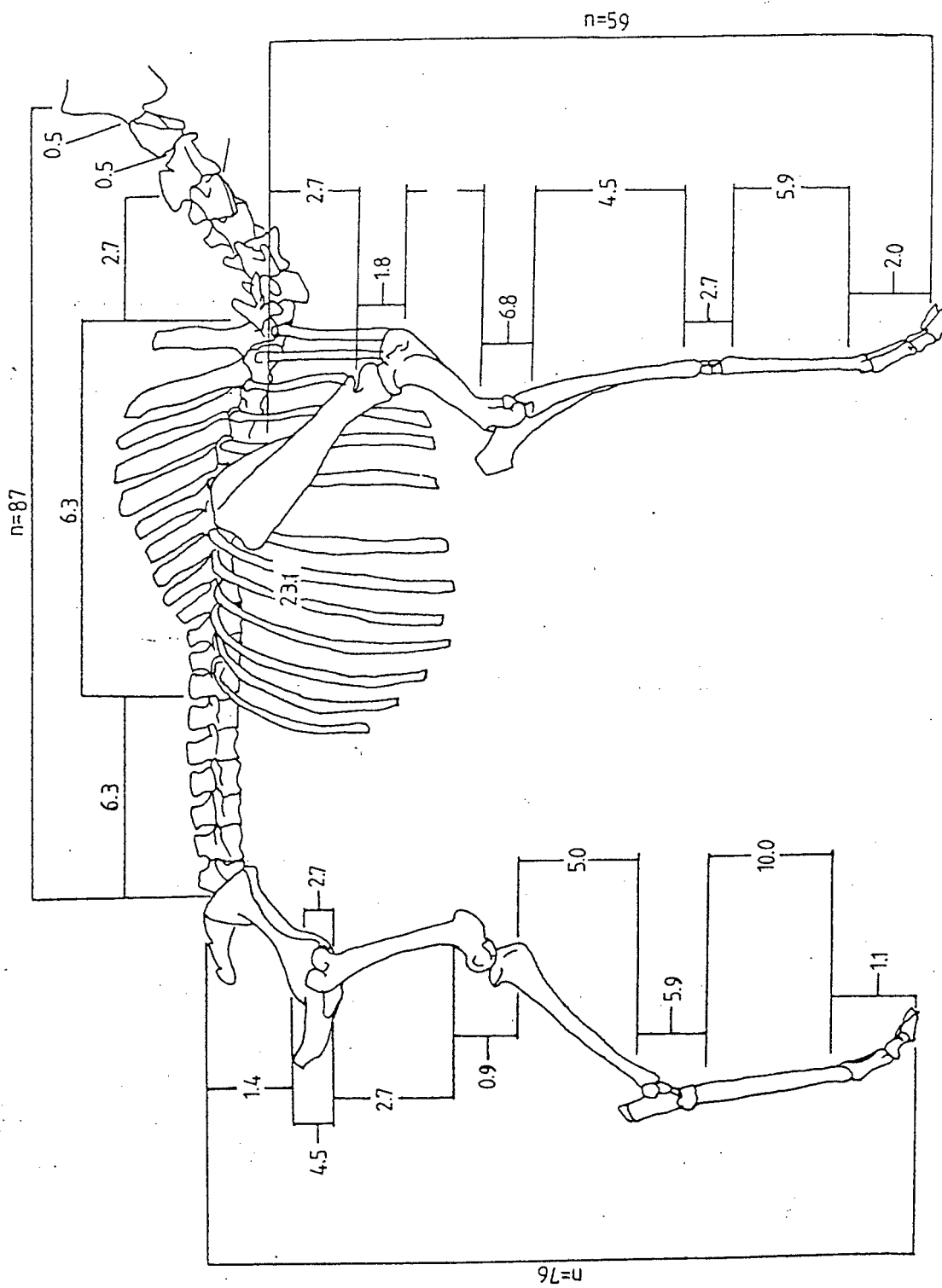


Figure 5.38: Frequency of cut marks per skeletal element, skeletal segment or skeletal grouping for MAN Phase 3..

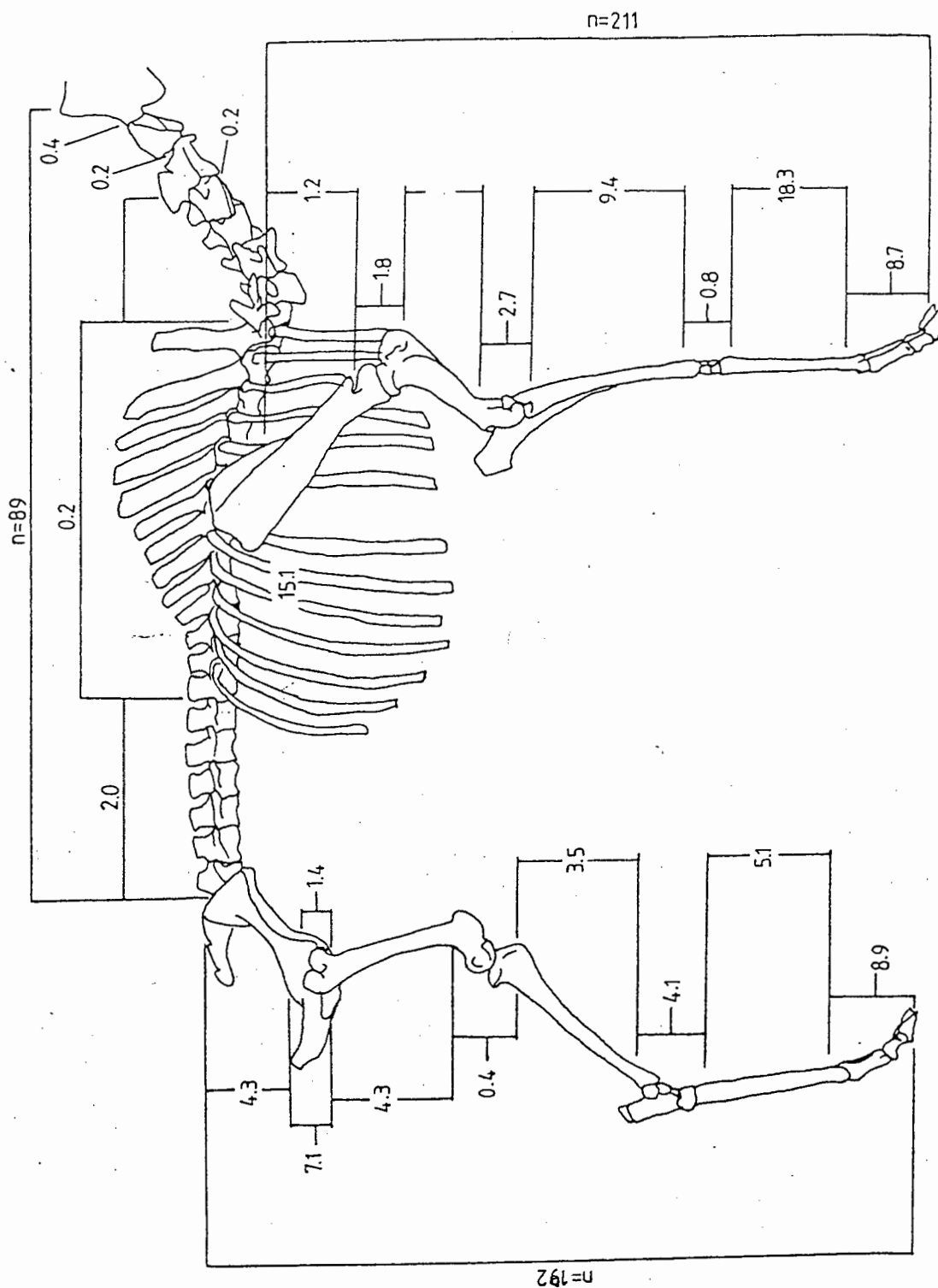


Figure 5.39: Frequency of cut marks per skeletal element, skeletal segment or skeletal grouping for JAM Phase 2.

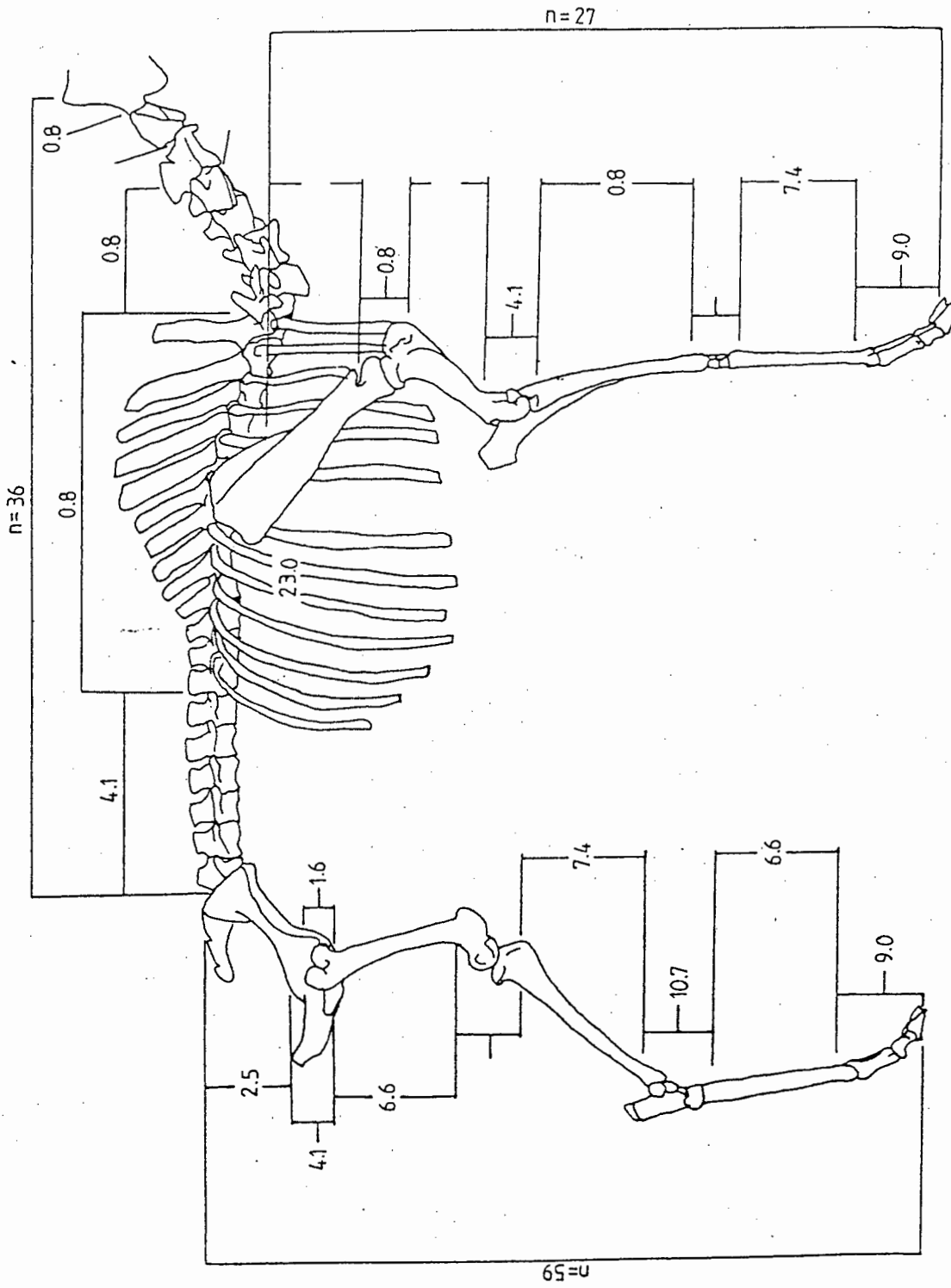


Figure 5.40: Frequency of cut marks per skeletal element, skeletal segment or skeletal grouping for MAN Phase 2.

presence on irregular shaped bones or surfaces, such as the proximal tibia, spine, anterior and posterior border of the scapula, and around the obturator foramen of the innominate would again not be seen as out of place. Cut marks on the phalanges may be interpreted as either part of the skinning process or part of the consumption process of utilizing feet and would neither be considered as unusual.

Lastly, we need to evaluate Spearman's *rho* values for cut marks. Of note here is the values between the different phases. If one looks at MAN Phase 2, one notes that there is a strong correlation between it and JAM Phase 2 (corresponding phases), while there is a weaker correlation between it and Phase 3 from houses JAM and MAN, which one would expect if the phases were different. As with Phase 2 across both houses, there is a fairly strong correlation between each of the houses for Phase 3, with a weak correlation with MAN Phase 2 (dissimilar phases), but however a stronger correlation with JAM Phase 2. Although the general pattern suggests greater similarity between phases, the anomaly of JAM Phase 2 can only be explained by suggesting a greater degree of homogeneity within the faunal sample or stratigraphy of House JAM, rendering differences less easily observable.

Table 5.10: Spearman's *rho* correlation coefficients for cut marks between phases.

	JAM Phase 3	JAM Phase 2	MAN Phase 3	MAN Phase 2
JAM Phase 3	-	0.707	0.712	0.548
JAM Phase 2	0.707	-	0.483	0.775
MAN Phase 3	0.712	0.483	-	0.585
MAN Phase 2	0.512	0.775	0.585	-

The most difficult butchery category to interpret has been the distributions of chop marks (see Figures 5.41 to 5.44). Although there is a degree of patterning between phases, there seems to be a greater degree of background noise, i.e. more variation between the phases.

If one first looks at the number of marks on the axial skeleton, fore- and hindlimb between phases, no clear patterns are discernible.

Table 5.11: Frequency of chop marks per skeletal groupings.

	axial skeleton	forelimb	hindlimb
JAM Phase 3	85	97	45
MAN Phase 3	44	37	28
JAM Phase 2	72	42	43
MAN Phase 2	13	19	32

As one sees from the above table, in some instances the most number of chop marks come from the axial skeleton in MAN Phase 3 and JAM Phase 2, whilst elsewhere most marks are found on the forelimb (JAM Phase 3) or the hindlimb (MAN Phase 2). A similar pattern is clear if one looks at the groupings with the second most abundant frequency of chop marks and those with the least number of marks.

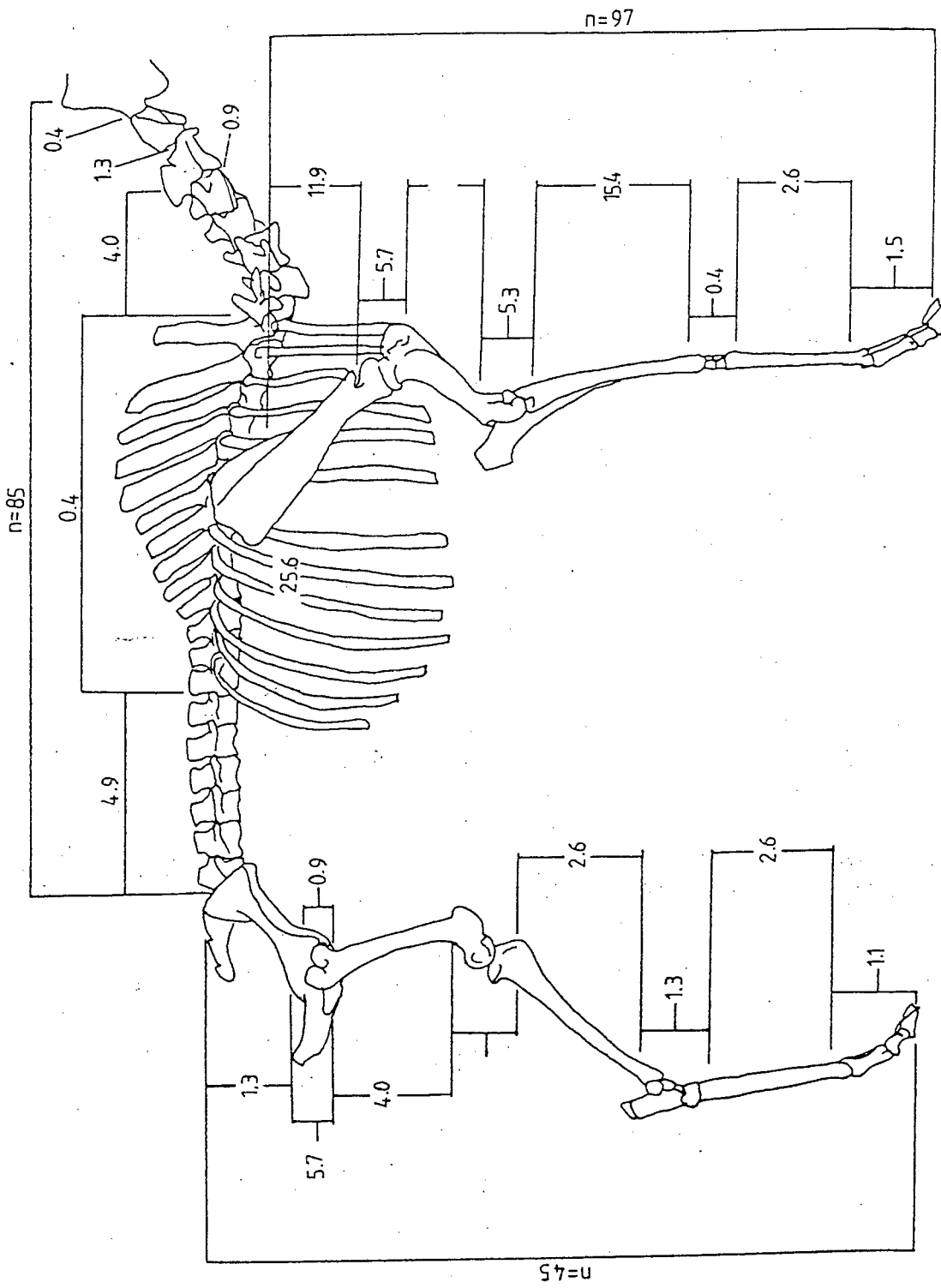


Figure 5.41: Frequency of chop marks per skeletal element, skeletal segment or skeletal grouping for JAM Phase 3.

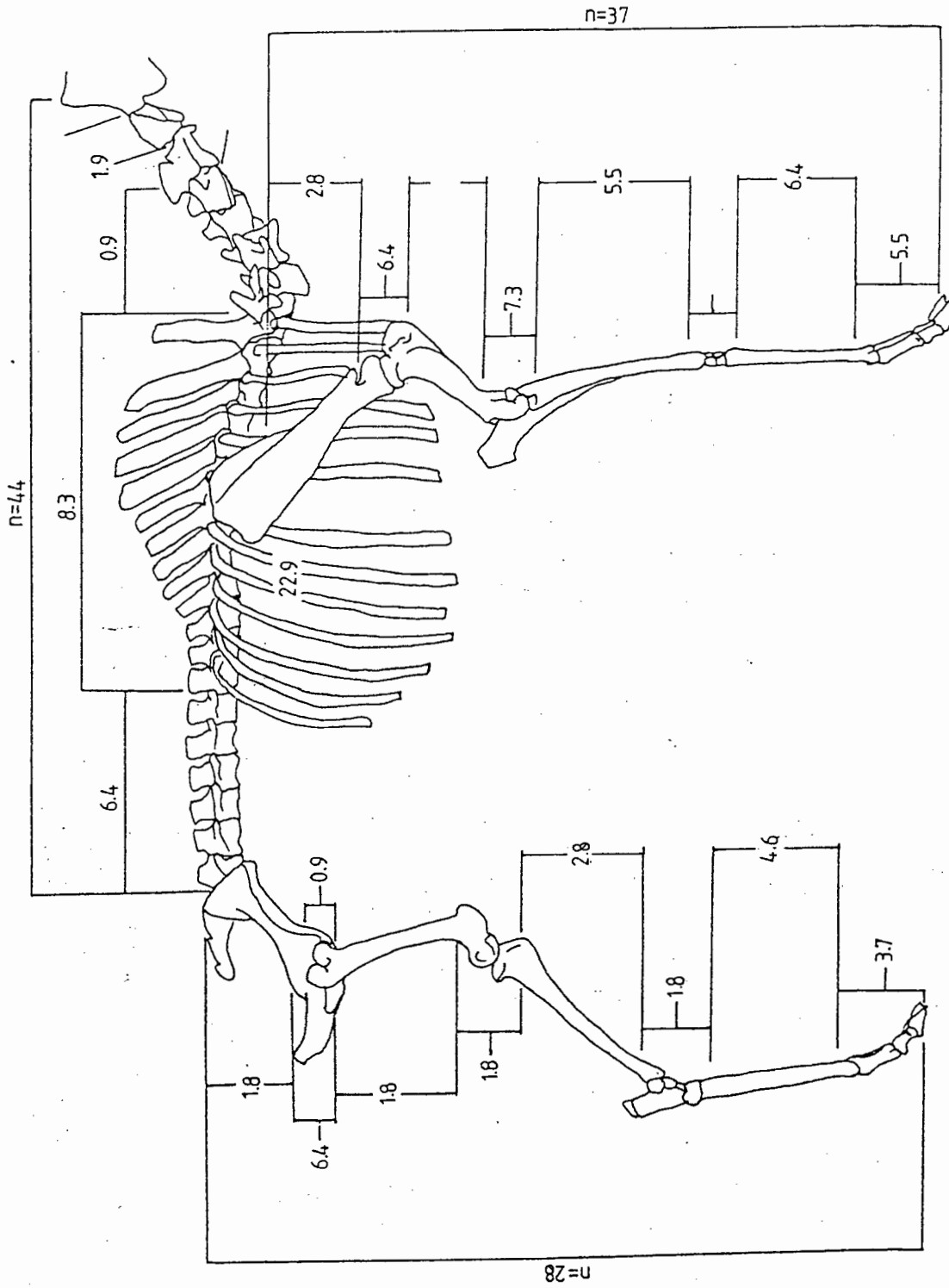


Figure 5.42: Frequency of chop marks per skeletal element, skeletal segment or skeletal grouping for M:AN Phase 3.

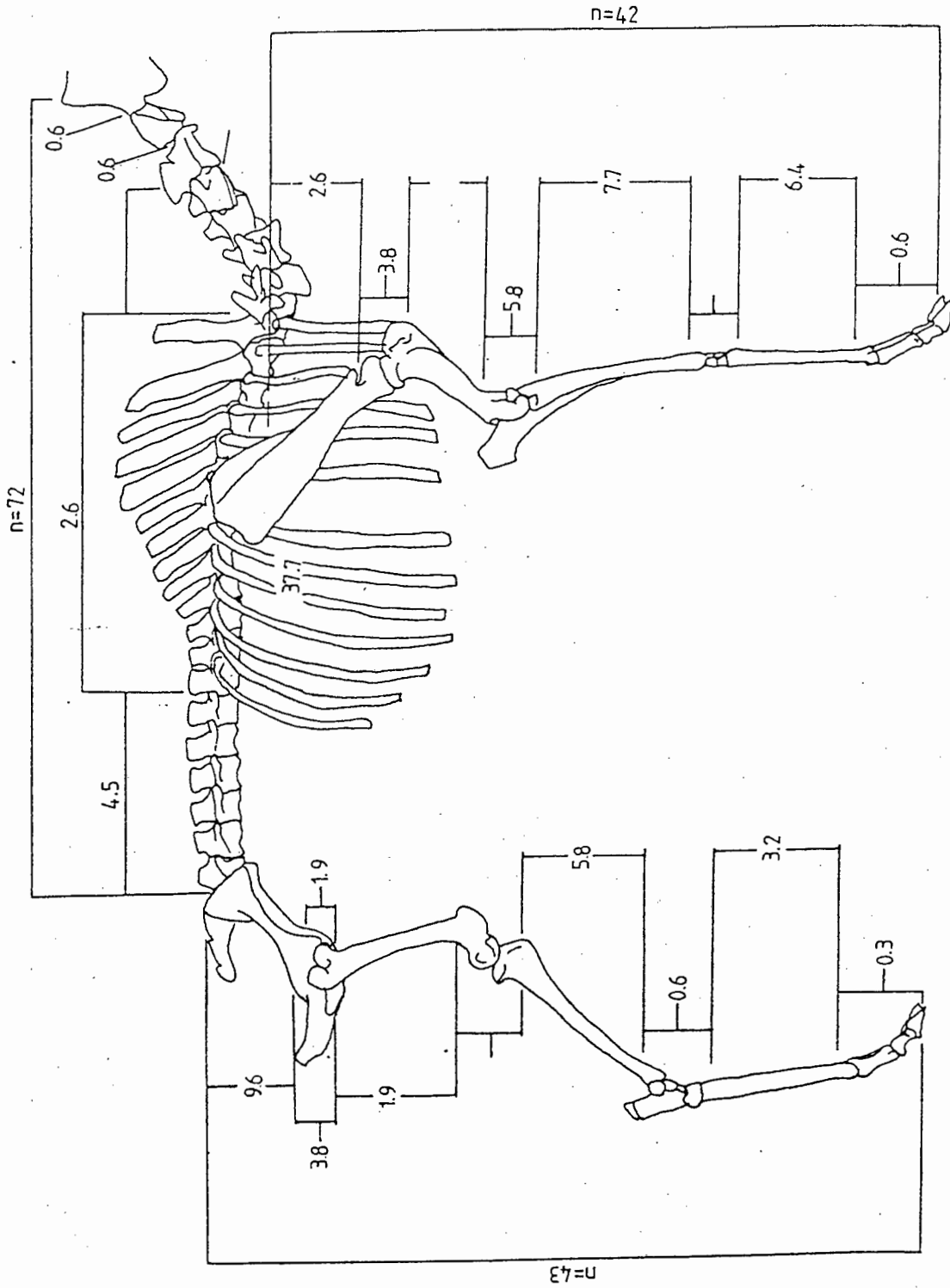


Figure 5.43: Frequency of chop marks per skeletal element, skeletal segment or skeletal grouping for JAM Phase 2.

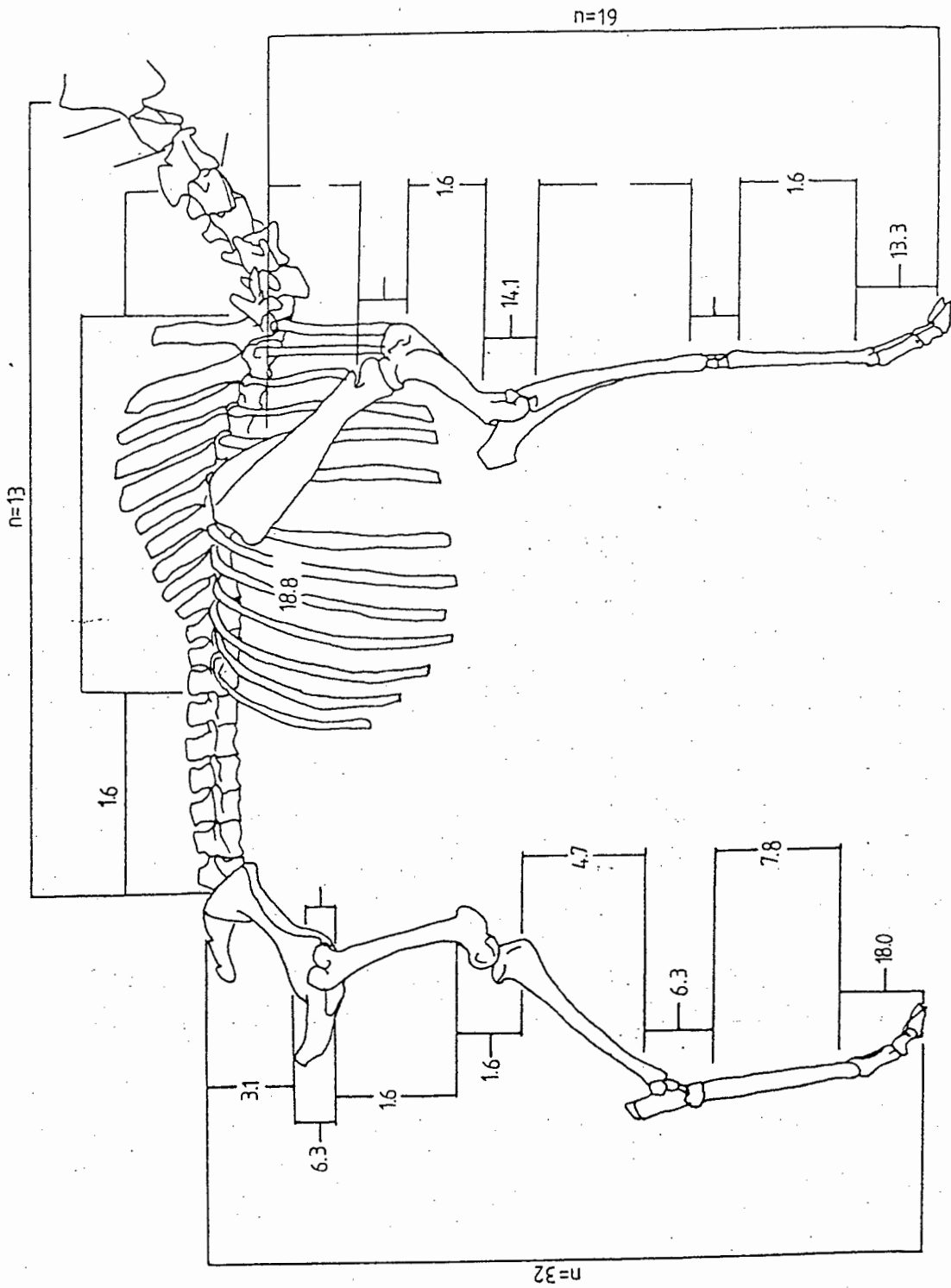


Figure 5.44: Frequency of chop marks per skeletal element, skeletal segment or skeletal grouping for MAN Phase 2.

The high degree of non-patterning across phases has probably also influenced the Spearman's *rho* values.

Table 5.12: Spearman's *rho* correlation coefficients for chop marks between phases.

	JAM Phase 3	JAM Phase 2	MAN Phase 3	MAN Phase 2
JAM Phase 3	-	0.677	0.623	0.214
JAM Phase 2	0.677	-	0.715	0.306
MAN Phase 3	0.623	0.715	-	0.440
MAN Phase 2	0.214	0.306	0.440	-

The above table shows the low degree of similarity between JAM Phases 2 and 3, and MAN Phase 3 on the one side, and MAN Phase 2 on the other. The similar values for JAM Phases 2 and 3, and MAN Phase 3 suggests that the degree of difference between the phases is less pronounced than with MAN Phase 2. This would also imply that MAN Phase 2 is an outlier and does not fit any of the patterns in any of the other phases, i.e. it is significantly different in terms of rank order correlation from each of the other phases.

If one moves attention away from skeletal groupings to individual skeletal joint locations or the skeletal element groupings, one notes that the distribution of chop marks according to anatomical position is more or less stable. Although there is a fair range across anatomical locations, this range is relatively stable across phases. The exceptions, however, are the radial shaft and proximal scapula regions in JAM Phase 3, and the distal humerus-proximal radius/ulna, distal metacarpal- and distal metatarsal-1st to 3rd phalanges regions in MAN Phase 2. Despite these two exceptions, I see the relatively stable range of chop marks across the carcass as supporting the notion of the ax/cleaver/chopper as a general utility tool, which is utilized whenever and wherever it is needed. If there is a pattern among the chop data, it lies in the significant greater utilization of the ax/cleaver/chopper on the medial and lateral ribs (see Figures 5.41 to 5.44). Across all phases the percentage of chop marks is highest in the rib category.

Of all the butchery categories, saw marks provide the most discernible patterns. If one divides the number of saw marks between the axial skeleton, hind- and forelimb, one notes that across all phases that the majority of saw marks are found on the axial skeleton (see Figures 5.45 to 5.48). The table below clearly shows this trend.

Table 5.13: Frequency of saw marks per skeletal groupings.

	axial skeleton	forelimb	hindlimb
JAM Phase 3	154	24	24
MAN Phase 3	79	11	9
JAM Phase 2	58	-	3
MAN Phase 2	73	14	17

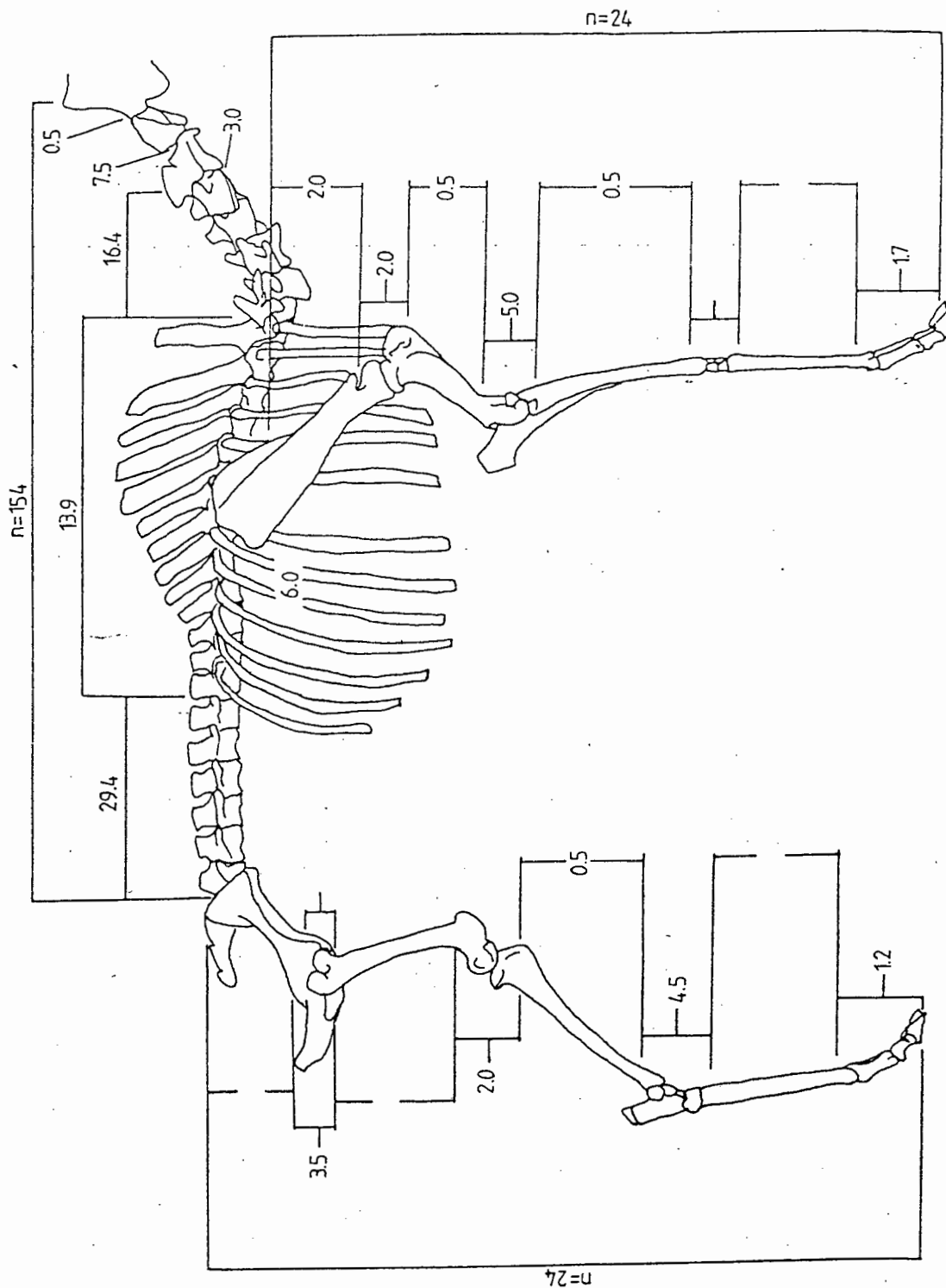


Figure 5.45: Frequency of saw marks per skeletal element, skeletal segment or skeletal grouping for JAM Phase 3.

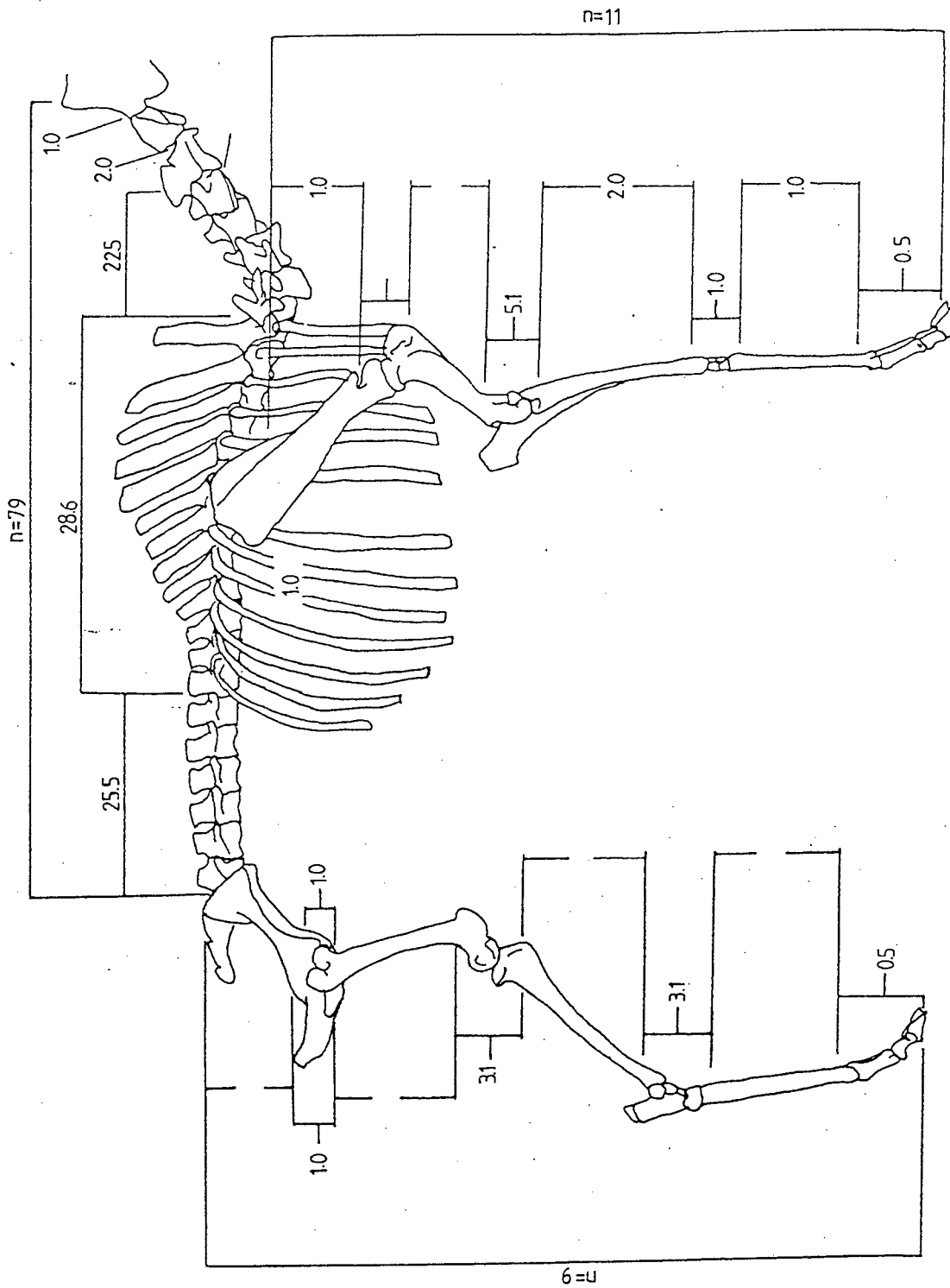


Figure 5.46: Frequency of saw marks per skeletal element, skeletal segment or skeletal grouping for MAN Phase 3.

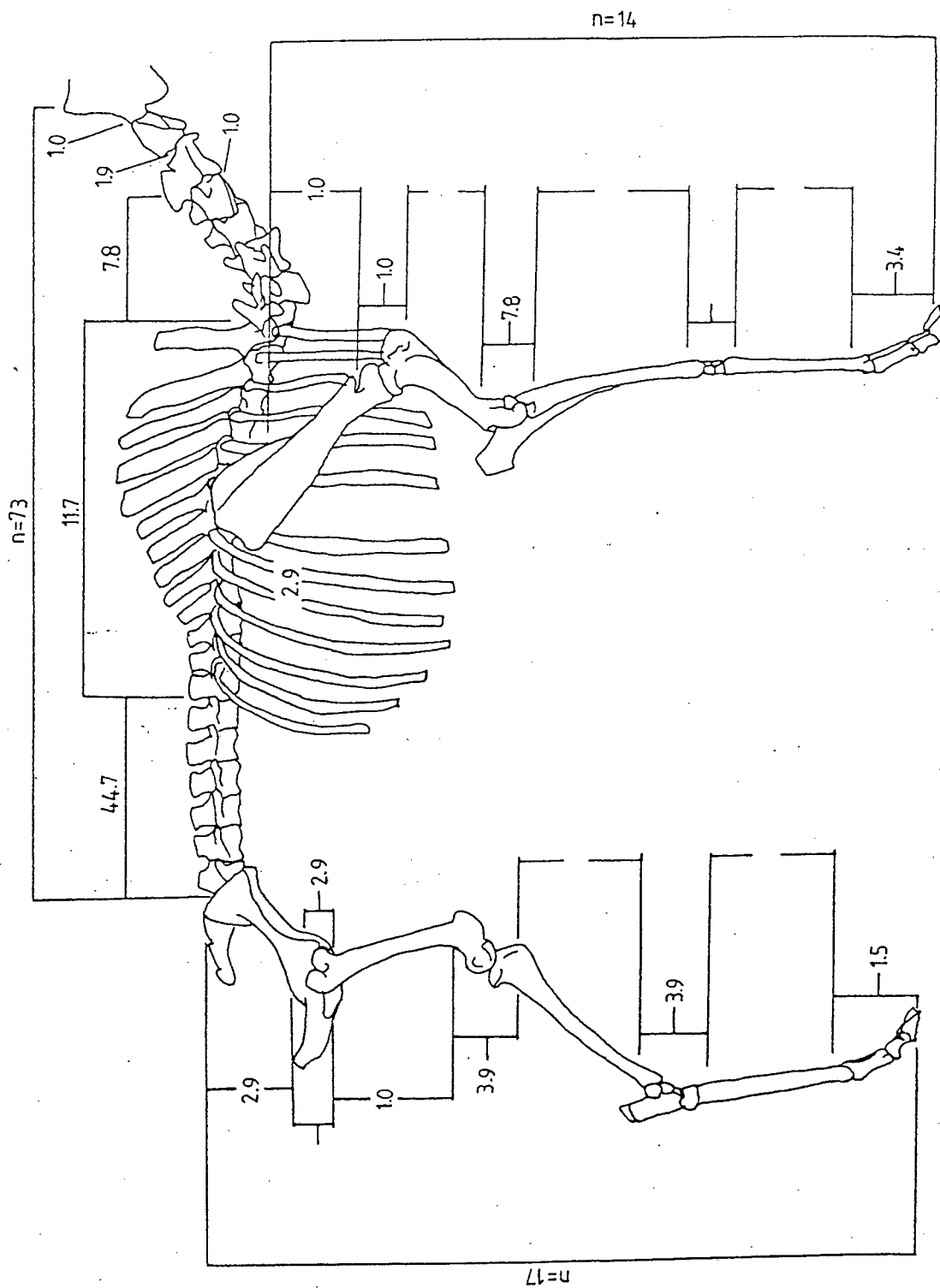


Figure 5.47: Frequency of saw marks per skeletal element, skeletal segment or skeletal grouping for JAM Phase 2.

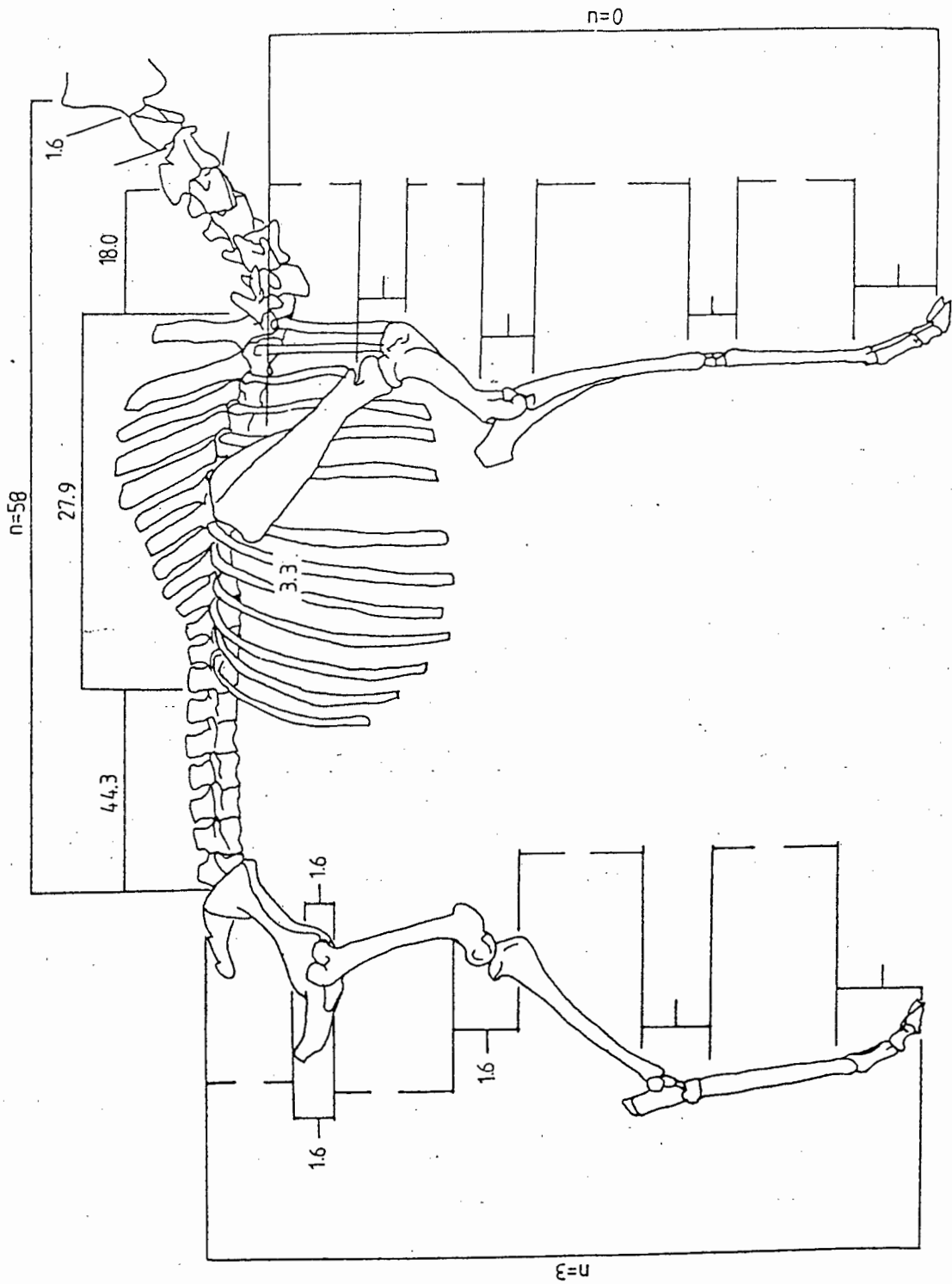


Figure 5.48: Frequency of saw marks per skeletal element, skeletal segment or skeletal grouping for MAN Phase 2.

Saw marks are found in high frequencies on all the vertebrae (cervical, thoracic and lumbar), not excluding either the axis or atlas<sup>5</sup>. If there is a directional trend along the axial skeleton, saw marks are encountered more often on the lumbar vertebrae, decreasing slowly as one moves anteriorly up the skeleton. The greater frequency of marks on the lumbar vertebrae may in part be influenced by sample size or the number of lumbar vertebrae recovered, but more likely reflect the fact that the choicer parts of meat are located here (the thick sirloin and the fillet steak), as well as the degree of stewing meat which comes from this region. Although a cursory study of butchery marks was done on the Oudepost material (cf. Cruz-Urbe and Schrire 1991) where saw marks were noted, they do not indicate where these took place, nor do they note the presence of chop or gnaw marks, while no data is provided for the Paradise material (Avery 1989).

Despite this pattern, the saw is also used at a number of joint regions: the scapula-humerus, humerus-radius/ulna, innominate-proximal femur, distal femur-proximal tibia, and around the carpal and tarsal joints. Despite the heavier use of this butchery tool near some of the joints (especially the humerus-radius/ulna and femur-tibial joint), the utilization of the saw in these and other regions shows that it also performed a general utility function, as a multipurpose tool.

The Spearman's *rho* values for the relationship of saw marks between phases for each of the joint regions and skeletal groupings is summarized below.

Table 5.14: Spearman's *rho* correlation coefficients for saw marks between phases.

	JAM Phase 3	JAM Phase 2	MAN Phase 3	MAN Phase 2
JAM Phase 3	-	0.786	0.639	0.637
JAM Phase 2	0.786	-	0.719	0.689
MAN Phase 3	0.639	0.719	-	0.638
MAN Phase 2	0.637	0.689	0.638	-

The resultant  $r_s$  values range between 0.637 and 0.786 indicate that the distribution of saw marks between each of phases does not vary significantly between each phase.

## 5.6. THE BASIC UNITS OF ACQUISITION.

Now that we have an idea of the process by which a carcass was utilized, let us consider the basic units of acquisition through which livestock could be acquired either as a larger butchering portion, as whole and half sheep can be acquired from butchers today, or alternatively in finished form, as a specific

<sup>5</sup> The fact that the saw was predominantly used to saw through the vertebral column has also been found among a consignment of Cape beef from the Vergulde Draeck, wrecked off the West Australian coast in 1656 (after Green 1977: 244-247 in Cruz-Urbe 1991: 100), despite Deetz's (1977: 124-125) suggestion that saws were only used after the late 18th century. I would modify his earlier suggestion that saws were only utilized to cut meat then, by saying that although saws were always available, they were *the best* equipped tools to dissect the carcass in half as it would have been absurd to split the carcass by chopping through the vertebral column. However a greater reliance was placed on the saw after the late 18th century and that this change should be seen in the overall percentages of saw marks on each of the skeletal elements.

cut of meat. [Greater detail will be given to this below in the next chapter when we consider the origin of the sheep, their arrival through various means at the Cape, and their subsequent entry into a market exchange economy alongside other articles of produce]. In addition to providing data on units of acquisition, data on MNI and average possible weight will also briefly be presented here.

To facilitate consideration of units of acquisition, minimum numbers of skeletal elements per phase were established, with the assumption based on the evidence above, that each half of the carcass was being treated in the same fashion (see Table 5.15 and 5.16; see Binford 1978: 70 on the use of left and right sides). This differs from the data provided in Table 5.17 on maximum MNI for each phase, as consideration of both left and right elements had to be undertaken. The second assumption underlying this section is that most or nearly all of the individuals which added to the faunal assemblage were older than 12 months. The contemporary historical literature supports this assumption, as do faunal results from two earlier dated sites (cf. Avery 1989; Cruz-Uribe and Schrire 1991). Discussing the ages at which sheep are sent to the market, Mentzel (1944) states that:

"[... sheep] are slaughtered between their first and second years. At this age their mutton tastes best and as a tremendous amount of mutton is consumed here, delivered to Dutch ships and sold to foreign ships, the wethers are not allowed to grow older. If this were not the case the farmers who live from a hundred and twenty miles from the City would not be able to sell their sheep" (Mentzel 1944: 212).

On the basis of this evidence, data provided by Lyman (1979) has been used on the average weights of sheep older than one year. The live weight of sheep older than 12 months, Lyman (1979) gives as 95 pounds, of which only 50 percent is consumable, leaving 47½ lbs of consumable meat (see Table 3.2).

Using the definitions of skeletal portions and butchering units of the standardized 19th century method by which a carcass was utilized, information was gained both on the actual amount of meat that could be gained on general skeletal portions and specific cuts of meat (see Table 5.18 and 5.19). Two interesting points can be noted from Table 5.18 on actual amount of meat (which is measured by MTWT) provided by skeletal portion per phase, as it is unlikely that each carcass was subjected to full utilization. Firstly, the dominating skeletal portions are divided between fore- and hindquarters, almost equally. The rib-vertebra section seems to be rather underrepresented. This may relate to socio-economic or cultural reasons. Secondly, although both fore- and hindquarter are particularly dominant, their contribution in real meat terms is 50 percent less, i.e. the consumable meat from the rib-vertebrae section is 50 percent higher than that of either fore- or hindquarter. Selection was therefore aimed at skeletal portions that provided less meat in relation to others. Were these skeletal portions were cheaper? Were they attempting to acquire meat cost-efficiently?

Basing our assumption on the utilization of individuals older than a year - historical information in Chapter 6 supports this view - poundage figures for sheep of that age group have similarly been taken from Lyman (1979: 541) so as to establish the contributions by butchering unit. Of note here is that the top four butchering units include the leg (pelvis, sacrum, femur, tibia, metatarsal, tarsal, and patella), chuck (cervical vertebrae, scapula, thoracic vertebrae 1-5, rib 1-5, proximal humerus and shaft), loin

Table 5.15: Minimum skeletal elements per phase.

	JAM PHASE 2	MAN PHASE 2	JAM PHASE 3	MAN PHASE 3
<i>astragalus</i>	$\frac{9}{8}$	$\frac{10}{10}$	$\frac{15}{15}$	$\frac{6}{6}$
<i>atlas</i>	$\frac{7}{4}$	$\frac{3}{3}$	$\frac{20}{11}$	$\frac{5}{4}$
<i>axis</i>	$\frac{4}{4}$	=	$\frac{10}{7}$	$\frac{2}{2}$
<i>calcaneum</i>	$\frac{8}{5}$	$\frac{9}{8}$	$\frac{22}{16}$	$\frac{13}{12}$
<i>caudal vertebrae</i>	$\frac{3}{3^2}$	$\frac{10}{10}$	$\frac{9}{9}$	$\frac{5}{5}$
<i>cuneiform</i>	$\frac{2}{2}$	=	$\frac{5}{5}$	$\frac{3}{3}$
<i>cervical vertebrae</i>	$\frac{11}{10^2}$	$\frac{5}{6}$	$\frac{46}{32}$	$\frac{20}{19}$
<i>external cuneiform</i>	$\frac{3}{3}$	$\frac{3}{3}$	$\frac{6}{6}$	$\frac{2}{2}$
<i>femur, proximal</i>	$\frac{21}{7}$	$\frac{14}{5}$	$\frac{19}{4}$	$\frac{29}{11}$
<i>femur, mid-shaft</i>	4	3	3	3
<i>femur, distal</i>	7	3	7	5
<i>humerus, proximal</i>	$\frac{12}{4}$	$\frac{6}{-}$	$\frac{20}{2}$	$\frac{12}{2}$
<i>humerus, mid-shaft</i>	-	2	3	-
<i>humerus, distal</i>	5	6	14	9
<i>hyoid</i>	=	=	$\frac{2}{2}$	=
<i>innominate, proximal</i>	$\frac{19}{8}$	$\frac{8}{3}$	$\frac{29}{10}$	$\frac{14}{2}$
<i>innominate, distal</i>	3	2	6	3
<i>innominate, acetabulum</i>	14	6	19	12
<i>internal cuneiform</i>	$\frac{1}{1}$	=	=	=
<i>lateral malleolus</i>	$\frac{3}{3}$	$\frac{1}{1}$	$\frac{9}{9}$	$\frac{2}{2}$
<i>lunate</i>	$\frac{3}{3}$	$\frac{6}{6}$	$\frac{10}{10}$	=
<i>lumber vertebrae</i>	$\frac{38}{32^2}$	$\frac{16}{17}$	$\frac{57}{37}$	$\frac{23}{21}$
<i>magnum</i>	$\frac{3}{3}$	$\frac{1}{1}$	$\frac{9}{9}$	$\frac{5}{5}$
<i>mandible</i>	$\frac{40}{30}$	$\frac{10}{7}$	$\frac{3}{3}$	$\frac{13}{11}$
<i>metacarpal, proximal</i>	$\frac{23}{15}$	$\frac{11}{6}$	$\frac{17}{11}$	$\frac{14}{8}$
<i>metacarpal, mid-shaft</i>	16	6	10	7
<i>metacarpal distal</i>	11	9	8	7
<i>metatarsal, proximal</i>	$\frac{10}{9}$	$\frac{13}{8}$	$\frac{11}{10}$	$\frac{14}{10}$

	JAM PHASE 2	MAN PHASE 2	JAM PHASE 3	MAN PHASE 3
<i>metatarsal, mid-shaft</i>	7	7	5	8
<i>metatarsal, distal</i>	5	8	2	5
<i>naviculo-cuboid</i>	$\frac{4}{4}$	$\frac{11}{11}$	$\frac{12}{11}$	$\frac{9}{9}$
<i>patella</i>	$\frac{4}{4}$	-	$\frac{1}{1}$	$\frac{4}{4}$
<i>phalanx 1st, proximal</i>	$\frac{34}{23^2}$	$\frac{35}{34}$	$\frac{35}{30}$	$\frac{22}{11}$
<i>phalanx 1st, mid-shaft</i>	32	32	33	17
<i>phalanx 1st, distal</i>	30	26	30	20
<i>phalanx 2nd, proximal</i>	$\frac{24}{21^2}$	$\frac{35}{34}$	$\frac{29}{29}$	$\frac{14}{14}$
<i>phalanx 2nd, mid-shaft</i>	23	35	28	12
<i>phalanx 2nd, distal</i>	23	35	28	12
<i>phalanx 3rd, proximal</i>	$\frac{22}{22^2}$	$\frac{46}{35}$	$\frac{13}{13}$	$\frac{9}{9}$
<i>phalanx 3rd, distal</i>	22	45	13	9
<i>pistiform</i>	-	-	$\frac{1}{1}$	-
<i>radius, proximal</i>	$\frac{23}{14}$	$\frac{15}{5}$	$\frac{43}{17}$	$\frac{11}{4}$
<i>radius, mid-shaft</i>	9	4	20	4
<i>radius, distal</i>	5	8	22	5
<i>ribs</i>	$\frac{87}{74^2}$	$\frac{62}{53}$	$\frac{103}{87}$	$\frac{57}{50}$
<i>sacrum, proximal</i>	$\frac{7}{4}$	$\frac{2}{2}$	$\frac{5}{3}$	$\frac{4}{3}$
<i>sacrum, mid-section</i>	1	-	1	1
<i>sacrum, distal</i>	1	-	2	-
<i>scaphoid</i>	$\frac{2}{2}$	$\frac{8}{8}$	$\frac{6}{6}$	$\frac{1}{1}$
<i>scapula, distal</i>	$\frac{9}{8}$	$\frac{1}{1}$	$\frac{29}{18}$	$\frac{11}{11}$
<i>scapula, proximal</i>	2	0	16	3
<i>scapula, mid-shaft</i>	6	0	15	8
<i>sternum</i>	-	-	$\frac{1}{1}$	-
<i>thoracic vertebrae</i>	$\frac{13}{14^2}$	$\frac{11}{14}$	$\frac{30}{23}$	$\frac{36}{42}$
<i>tibia, proximal</i>	$\frac{15}{3}$	$\frac{9}{4}$	$\frac{17}{4}$	$\frac{10}{3}$
<i>tibia, mid-shaft</i>	6	3	6	4
<i>tibia, distal</i>	11	3	9	6
<i>ulna, proximal</i>	$\frac{4}{2}$	$\frac{3}{2}$	$\frac{16}{12}$	$\frac{9}{7}$
<i>ulna, semi-lunar notch</i>	3	3	12	8
<i>ulna, distal mid-shaft</i>	4	2	12	3
<i>ulna, distal</i>	2	-	6	-
<i>unciform</i>	$\frac{3}{3}$	$\frac{2}{2}$	$\frac{6}{6}$	-

- Notes:
1. The numbers in italics refer to the total NISP for that skeletal element.
  2. The data for the vertebrae, phalanges and ribs are still in their raw form and should be divided by the frequency of that skeletal element in the skeleton.

Table 5.16: MNIs of skeletal elements by phase.

	JAM PHASE 2	MAN PHASE 2	JAM PHASE 3	MAN PHASE 3
<i>astragalus</i>	8.0	10.0	15.0	6.0
<i>atlas</i>	4.0	3.0	11.0	4.0
<i>axis</i>	4.0	-	7.0	2.0
<i>calcaneum</i>	5.0	8.0	16.0	12.0
<i>caudal vertebrae</i>	1.0	3.3	3.0	1.7
<i>cervical vertebrae</i>	2.0	1.2	6.4	3.8
<i>cuneiform</i>	2.0		5.0	3.0
<i>external cuneiform</i>	3.0	3.0	6.0	2.0
<i>femur</i>	7.0	5.0	7.0	11.0
<i>humerus</i>	5.0	6.0	14.0	9.0
<i>hyoid</i>	-	-	2.0	-
<i>innominate</i>	14.0	6.0	19.0	12.0
<i>internal cuneiform</i>	1.0	-	-	-
<i>lateral malleolus</i>	3.0	1.0	9.0	2.0
<i>lumbar vertebrae</i>	5.3	2.8	6.2	3.5
<i>lunate</i>	3.0	6.0	10.0	-
<i>magnum</i>	3.0	1.0	9.0	5.0
<i>mandible (half)</i>	30.0	7.0	3.0	11.0
<i>metacarpal</i>	16.0	9.0	11.0	8.0
<i>metatarsal</i>	9.0	8.0	10.0	10.0
<i>naviculo-cuboid</i>	4.0	11.0	11.0	9.0
<i>patella</i>	4.0	-	1.0	4.0
<i>phalanx 1st</i>	16.0	17.0	16.5	10.0
<i>phalanx 2nd</i>	11.5	17.5	14.5	7.0
<i>phalanx 3rd</i>	11.0	22.5	6.5	4.5
<i>pistiform</i>	-	-	1.0	-
<i>radius</i>	14.0	8.0	22.0	5.0
<i>ribs</i>	5.7	4.1	6.7	3.8
<i>sacrum</i>	4.0	2.0	3.0	3.0
<i>scaphoid</i>	2.0	8.0	6.0	1.0
<i>scapula</i>	8.0	1.0	18.0	11.0
<i>sternum</i>	-	-	1.0	-
<i>thoracic vertebrae</i>	1.1	1.1	1.8	3.2
<i>tibia</i>	11.0	4.0	9.0	6.0
<i>ulna</i>	4.0	3.0	12.0	8.0
<i>unciform</i>	3.0	2.0	6.0	-





(lumbar vertebrae) and short/hotel rack (thoracic vertebrae 6-12, dorsal rib 6-12, lumbar vertebrae) (see Table 3.4).

Similarly, to facilitate an understanding of the selection of certain skeletal elements/butchering units, a table has been constructed in which each of the butchering units have been ranked according to those units which provide the greatest amount of meat. In cases of ties, both butchering units have been given half their combined rankings, with the following one ranked two above the first case (see below).

Table 5.20: Ranking of butchering units listed in Table 5.19.

	JAM Phase 2	MAN Phase 2	JAM Phase 3	MAN Phase 3
<i>chuck</i>	2	4.5	2	2
<i>foreshank</i>	5	4.5	4	5
<i>brisket</i>	8	8	8	8
<i>breast</i>	6	6	7	6
<i>short/hotel rack</i>	4	3	5	4
<i>loin</i>	3	2	3	3
<i>flank</i>	7	7	6	7
<i>leg</i>	1	1	1	1

The general pattern is as follows. The leg is best represented across all phases. Second is the chuck (or shoulder section), with the loin third. Four and fifth place is shared collectively by the short/hotel rack and the foreshank. Sixth place is taken by the breast, with seven going to the flank. In last place across all phases is the brisket. The ranking of butchering units seems to follow the amount of consumable meat provided by each unit. Is this co-incidental or are we seeing individual/group choice pertaining to cost-efficiency - the selection of units that are providing the greatest amounts of meat?

The presence of a number of large skeletal fragments, whether from the fore- or hindquarter, suggests that roasts formed a significant part of the diet. If we assume that people after a full day's work had little time at hand to prepare food, then roasts may have been particularly useful. They required the minimum possible time and effort to be invested in food preparation and serving, as well as providing a quantity of meat (see Schulz and Gust 1983a: 49-50). Roasts required little effort, as they could be "placed in the oven (or on the stove to boil) in the morning and left to cook unattended" (Huelsbeck n.d.: 3). Meat could easily be cut off the bone for individual servings. In addition, specific single serving cuts, like steaks and chops, are usually more expensive per pound than roasts (Huelsbeck 1994: 4), and therefore there may have been a cost-incentive in acquiring multi-serving cuts.

To test the degree of similarity between the phases for each of the butchery portions, i.e. to test how strong the general pattern described above is, a Spearman's rank correlation coefficient was established.

Table 5.21: Spearman's *rho* correlation coefficients for each of the butchery portions between different phases.

	JAM Phase 3	JAM Phase 2	MAN Phase 3	MAN Phase 2
<i>JAM Phase 3</i>	-	0.95	0.95	0.84
<i>JAM Phase 2</i>	0.95	-	1.00	0.90
<i>MAN Phase 3</i>	0.95	1.00	-	0.90
<i>MAN Phase 2</i>	0.84	0.90	0.90	-

The resultant  $r_s$  values would suggest that there is little difference between each of the phases. Even the lowest correlation between JAM Phase 3 and MAN Phase 2 is relatively high at 0.84. In all cases the correlation coefficient is significant beyond the 5% level ( $p < 0.05$ ). There is thus not significant archaeological evidence to suggest that there is any difference between each of the phases in the numbers of individual butchery portions. If one accepts the assumption that the material found at Sea Street originated from sources elsewhere in Cape Town, and were dumped on or near the beach, then the faunal analysis leads to a number of inferences:

1. The method of butchery had not changed significantly between Phases 2 and 3.
2. By extension, the units of acquisition remained fairly stable, even though there were differences in the frequencies between butchery portions.
3. Cultural differences have not filtered into the zooarchaeological record, whether these had originated at the household level (secondary or tertiary) or at the butcher (primary level).
4. A further reason for the relative high degree of similarity, and low degree of dissimilarity, may relate to technology, i.e. the instruments used in the butchery process. If one accepts that there was a narrow range of instruments that could be used in butchering - saw, knife, or ax/cleaver/chopper - then one acknowledges that the degree of variability between samples is reduced due to the functional choices that butchers made.

Woodborne (1994) has gone one stage further, and has discussed how the butchery cuts were cooked. Firstly, he calculated MNIs per skeletal element (see Woodborne 1994: table 3), and thereafter established the number of cooking units, as either stewing units, individual and communal roasts, or waste (see Table 5.22). He fails, however, to consider mandibles, ribs, ulna, 1st and 2nd cervical vertebrae, carpals and tarsals. Some of these skeletal elements are similarly excluded in the analysis by Lyman (1979) and others. Similarly, I am at odds with Woodborne's (1994) inclusion of metacarpals and metatarsals as waste<sup>6</sup>. For example, I have noted the presence of the distal tibia with the proximal

<sup>6</sup> Woodborne (1994:7-8) does, however, provide detailed reasons why metacarpals or metatarsals are included as waste items. His reasoning is as follows. "The existence of skinning marks at two locations on the lower limb may result from the feet (metapodials and phalanges) being left on the skin during primary butchery, and the subsequent removal of the phalanges (perhaps the hoof itself). If this is the case then the presence of feet bones at the site indicates that the skin, and therefore the whole butchery process, was handled at the domestic unit. The bimodality in

Table 5.22: MNIs of cooking units by phase (adapted from Woodborne 1994).

	JAM PHASE 2	MAN PHASE 2	JAM PHASE 3	MAN PHASE 3
<i>Stewing Units</i>				
*[mandible	15.0	3.5	1.5	5.5]
*[atlas	4.0	3.0	11.0	4]
*[axis	4.0	-	7.0	2]
cervical vertebrae	2.0	1.2	6.4	3.8
lumber vertebrae	5.3	2.8	6.2	3.5
	<b>7.3</b>	<b>4.0</b>	<b>12.6</b>	<b>7.3</b>
<i>Individual Roasts</i>				
innominate	14.0	6.0	19.0	12.0
**rack of ribs	5.7	4.1	6.7	3.8
sacrum	4.0	2.0	3.0	3.0
scapula	8.0	1.0	18.0	11.0
thoracic vertebrae	1.1	1.1	1.8	3.2
	<b>32.8</b>	<b>14.2</b>	<b>48.5</b>	<b>33.1</b>
<i>Communal Roasts</i>				
femur	7.0	5.0	7.0	11.0
humerus	5.0	6.0	14.0	9.0
radius	14.0	8.0	22.0	5.0
*[ulna	4.0	3.0	12.0	8.0]
tibia	11.0	4.0	9.0	6.0
	<b>37.0</b>	<b>23.0</b>	<b>52.0</b>	<b>31.0</b>
<i>Waste</i>				
*[carpals	3.0	8.0	10.0	5.0]
metacarpal	16.0	9.0	11.0	8.0
*[tarsals	8.0	11.0	16.0	12.0]
metatarsal	9.0	8.0	10.0	10.0
phalanges	16.0	23.0	17.0	10.0
	<b>41.0</b>	<b>40.0</b>	<b>38.0</b>	<b>28.0</b>

\*Not included in the original analysis by Woodborne (1994), nor included in the analysis here, but given as an indication of how the cooking units could be adjusted with the addition of other units such as the mandible.

\*\*Not included in the original analysis by Woodborne (1994), but added here.

metatarsal as one butchering unit that could be roasted. In addition, a number of cuts have dual or multiple uses, including being prepared as soups, brawn, meat stock, minced meat, roasts, grills, fried, pot-roasted, and/or stew. For example, steaks could have been cut up and used in stews, etc. (Huelsbeck n.d.: 3). For these reasons, discussion on the uses to which various cuts were put is not included here (see Chapter 6 below for some discussion on the utilization of various cuts for different servings).

## 5.7. CONCLUSION.

One might argue that because no noticeable changes were noted across the phases from Sea Street why indeed was the faunal analysis done and why was the material analyzed by unit/phase rather than as one sample? Firstly, during excavation, the stratigraphic layering suggested that certain layers were discrete, and not the result of one fill episode; therefore the faunal material could not be combined together. Secondly, on the advice of the principal excavators, certain layers were combined as part of different phases, which were considered temporally discrete. Thirdly, at the beginning of this research project, it was believed that part of the site material was contemporary with the construction and occupation of the houses on the Sea Street lot. Included in the original interpretations (cf. Hall 1991) was the belief that Phases 2 and 3 from Sea Street were temporally different. In addition, the expectation of temporal change affecting the faunal patterning was not totally unwarranted considering the maximum time range for the site (*c.* 1760-*c.* 1836), as well as the evidence of technological changes toward the turn of the 19th century (see following page), and the change over of governments around the same time from VOC outpost to British colony. The possibility for cultural change is somewhat limited as the site is a dump site and as any pattern might simply be part of the background noise that forms part of the "general butchery pattern" (see discussion in the conclusion). As a result of these interpretations, one of the original aims of this research project was to attempt to document these changes from the faunal material. Simply because statistical analyses suggest that the material has more similarity than dissimilarity, does not mean that there are no differences in the faunal material from the site. All it means is that from the available archaeological material no statistically "significant" changes could be noted.

I would now like to consider a few positive and negative aspects about the data sheet and one or two theoretical questions. The recommendations relate to the addition of zones and the labelling of artifacts. Although zoning worked very well in nearly all cases, two exceptions were found. One was that the zones (3 and 7) attributed to the lateral and medial surfaces of the rib were not sufficient, in that they were too long. As many of the chop, cut and other marks were placed part of the way along each of the surfaces, a clearer indication of where they were may have given a better angle on what the portion or unit

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the processing of the metacarpals, however, presents an alternative explanation. This involves two ways of handling the feet. They may have been skinned from the phalanges and incorporated into the leg at the primary butchery stage. Alternatively, they may have been cut from the leg at the proximal metapodial with the skin still adhering and sold as a 'waste product'. In the latter instance they may have been boiled to render fat or used in the production of soap, but they were not further utilized. In the former instance the feet were considered to be food items and attempts to penetrate the marrow cavity suggest that they were cooked, perhaps as inclusions in stews or as bones for soup".

of butchery was. Secondly, despite sorting by skeletal element, left/right aspects, and in some cases proximal/distal ends, it is still recommended that each diagnostic faunal fragment is labeled, as it is often unfeasible to return to a large number of specimens.

Despite these two minor disadvantages, the worksheet does have certain advantages. The one practical advantage relates to data extraction from a spreadsheet or data management program. Secondly, when analyzing the faunal collection, one usually debates whether or not to draw each specimen, in addition to recording data. In this sample, all the data was redrawn both in draft and final form within two weeks, thereby enabling one to re-acquaint oneself with the material and reduce the amount of information one has to deal with.

The theoretical question which I wish to deal with relates to cultural change and the rate thereof. In historical sites, the rate of cultural change is measured in changing patterns or percentages of items of material culture in an assemblage, and/or the introduction or discontinuance of an item or category of goods. The rate of change can tangibly be seen in categories such as porcelain, ceramics, pottery, glassware and tobacco pipes. But we have to ask ourselves if similar cultural changes can be seen in faunal procurement, remembering that historical sites or collections - despite being large - tend to deal with a better resolved resolution. In this case we may be looking at a minimum 30 year time period. Would this be enough time for change to be recorded? How significantly would butchery patterns change in this period? In the supply of a necessary parcel of food would or could practices not have remained stable? It may well be that patterns of butchery did not change significantly over the period of time that we are looking at; and that what we are seeing are simply minor variations in a general butchery pattern. This supposition can be tested only once we have other comparative site data, analyzed to the same level. One would expect to see differences, if one was comparing rural with urban households; between different cultural groups, such as between Dutch and Moslem families; between wealthier and poorer households; or between different time periods when butchery techniques are known to have undergone changes with the introduction of new butchery equipment.

James Deetz (1977) suggested that in the late-18th century a rather abrupt change occurred in the method of cutting up a carcass into smaller portions. He stated that the earlier method, which was contemporary with the period of mixed cooking, was marked by chopping the bone, probably with an ax (Deetz 1977: 124). The quartering of the animal produced large pieces that could be roasted and then corporately consumed, or cooked in a stew. This was replaced by the use of saws to divide up the carcass, which allowed for individual servings as it allowed the production of small cuts. He suggests that the use of saws to cut meat increased after the late-18th century, although they had always been present (Deetz 1977: 125). In America it is known that handsaws were not used in butchery until c. 1800; while circular saws had been available since the late 1700s. Bandsaws were only invented in 1808, but were not successful till later when durable steel bands became available (Gust 1993: 344). This does not mean that saws were not used previously, but rather that increasing reliance was placed on saws after the late-18th century. Thus the use of new techniques would have altered the method by which carcasses were utilized and thus have influenced the observable faunal pattern.

What we are looking for is data from sites equally spaced at 50 year intervals over three centuries from the 17th to 20th century. This would enable us to make inter-site comparisons and to establish how much and when changes in butchery patterns had occurred. By implication, one would also be establishing the general dietary preferences of colonists for the same time period.

Indeed the general butchering pattern is not significantly different from that of today. In general the procedure is similar to modern butchery practices, except that certain elements which are today considered to be prime roasting units are treated differently. Woodborne (1994) provides a very valid warning concerning assumptions made on our part. He noted that, although the scapula and pelvis are bearers of substantial quantities of meat and are prime for roasting, they were treated differently in the sample he chose to study. This therefore clearly "illustrates the danger of affording anatomical units a measure of utility based exclusively on modern perceptions of how each unit should be presented. *The expression of status may not lie entirely in the utility of the food that is eaten, but perhaps also in the fashion in which it is prepared*" (Woodborne 1994: 11, emphasis added).

## CHAPTER 6.

### BEYOND THE MERE BONES!

#### 6.1. INTRODUCTION.

Historically we know that the Shambles was a functional attribute of everyday Cape Town. In the VOC period, the slaughter houses were in the same vicinity as where the shambles stood during the British period. The shambles consisted of a series of twelve shops that were tendered out on a yearly basis to the highest bidders. Many of those who rented one of the Shambles, also had a shop in Cape Town, where they dispensed their meat. The people who stood behind the counter were not always those who put in the tender, but also included Free Blacks and slaves. Despite providing meat to the local populace, the butchers also sold in bulk to both passing ships and the contingent of soldiers at the Castle.

Historically we also have evidence from contemporary newspapers that citizens kept livestock in the backyards, and that these domestic animals also found their way onto the streets, resulting in various individuals being fined by the Police Court for keeping pigs, fowls, cattle and sheep. These abodes therefore provide an additional source from where livestock were acquired and subsequently slaughtered. Therefore the primary, secondary and tertiary butchery on the archaeological faunal assemblages may in fact have originated from these houses, and one can therefore not assume that all livestock was obtained from the market place. Nevertheless the consistent patterning found within the faunal material (see Chapter 5) suggests that the majority of the meat was locally acquired from a central point, or where at least a number of butchers followed the same "general butchery pattern". Variations within the pattern may relate exclusively to secondary and tertiary butchery away from a central point, and should not be seen as contradictory evidence to the general butchery pattern.

Despite answering a number of questions pertaining to the existence of the Shambles and the systematic form of butchery undertaken, a number of questions nevertheless still have to be answered:

1. How did sheep arrive at the market place?
2. Where did they come from?
3. Who owned the farms on which the sheep were bred?
4. Are we dealing with pure-bred sheep, foreign or hybrids of sheep?
5. How did the monopolistic practices work? Who benefited?
6. What about other forms of livestock and produce? Where were they grown and why are they less prevalent in the archaeological record?
7. Once food had arrived at the Cape market, what happened to it? How was it sold?

Firstly, we look at the role of sheep in the Cape economy. Among the various questions raised, we look at where sheep may have come from, how livestock arrived at the market and the relationships between butchers and/or agents at the Cape and the farmers in the interior. Secondly, we look at the comments that

visitor's had about the availability and selection of various foodstuffs that could have ended up on their table. Lastly, in light of the faunal evidence provided above, we return to the various documentary sources, which may provide information on the acquisition, sale of, preparation and consumption of the various items of food that arise most often in the archaeological record. Furthermore this last section considers the discrepancies between the historical and the archaeological record, and attempts to explain or illustrate why these discrepancies may occur.

[The reader may note the discrepancy between the dates for the newspaper references and the date to which the site is attributed. The difficulty lies in the selection of historical material available for information. Other than the *Cape Town Gazette*, later the *Cape of Good Hope Gazette*, a governmental voice, the South African press was quiet till the establishment of the *South African Commercial Advertiser* in January 1824 (Durdin *et al.* 1992: figure 7), whereafter the press experienced a period of liberalization, especially after the 1830s. The newspapers initially selected for scrutiny included *The South African Commercial Advertiser*, *The Cape Town Mail*, *The Shopkeepers' and Trademen's Journal*, *Sam Sly's African Journal*, *The Magazine of Domestic Economy*, *The South African Advertiser and Mail*, *The Mercantile Advertiser* and *The Cape Monthly Magazine* (Durdin *et al.* 1992). To fill the gap presented by the lack of newspapers, the only available sources are diaries, journals, letters and official correspondence. Other than looking at letters, official correspondence, and criminal cases, a selection of visitor's journals were looked at. These included the journals of Otto Mentzel (printed 1784), Samuel Hudson (1797-1807), Lady Anne Barnard (1797-1798), Robert Semple (1797-1802/3), D.G. van Reenen (printed 1803), Henry Lichtenstein (1803-1806), H.G. Nahuys van Burgst (1806), Lt. James Ewart (1811-1814) and William Bird (1822), among other shorter travel accounts and diaries of visitors and residents alike. Thus journals and other accounts as well as supplementary information from various newspapers are consulted to provide insights into food use at the Cape. Furthermore, as historical records do not cover certain periods or cannot answer certain questions as there is not any material, it shows the value of archaeology that can attempt to do so].

## 6.2. THE VALUE OF SHEEP TO THE CAPE COLONY.

Prior to the establishment of a livestock industry in the Colony, Mentzel (1921: 55) noted that: "In the early stages of the settlement the cattle were purchased by the Company or its agents from the Hottentots and sold to the farmers upon credit". One could assume that a similar process was undertaken to acquire indigenous sheep from the Khoikhoi. At Oudepost, an outpost established in 1669 on the west coast to provision passing ships, there is evidence to suggest that it was provisioned with beef and pork that had come from the Cape, while sheep were either obtained from Khoikhoi or European farmers or from the Company's abattoir at Mamre (Cruz-Urbe and Schrire 1991: 96-97). The early confrontations between the VOC and groups of roaming pastoralists over livestock, and the theft of livestock by the Khoikhoi, and the confiscation of livestock of the VOC, clearly point to the fact that the acquisition of food and the maintenance of a food supply was a hotly fought over issue in the early years.

After the initial period of occupation the VOC adopted other policies so as to meet local consumption or export. One of the methods employed by the Company to fulfill its quotas was to tender out monopolies to certain individuals, who guaranteed to meet demand at set prices (see Ross 1989: 246; and Chapter 1 above). Tenders covered various fields and did not exclude the procurement of food.

On the meat contract, Mentzel (1921: 171) had the following to say: "The meat contract was given out for a period of six years and the rate per pound varied from 13 duchte [8 Duchte = 1 Stuiver] to 14<sup>1</sup>/<sub>8</sub>. [...] After subtracting the quantity of meat required for the hospital and the slaves we have to consider the meat allowance for the Governor's table and for passing ships [...]". In considering the turnover of sheep consumed, Mentzel (1921) also provided some useful information. He noted that the Governor's monthly shopping list included among other items: "4 slaughtered sheep or more if these should not suffice. 20 lbs. of imported Dutch corned-beef and bacon. Vinegar essence *ad lib*. Fish likewise [...]" (Mentzel 1921: 139). While, 'Every ship takes a certain number of live sheep in order to have fresh meat for the officers and the sick. Each ship takes about 15 at the fixed price of 1 Dukaton of 78 st. per sheep. [...]' (Mentzel 1921: 171). And if one makes allowances for the Governor's four plus sheep per month and the 15 sheep per ship, Mentzel (1921: 171) estimated that the annual 'total quantities would come to about 300,000 [...]' Such was the demand of the colony. This demand continued during the British period with tenders of beef and mutton for Her Majesty's Troops in Cape Town, Simonstown, Mauritius, St. Helena and elsewhere. Generally it was demanded that the salted meat was to mimic the size and number of pieces that were found in barrels of Irish provisions. Later 19th century advertisements provide some additional information:

Tenders (in duplicate) will be received at this Office, [...] for the supply of **210,662 lbs. of Cape-cured Beef**, for the Service of Her Majesty's Troops, &c., at Mauritius, - [...] The Meat to be the best description, to comprise the four quarters of the Animal: the Neck, Shine and other inferior parts being excluded; to be cured with Liverpool Salt only, packed in St. Ube's Salt, cut and packed like Irish Provisions. The Casks to be of substantial quality, and not of Colonial Wood. The Contractor to guarantee the Meat to keep in good and wholesome condition for Twelve Months from the date of its delivery at Cape Town. [...] Tenders to state the price per 100lbs. English weight, including the Casks. [...]<sup>1</sup>

The people who were able to fill these contracts were exactly those groups of men who had prospered out of the *impost* system, allowing them as franchise holder or *pachter* to gain a strong, and sometimes excessive, grip on the market, via their respective monopolies. This can aptly be seen in the following example.

Dirk Gysbert van Reenen was one of the individuals who held a contract with the VOC to supply the Company with meat. Prior to the availability of monopolies on certain items, the Company had attempted to be self-sufficient. It soon realized that this was impractical, and "[...] judged [it] better to farm out the furnishing meat for these purposes to private persons" (Lichtenstein 1928: 30). Van Reenen's 1803 journal is particularly revealing in certain respects. The editors of his journal noted that it was on the

<sup>1</sup> *The Cape Mercantile Advertiser*. No. 700, May 2, 1857.

basis of this sole monopoly, on his meat, wine and beer trade, that his material success lay<sup>2</sup> (Van Reenen 1937: 6). The editors also noted that he and his brothers were the first to import Spanish sheep and breed them with Cape fat-tail sheep (Van Reenen 1937: 4). This information is not at odds with that provided by Mentzel (1921: 56), who noted that "The Afrikaner sheep, i.e. those possessed by the Hottentots at the time of the European occupation, were not as good a quality as those bred in Holland, England, Spain or Persia, for their tails were long and lean. Hence the settlers attempted to obtain some Persian sheep with broad tails" (Mentzel 1921: 56). Lichtenstein (1928: 103) confirmed the introduction of the 'Spanish breed of sheep for the sake of the wool', as well as the fact that 'the African sheep' were considered as 'good for nothing'.

However, Van Reenen was not the first to introduce new breeding stock. Mentzel (1921: 17) noted that Willem Adriaan van der Stel 'imported rams from England and, upon pretense of establishing a wool industry, took from the farmers ewes without making any compensation'. The significance of cross-breeding, and information based thereon, is fundamental in any attempt by zooarchaeologists to establish what the original population looked like on the basis of measurements of skeletal elements; and whether one is dealing with Khoikhoi, Dutch or hybrids of sheep. The problem of acclimatization for foreign domestic animals was noted by Van Reenen, as pure-breeds had less chance of survival than did hybrids. He noted that: 'The home-bred [Dutch] cattle are also useful animals because they yield far more milk than the Cape variety, and the butter produced from their milk can serve to replace the fat made from the tails of the Cape sheep: [...] There are very few farms in our country on which purebreds can thrive, for they invariably require rich and abundant pastures and cannot exist on poor grazing' (Van Reenen 1937: 141). Archaeological evidence based on the morphological variability and differences with prehistoric indigenous sheep suggests that the sheep from both Oudepost (established 1669) and Paradise (established 1720) were hybridized European/Khoikhoi specimens (Avery 1989: 114-115; Cruz-Urbe and Schrire 1991: 92, 97-98). The other advantage of cross-breeding is to produce sheep with higher meat yields, and, if they were kept mainly for sale, then they were most likely slaughtered at their optimal weight - between one and two years (see Avery 1989: 115).

In addition, D.G. van Reenen was of the firm belief that the introduction of 'foreign' sheep would have beneficial spin-off's for the economy. He believed, writing before 1803, that there was nothing in his opinion to deliver them from the high cost of commodities "than the raising on as large a scale as possible of Spanish or wool-producing sheep of which our country can carry more than two million. If one estimates their yield of wool at only 2 lbs. each per annum, they would produce an enormous sum, whilst from the Cape sheep only meat and fat are obtained" (Van Reenen 1937: 139). Lichtenstein (1930), however, noted that through the intervention of the commission for promoting the improvement of agriculture and the breeding of cattle, Spanish rams had already been introduced into the colony, and that 'many farmers have now excellent wool to bring to market'. He went on to note that "[w]hen the advantages to be derived from these improvements in the breed shall be more extensively known and

<sup>2</sup> In the 1799 Burgerrad census a Johannes Gysbertus van Reenen is listed at 19 Strand Street with his wife, two sons and a daughter, 7 male slaves, 10 female slaves and 8 children (Cairns 1981: 44).

allowed, so that it shall become a matter of general adoption, it will easily be seen what a vast source of profit must be opened to the colonists of these parts" (Lichtenstein 1930: 7). Although he also saw the benefits to the colony, Lichtenstein (1930) seems to imply that only a limited number of imported livestock had been introduced, and that the Company was still attempting to control the economy with a heavy hand.

D.G. van Reenen noted that there were additional sources of meat other than from the southwestern Cape. Talking about Port Elizabeth (Algoa Bay), he noted that:

'The salt is snow white, and I believe that by establishing a factory for preserving meat there, it would be possible to supply the garrison at the Cape with good meat quite successfully' (Van Reenen 1937: 137).

James Ewart (1970) writing in 1812, also noted the potential of Algoa Bay. It would afford them "[...] an inexhaustible supply of cattle, whilst extensive salt pans at a few miles distance, are capable of yielding an indefinite quantity of fine bay salt. In winter when the weather is cool so as to allow the meat to be kept fresh for several days, the cattle might be killed immediately on coming from the pastures, which in that season are in their greatest luxuriance, and the beef when cured and packed might be either shipt coastways for Cape Town, or vessels for foreign parts might lay there and take in their cargo's" (Ewart 1970: 39). Not only did meat no longer have to be sent on the hoof, but in the absence of any form of refrigeration, meat could be kept 'fresh' for longer periods of time. Along with the salt other items from the Algoa Bay area were also shipped to the Cape (see Lichtenstein 1928: 257).

The availability of salt was not only limited to the Port Elizabeth area. There was also a 'large salt pan' in the 'Groenekloof' area (Mentzel 1944: 20). Mentzel (1944: 76) also remarks that at Groenekloof "a Buyten Post has been established there in charge of a Corporal and a few men to keep order at the loading of the salt drawn from the salt pans in that area" (Mentzel 1944: 76). In contrast, Lichtenstein (1928) seems to suggest that these salt pans were not worked by the government; rather they were worked by individuals who had rented land from the government. He stated that: "In these domains the farmers had also the liberty of carrying on saltworks, for which they paid a yearly rent of about twelve hundred dollars, they being bound to furnish the Cape Town with fine salt at the price of three dollars and a half per bushel" (Lichtenstein 1928: 30).

The mechanism by which meat arrived at the Cape has become clearer. One of the methods was to drive meat on the hoof to the capital. Farmers had contracts with butchers at the Cape. In addition to relationships between butchers and farmers, meat buyers seem to have traversed the colony in search of 'fat sheep'. Mentzel (1944: 114) noted that 'a few of these are always traveling about the country for the meat contractors'. Lichtenstein (1928: 25) similarly noted that 'the butchers of the Cape Town' sent their own servants 'up the country for this purpose' of acquiring meat. Elsewhere, Mentzel (1944: 212) noted that "[...] the meat contractors employ several butchers, who travel round the country to buy the wethers, the most distant farmers meeting them on the way or delivering the sheep at the appointed place. At one year's sale, the next year's order is placed, and the place and time at which the sheep are to be delivered specified. Naturally selling stock in this way is difficult for both buyers and the sellers, hence those

distant farmers never get as much for their flocks as the nearer ones who sell to the private butchers. Those wethers that are driven a long way to the Groene Kloof become very thin and have to be fattened again, especially if they have to be driven through the barren cold Bokkeveld or the sandy stretches of the Karroo" (Mentzel 1944: 212). Ewart (1970) who was at the Cape during the first part of the 19th century, some 50 years after Mentzel and a decade after Lichtenstein, similarly implied that similar mechanisms of acquisition were in place. He noted that: "[The farmer's] cattle and sheep are purchased by butchers from Cape Town who make perignations through the remote districts for that purpose" (Ewart 1970: 37).

The fulfillment of the meat contract was worsened by transport problems that farmers encountered. 'The transport of produce is the most difficult problem with which the farmer has to contend, taking into consideration the distance of the farms and the bad state of the roads along which, owing to the absence of navigable rivers, everything must be carted' (Van Reenen 1937: 285). The transport problem resulted in farmers lamenting that: 'At present, owing to the distance of transport, the cattle become thin and get into poor condition before they arrive at the capital' (Van Reenen 1937: 137).

As the contractors 'send to distant parts for the cattle [and other livestock], which often grow lean upon the journey from its great length', they were kept at Groenekloof for example, 'for a time to recover their flesh before they are killed' (Lichtenstein 1928: 30). But the 'thin' and 'poor' condition of livestock were not only fattened on farms in the vicinity of Cape Town. Dirk Gysbert van Reenen (1937: 263) noted that: '[The Cape Flats] is used as commonage for the grazing of livestock for both those who have farms in the neighbourhood and for those who come long distances from the country. Similarly the butchers, who provided the residents at the Cape and the Government with meat, made use of it'. Apart from the commonage area of the Cape Flats, this area was also utilized by the government and the remainder was leased to interested parties. For example, the Commission for Agriculture and Stock-breeding made use of 'some of the best Government farms for breeding and rearing wool-producing sheep and Dutch cattle'. Other available land was 'leased every three or five years to those who undertake to supply the Government with meat, cattle and sheep at the lowest tender' (Van Reenen 1937: 265). This would have included the government lands in the Groenekloof area, that had been 'ceded to the meat contractors for fattening the slaughter cattle' (Mentzel 1944: 76). In addition to the Groenekloof area, Lichtenstein (1928: 30) noted that "[...] Six other domains have in like manner been granted by the government to the same contractors for the purposes of husbandry and feeding cattle", however, he does not name the other sites where livestock were kept.

The use of two farms by farmers, one in the interior and one near the market, for 'breeding and fattening' of various forms of livestock was not unknown during either Mentzel's (1944: 98) time, or that of Van Reenen (1937) and Lichtenstein (1928; 1930). For example, the 'part known as Vier-en-Twintig Rivieren to the north of the Berg River' (Mentzel 1944: 67), was one of the areas used by farmers for cattle raising. The area to the north-east, the 'Karoo Veld of mixed sour and sweet soil', although generally very arid with scanty pasture, was well suited to stock-farming, especially for sheep farming (see Mentzel 1944: 88), as was the area of the Roggeveld, which not only had 'the most weighty [sheep]

of any in the colony' but also the best flavoured (Lichtenstein 1930: 7). Of the meat contractor's family, Van Reenen, Lichtenstein (1928: 114) noted that the "most considerable estate, belonged to a Mr. John Van Reenen, which lay on the north-west side of the Hantam Mountain, the part which is well watered".

In the 1770s, Ross (1993: 36) notes, a Jacob van Reenen, the colony's major butcher, had farms spread as far as Hantam in the north and the mouth of the Gamtoos in the east, both on the margins of settlement (Ross 1993: 36).

"Van Reenen's flock consisted at this time of more than sixteen hundred sheep. As he was one of the first introduce the Spanish sheep, many of his flock, even as far as the fifth generation, were of that breed, and bore very fine wool; an article which already brought him in great profit" (Lichtenstein 1928: 114).

The success of Dirk Gysbert van Reenen was probably influenced by the help of his three brothers, Sebastian, Jacob and Daniel van Reenen, who had farms elsewhere in the colony, and with the latter's described as the 'best estate in the whole district' (Lichtenstein 1928: 29, 31, 202). The Van Reenen family were not only involved in supplying meat, but included a diversified industry based on the import of agricultural tools (see Ross 1989: 256). This family may still have been in business after the mid-19th century, as a B.J. van Reenen was renting out Shamble No. 5.<sup>3</sup>

In the foregoing section we have discussed issues pertaining to the duration of the meat contract and who held these contracts. Where the sheep came from, as well as the introduction of sheep that were not indigenous to the Cape Colony. Discussion has also covered both alternative sources of livestock, how livestock arrived at the market and the relationships between butchers and/or agents at the Cape and the farmers in the interior. The two issues that remain to be discussed include what items of consumption were available either through formal or informal means, and what type of meals people were eating. It is to these issues that we now turn.

### 6.3. VISITORS' COMMENTS ON FOOD AT THE CAPE!

So as to gauge what was locally available, let us consider two accounts of contemporary literature from the turn of the 19th century. Robert Semple is the first individual, whose two sons were probably shopkeepers in Cape Town, and who had a mercantile firm at 13 Berg Street (Philip 1981: 374-375), with lodgings at number 3 Berg Street and who published his *Walks & Sketches at the Cape of Good Hope* in 1803, after residing at the Cape for five years. The second individual is Lt. James Ewart of the 93rd Highlanders, who was assigned to the Cape garrison between 1811 and May 1814 (Philip 1981: 121). Both journals provide valuable insights into local produce.

During Ewart's (1970) brief sojourn at the Cape, he noted that:

'All kinds of provisions are cheap in Cape Town, particularly mutton, and fish, the latter the same as described of Simons Town, with the exception of the roman fish, which is not found on the west coast. Fruit, such as grapes, oranges, lemons, figs, almonds, peaches, apricotes (*sic*), melons, and

<sup>3</sup> *The Cape Mercantile Advertiser*. No. 660, January 28, 1857, p.2.

pomegranates, are in great plenty, as are all kinds of vegetables (*sic*). The best Cape wine may be had for 2/- a bottle. All foreign wines are high in price, as well as spirits. Indeed all articles of European growth, or manufacture, are exorbitantly (*sic*) dear' (Ewart 1970: 21).

Semple (1968: 31), in discussing the presence of food among the middle classes, noted that: "The tables of the middling ranks are generally well covered, and their feasts are mere exhibitions of fish, flesh, and fowl, heaped together with the utmost profusion". Although a selection of meat types were available from the Shambles next to the Parade, a similar variety of fish were available from the Fish Market further along the coastline towards Rogge Bay. Here fish was sold either via vendors, or directly off the boats belonging to slaves or Free blacks, or by wives and relatives whose husbands or kin had gone out fishing earlier that day. All types of fish were seasonally available, with snoek being the cheapest (see Mentzel 1944).

From Ewart's and Semple's description, it seems that to the average visitor to the Cape, food was cheap and provided a wide variety of food stuffs available for selection. This was not the case when Ewart visited Simonstown, where he noted that: '[...] all kinds of butchers meat is high in price, and sometimes is not to be procured; the same is the case with fruit and vegetables. This is owing in a great measure to the complete sterility of the country for many miles round the town, and in a greater one to the extreme badness of the roads, which causes the farmers in more fertile districts to send all the produce of their lands to the Cape Town market' (Ewart 1970: 12-13).

Despite such minor problems, the hospitality to which visitors could be treated to was well known. On his wanderings, Semple (1968: 138), was a visitor at the Duprés' for one night. Here he noted: 'At eight o'clock all [...] assembled to supper, which consisted of salt mutton, mashed pumpkin, potatoes powdered with nutmeg, and two or three tureens of boiled milk'. Not only did salted mutton feature heavily on the menu, but so to did 'cold meat', 'fowls', and 'roasted lamb' (Semple 1968). Mentzel (1944), similarly discussing his visits to farmers in the country districts, seems to paint an even more flattering picture. He noted that for their roasts, farmers could choose from "[...] chickens, ducks, geese and fat legs of mutton. Fresh, pickled, smoked and dried beef, mutton and pork constitute their daily fare. For additional dishes there is no lack of vegetables and greens. They have plenty of eggs for a variety of egg-dishes, but few milk dishes [...]" (Mentzel 1944: 108). In the urban area, fruits and vegetables were also available. Contemporary historical records suggest that a number of households supplemented their earnings by growing produce in their gardens. In addition, there were a number of gardens in the Tafel Vallei (see Figure 1.1 above and 1818 Renvooy map (*South African Library*, KCB: CT.)). What is known is that local produce was very erratic and that supply was not consistent. Local fruit and vegetables were not only hawked by vendors, but also stolen by thieves (see Chapter 1).

From the above two residents' descriptions of food at the Cape and from other visitors, three general observations are clear. Firstly, there was a wide variety of meat that could have ended up on the table. Secondly, fish and mutton were the most common items mentioned, and both these items were relatively cheap. Thirdly, and rather importantly, a wide variety of fruit and vegetables also passed over the dinner table, and it is exactly these items that are missing from the archaeological record.

#### 6.4. THE UTILIZATION OF FOOD AT THE CAPE.

The following section aims to present various forms of information on those types of domestic livestock that are found most often in the historical archaeological record, viz. sheep, cattle and pigs; as well as information on fish, and less well known items like fruit and vegetables. The approach taken here is to consider what information is held within various historical sources, and thereby answer questions on acquisition, sale of and consumption of these various items of food.

##### 6.4.1. SHEEP and CATTLE.

Archaeologically we are well aware that both sheep and cattle are present, with far greater numbers of the former contributing to the faunal record and total MNI. As with other forms of domestic stock, we note that sheep and cattle were directly available for sale to "Butchers, Salters and Others" (see Figure 6.1) by public auction. Numerous notices were put in the press for the attention of either butchers, farmers or general buyers. Not only was beef locally available from farmers and agents in the Groenekloof, and Langeberg areas of the Cape District, but also nearer to the town where cattle were stall fed (see Figure 6.1). Not only was slaughter cattle available to butchers, so too were sheep, often in far greater numbers. In one particular case "1863 Fat Sheep" were offered for sale to "Butchers and Buyers generally", with the clear intention of making it known that they were slaughter stock (see Figure 6.1).

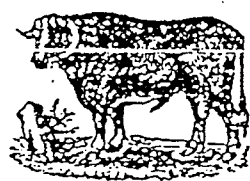
The shambles, on the site of the present railway station, offered a wide variety of "meats" (fresh and salted beef or mutton) to the general public (see Figures 6.4 and 6.5 of butchers' shops) and the shipping trade at competitive prices on the shortest notice and at the *cheapest* prices. Despite the local availability of mutton and beef, lamb was also available from certain stalls. So too was mutton, either Cape mutton or merino sheep from either the Cape District or possibly further afield. Various shambles offered these meats to their customers at very low prices or at "present retail prices", each trying to corner a share of the market (see Figure 6.1). Not only were these forms of meat available, but so too were preserved forms of meat (mostly beef) and other by-products. For example, the list of commodities required by the Governor at the Cape included "20 lbs. of imported Dutch corned-beef and bacon" (Mentzel 1921: 139). Salted beef and tail fat, other than usual mutton, prime mutton and prime beef was also on sale. In addition, the colonial tenders (see above) noted the large quantities of Cape salted beef that was exported, while preserved tins of beef were also imported (see Figure 6.1). Despite this cattle were largely used as draught oxen or as producers of milk. The fact that beef was sold in these preserved forms, to the exclusion of mutton or lamb, may also explain why *Bos taurus* are represented in far fewer numbers than sheep in the archaeological record.

Other than Van Reenen's offer to sell tail fat, a number of visitors and colonists (Ewart 1970: 23-24; Mentzel 1944: 212; Van Reenen 1937: 293) commented on the vast quantities of fat that was stored in sheep's tails. Whatever the exact amount of fat in sheep's tails, the two pencil sketches by Samuel Daniell, c. 1802, of Cape fat-tailed sheep, speak a thousand words (see Figure 6.3, Boucher and Penn 1992: 135, plate 39).

To Butchers, Salters & Others.

**137** FAT OXEN and **57** FAT COWS will arrive at Mr. BEYER'S Place, Stikland, on **TUESDAY**, the 17th instant, and the same will on that day be there sold at auction to the highest Bidders.

These Cattle have been fattened on the place Zout Rivers Valley, near Beaufort.  
5th August 1847. G. W. PRINCE.  
Mr. D. A. DE VILLIERS, Auctioneer.



### Cheap Meat.

AT Shamble No. 12; in Long-street No. 55, Corner of Leeuw-street, at No. 55, Dorp-street, and in Sir Lowry-street, are to be had—

Mutton, 2d. per pound,  
Beef, 2d. to 3d. per pound.

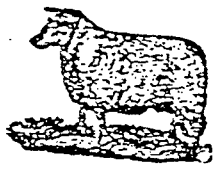
As the Undersigned has learnt that the Butchers have now also reduced the price of their meat to 2d. per pound, he hopes the public will give him the preference and cause their meat to be fetched at his shops.

He only deems it necessary to remind the public that he was the first to fix the price of meat at that rate, and that he merely embarked in the business, because he would not submit himself to be compelled to sell his Sheep at a sacrifice, and thus has upset the system of paying a certain price to the Dealer and selling at a certain price to the public.

By giving him the preference, he assures the public, that he will endeavor, as hitherto, to supply them with good and cheap Meat.

J. M. ENSLIN, Jr.

BY Shipping and Contractors supplied with fresh and salt Meat, Live Oxen, Cape and Merino Sheep, on the shortest notice.



### 1,863 Fat Sheep.

THE above number of SLAUGHTER SHEEP will be Sold by PUBLIC AUCTION, on the place of Mr. BEYERS, Stikland, in the forenoon of

**Thursday next, the 27th instant.**

These SHEEP, already arrived, comprise the entire flock, as it left the Interior, no portion having been drafted off—~~are in first rate condition, and well worthy the attention of Butchers and Buyers generally.~~

JAMIESON & Co.

J. G. STEYLER, Auctioneer.

### Shamble No. 1.

MR. W. J. KLERCK begs to announce to his Friends and the Public, that he has opened the above Shamble, where they can always be supplied with the best and cheapest Beef, Mutton, &c. &c.

N.B. Captains of Ships and Passengers supplied on the shortest notice and most reasonable terms.

### Cheap Beef—SHAMBLES, No. 12.

ON SATURDAY, the 15th inst., BEEF 2d. per lb., Surlains and Rump-Steaks 3d. per lb.

Sheep are expected, when MUTTON will be sold at 2½d. per lb.

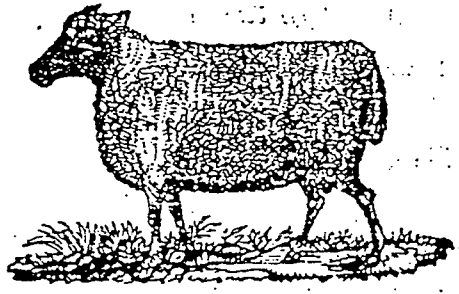
J. KREITZ.

### Stall Fed Beef.

TAKE NOTICE that the 150 OXEN from SALT RIVER VALLEY, previously Advertized will be sold at Mr. Beyers, STIKLANDS, on

**Thursday next, 29th inst.**

G. W. PRINCE.



### AT WINSPEAR'S

No. 3,

SHORT-MARKET-STREET.

Good Cape Mutton, at 2d. per lb.

Do. Merino, at 2½d.

### SHAMBLES No. 10.

J. KREISZ has always on hand the Best Merino J. and Cape MUTTON, which he can supply to Families and the Trade at **VERY LOW PRICES.**

PRESENT RETAIL PRICE.

Cape and Merino Mutton, 2d. per lb.

### CHEAP MEAT!

AT Shambles No. 3 and 9. can be had, from this date, best MUTTON and BEEF at 3d. per pound.

P. L. MORTEL,  
J. A. SCHICKERLING.

July 19, 1852.

### Preserved Beef.

AT the Auction of Messrs. BLOK & BARTMAN'S, THIS MORNING,

90 TINS, each 4lbs., PRESERVED BEEF.

HOME, EAGAR & Co.

Figure 6.1: A selection of 19th century newspaper advertisements on the sale of food. Part 1.

## Cheap Meat.

IN THE SHAMBLES No. 10 is to be had all sorts of OFFALL, PLUCK, SOUP MEAT, &c. &c. at very prices.

## TRIPPI.

**T**O-MORROW, (Saturday,) will be Sold at the Commission Sale of Mr. L. P. CAUVIN, on the Parade.

20 Kegs of Excellent *TRIPPE*,  
WITHOUT RESERVE.

## Fresh Biltongue,

**F**OR Sale at the Stores of L. A. LICHTWARK,  
Corner of Castle and Long-streets.

## AMERICAN PORK.

**140** BARRELS AMERICAN PORK in Bond and in prime order, for Sale at a reasonable Price. By the new regulation, Provisions may be supplied for the consumption of Ships out of bond. This is well worthy the consideration of Ship's Masters.—Apply to  
**ISAAC CHASE.**

Irish Pork in Barrels.

**F**OR Sale at the Stores of  
Wm. DILSON & Co.

## Prime Irish Mess Pork and York Hams,

**I**N BOND OR DUTY PAID.

**A**LSO, ON HAND,  
RIO COFFEE  
MAURITIUS SUGARS  
TEAS, CAPER and PEKOE  
NUTMEGS, MACE  
WHITE and BROWN RICE  
PEARL BARLEY,  
Do. SAGO, &c., &c.

HAMILTON ROSS & Co.

## Real York Hams.

**FOR SALE,**

**Y**ORK HAMS, double Gloster and Sweetmill Cheese, Currants, bottled Fruits, fresh Salmon, in 1 and 2 lb. Tins, Preserved Meats, Shrimps, Anchovy, Herring, and Shrimp Paste, Indian Mungoes, Orange Pekee, Caper, and other Teas, Mustard, Pickles, Sauces, Red Herrings in 1 and 2 dozen Tins, Curry Powder, Treacle, Lemon Syrup, China Preserves, Jams and Jellies, Nutmegs, Cloves, Cinnamon, Mace, Ginger, Loaf and Moist Sugars, Sugar Candy, Starch, Rice, Indigo, Thumb Blue, Sperm Candles, Sweet Oil, Crockery and Glass Ware, Cigars, Cavendish Tobacco, &c.

LAWTON & WHITTA,

Licensed Dealers in Spirituous Liquors, Foreign and Cape Wines, English Ale and Porter, Cape Beer, &c. by Retail.

New Shipping Stores, 8, Waterkant.

N.B. Just received 250 Cases of **GIN**, of the best quality, at 15s. per Case, containing 12 Flaiks.—Allowance to Dealers.

## Prime Mess Pork.

**J**UST Landed, and for Sale at the Stores of the Undersigned; a small sample of the above.

JAMIESON. & Co.

## MARTIN,

**Pork Butcher, Poulterer,  
&c. &c.**

**B**EGS to acquaint AGENTS, CAPTAINS OF SHIPS and OTHERS, that he has always on hand **CAPE-CURED PORK**, by the Barrel, warranted to keep in any climate; as nothing is killed but of the very best description; **STORE PIGS**, all sizes, at the shortest notice. Also, a good stock, kept on hand of **DRIED POLONIES**, in bundles fit for exportation. The Advertiser has supplied *St. Helena* and *Ascension*, for the last sixteen years, without any complaint whatever.

N.B. Orders punctually attended to.

St. George's street, No. 61.

## Dried Fish.

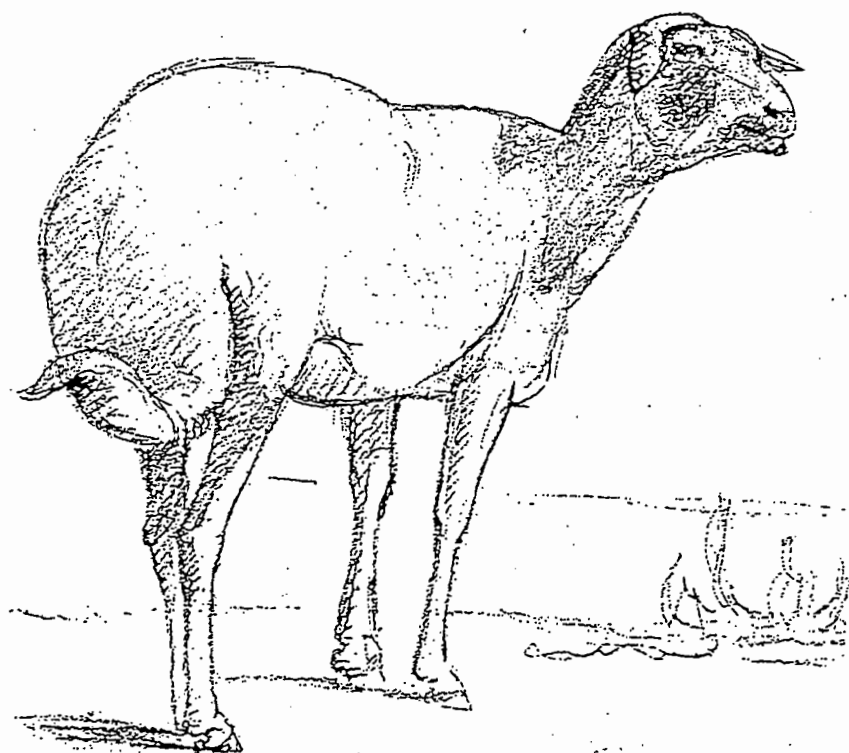
**A** few Tons of the above will be sold on the Parade **T**HIS MORNING, by Mr. JONES.

## Milch Cows for Sale.

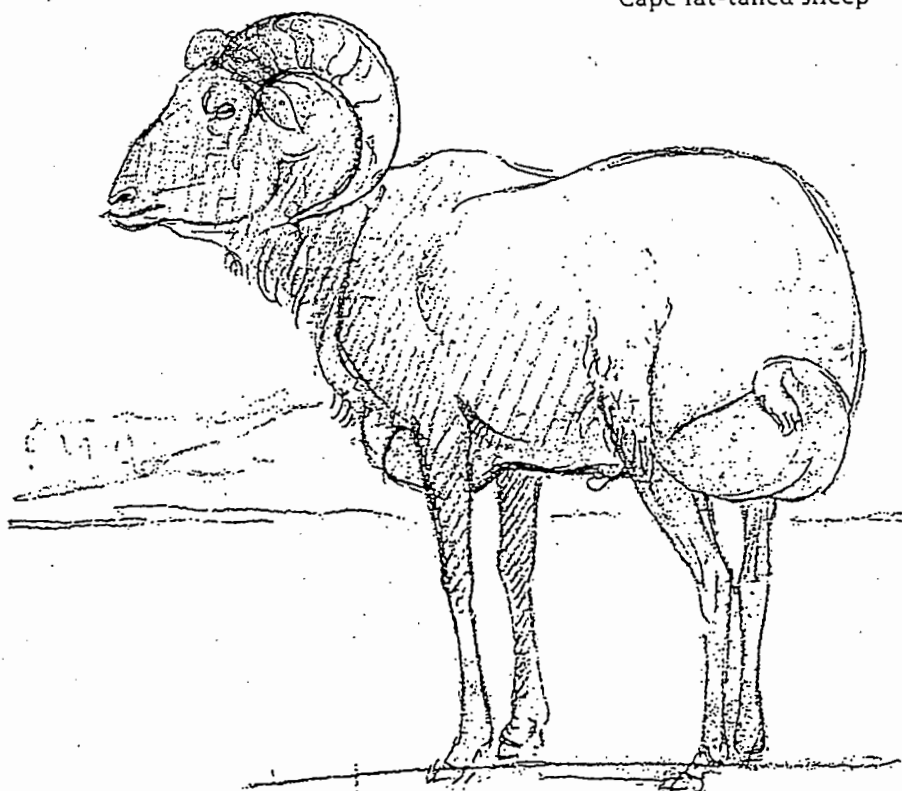
**F**OUR excellent **MILCH COWS** for Sale, at very reduced prices.  
Apply at the Office of this Paper.

Figure 6.2: A selection of 19th century newspaper advertisements on the sale of food. Part 2.

Figure 6.3: Pencil sketches of Cape fat-tailed sheep by Samuel Daniell, c.1802 (after Boucher and Penn 1992: plate 39).



Cape fat-tailed sheep



Not only was tail fat sold as a by-product, so too can one note the sale of all sorts of OFFAL, PLUCK, SOUP MEAT, &c. &c.", tripe sold in keg form, as well as the sale of fresh biltongue (see Figure 6.2). Special note should be taken of the definition of pluck. The *Collins Dictionary* (1981: 641) defines it as among other things "the heart, liver and lungs, especially of an animal used for food".

Additional information on the use of by-products comes from Mentzel (1944: 202) who noted that:

"[...] Everything the butcher considers as tripe is thrown to the dogs, but the pluck is cooked for the slaves. A special delicacy is made from the feet on account of the grease in them which is called 'Spiecke' in Germany. [...] Since no family is big enough to consume a freshly slaughtered ox in a short time most of the meat is salted, whether in summer or in winter, and then part of it is smoked and part dried in the air [...]"

There is thus a range of by-products which technically would not have entered the archaeological record.

A little information has been found pertaining to the preparation of mutton and beef. This information comes from various newspaper advertisements and recipes, colonial tenders and journal extracts, which are used together here. The first is from an advert in the *Cape Town Mail*<sup>4</sup>, informing people of able-bodied stature, that their dinner should consist of "Bacon &/or Potatoes &/or Beef &/or Soup &/or Pudding", but does not stipulate what cuts of beef should be utilized or how it is to be cooked. Newspapers printed within a decade after the first houses were built on the Sea Street block, note that beef and mutton were the best buys, and that all portions of the carcass should be used.<sup>5</sup> In addition, the tenders for beef and mutton clearly stipulate that the beef or mutton should include all the prime portions of the carcass and that the salted cuts of meat should be as close to Irish Provisions as possible. If one could establish the exact nature of what 'Irish Provisions' were, one could test the archaeological assemblage against the profile that characterized Irish Provisions. Furthermore, *Sam Sly's Journal* includes a series of mutton sonnets, on mutton roast, mutton chops, boiled mutton, hashed mutton, Irish stew, mutton pies, sheep's heart, and brains and/or head. Although these sonnets do not tell us how they were cooked in detail, they mention what was included with them. For example, boiled mutton included turnips, and was considered 'pot-luck' in a 'family way'. ("Pot-luck" implies all forms of leftovers that were simply thrown into the pot.) Sheep's kidney and heart were grilled, while mutton pies may have included lost cats.<sup>6</sup> The mutton sonnets also make mention of steak, loin, saddle, shoulder, neck of mutton, haunch, and mutton-chop or mutton-cutlet. Further evidence is provided by the advert in Figure 6.1 which states that sirloins and rump steaks were freely available at 3d per pound, with mutton at 2¼d per lb. and beef at 2d. per lb., from Shambles No. 12, but no additional information is provided. More information is provided by Lichtenstein (1930: 445, emphasis added) who noted some aspects of how the carcass was utilized:

"[...] Two or three sheep were killed every day: the entrails and feet were cooked with the fat of the tail, for breakfast, after a fashion which is very much in vogue throughout the colony, under the name

<sup>4</sup> *Cape Town Mail*. Vol. 2, No. 75, August 6, 1842, p.3.

<sup>5</sup> *The Magazine of Domestic Economy*, Vol. 2 (New series), 1844, March, pp.414-415. London: W.S. Orr & Co., Paternoster Row; and W. & R. Chambers, Edinburgh.

<sup>6</sup> *Sam Sly's Journal*, Vol. 1, No. 28, December 7, 1843, p.4, Vol. 1, No. 29, December 14, 1843, p.4, and Vol. 2, No. 56, July 18, 1844, p.4.



Figure 6.4: A California butcher's shop with a display of freshly cut meat with cleaver and handsaws hanging on the back wall, c.1900 (after Gust 1983: 343, figure 2).



Figure 6.5: A lavish display of dead flesh and sausage outside the Jones Street Butchery (unknown, n.d., Africana Library, Kimberley) (after De Beer 1992: 132).

of *pens and pootjes*. The dinner consisted generally of a strong soup, and roasted mutton: the remaining scraps of the sheep were made into a sort of hash for supper".

The high presence of phalanges in MAN Phase 2 may attest to this meat dish, *pens and pootjes*, as part of the diet of those who contributed to the Sea Street faunal material. This may also have been the case at another Capetonian site of Paradise, where phalanges attributed for 29.7% of the total body part representation in Phase 4 of the Main House (Hall *et al.* 1993: 52, table 9). On the issue of soup, Lichtenstein (1928: 27) suggests that it was either made of salted meat, or the 'flesh of a sheep killed the day before' that was turned into an 'exceedingly strong and savoury' soup. If some individuals did not have an appetite for beef, 'a mutton stew, called *kerri-kerri*' (Mentzel 1921: 112) could also be prepared. This shows the influence of eastern cuisine brought over by Indies officials, VOC employees and slaves in the local diet.

#### 6.4.2. PIGS.

Comments by Otto Mentzel (1921, 1944) are not limited to sheep. Although '[m]ost farmers slaughter a sheep daily', they also slaughtered 'a pig every four or five weeks, except in the hottest season' (Mentzel 1944: 101). He also commented on how pigs were reared, their by-products and the manner in which they were 'used' or processed. Mentzel (1944: 213) firstly noted "that there are two kinds of pigs here, the ordinary European type and the Chinese type which have claws like dogs, the latter are not actually bred here; through their meat is very dainty, their bacon is very flabby; and spreads out or drips down when being smoked". In the rural areas beyond Cape Town, Mentzel (1944: 102) noted of "African farmers" that they:

"[...] may have as many pigs as he likes for they cost him practically nothing; unless he wants to fatten one unusually by feeding it with barley and bran. It is well-known how prolific these animals are in Europe, and here the same is true. And since there is no market for them, they would become too numerous if they were not slaughtered. As they cannot all be allowed to grow up, the young pigs are turned into a tasty preserved food for the summer. They are slaughtered when six or eight weeks old; meat is chopped into small pieces, boiled for a while, then soaked in vinegar, seasoned with spice and Spanish pepper for a few days, and then eaten cold".

Elsewhere, Mentzel (1944: 213, emphasis added) in discussing the European type of pig noted that:-

"[...] every farmer raises only enough for his own needs: and since the sows have litters of five, six or more piglets two or three times a year as in Europe, many of them are slaughtered before they are half-grown, cut up, then cooked for a short time, preserved in vinegar and eaten cold. Except near the City, no pigs are fattened for selling. There is no great demand for them and, since they cannot be transported by wagon but perish on the way, it would hardly be worth while to drive even a single pig to the market. But to drive whole herds to the City for sale would be no use, for *no one except owners of eating-houses lays in a stock of pork. Smoked hams and pigs' heads, however, when brought to town, are soon sold* although they do not compare in quality [...]"

These extracts from Mentzel's diaries do tell us that, although pigs were bred in reasonable numbers, there was not such a great demand for them, as they lost much weight on the way to market. Those that were brought to town were often sold to the owners of eating houses. A percentage of those that made it to market were however raised within the confines of the town or near the city, as Mentzel suggested.

Some of the adverts note that pigs were for sale, but do not disclose whether they were from farmers outside the town or were reared within the town<sup>7</sup>. It is known that certain individuals were fined for allowing their pigs to stray onto the streets. Not only did local citizens keep pigs in their backyards, but “Martin”, a local pork butcher and poulterer, informed his clients that he had store fed pigs of various sizes for sale as well (see Figure 6.2).

Archaeologically, we are aware that pigs found in the faunal record, rank far behind sheep and cattle. Their MNI counts for JAM Phases 2 and 3 are two each, and for the same phases in MAN four and three respectively; while sheep provide total MNIs for JAM and MAN across all phases in the region of 106 and 100 respectively (see Chapter 2). Mentzel (1944) informed us that there was no great market for them, with supply satisfying local demand. There may, however, be another factor which may result in low MNI figures for pigs in the archaeological record, and why Mentzel (1944) noted that pigs (on the hoof) were not in great demand. The answer may lie in the prepackaging of food. Two shipwrecks that date to this time, the *Betsy* (1781) and the *Earl of Abergavenny* (1805) (P.L. Armitage *pers comm.*), have the faunal remains of prime or mess barreled pork on board. At Paradise only two pigs were identified (Avery 1989: 114), while at Oudepost not only were 14 pigs identified, but there is documentary evidence that states that shipments of salted or smoked pork and bacon were sent to the post (Cruz-Uribe and Schrire 1991: 94, 96). With pigs they were often “pre-chopped up” and packaged in one form or another. The advertisements (see Figure 6.2) either note that local or imported barrels of pork were for sale, but do not specify the cuts of meat that were part of these barrels. Alternatively, they mention that imported Irish or American mess pork was on sale (see Figure 6.2). If the “Mess Pork” was of American origin, then we know that it had to consist of certain cuts and not others. On this issue Clemen (1923) had the following to say:

“The pieces had to weigh 4 lbs each and were packed in barrels of 50 pieces of 200 pounds. All parts of the carcass could be used except the head, feet, legs and knee joints. The cleaver divided the hog into three parts - hams, shoulders and middles. The size of the ham and shoulders varied with market price and the price of lard. [...] The finest and fattest making ‘CLEAR’ and ‘MESS’ pork, while the residue was put into prime and bacon. ‘CLEAR’ pork was made of the sides without the ribs of the largest sized hogs. ‘MESS’ pork had the entire sides of the carcass with two rumps to each barrel. ‘PRIME’ pork was made of lighter hogs, consisting of two shoulders, two jowls, and sides enough to fill the barrel [...]” (Clemen 1923: 116-117).

Archaeologically, the faunal remains from a better site than Sea Street (e.g. the Shambles) of *Sus scrofa* could be tested to see whether the skeletal element profile matched the pattern described above; however, pre-packaged meat was at times de-boned prior to packaging, thereby making these aspects of the meat archaeologically invisible. Equally, pork was also prepared as ham, bacon, pork sausages, or as dried polonies. Furthermore, farmers raised only enough for their own needs, they were “never without fresh, smoked, dried and pickled meat”, with the best ham being kept “for festive days, or eaten when friends or neighbours come on a visit” (Mentzel 1944: 101). It is, therefore, not inconceivable that the meagre

<sup>7</sup> As early as 1659, Hall (1992: 8) has noted that although salted pork was the staple of the VOC, neither the Company nor the country burghers had been successful with their herds; town burghers were therefore “ordered to keep a minimum of 6 sows and a boar”. Although land was allocated for the raising of pigs, individual herds proved impractical and in April 1660 they were allowed to keep a common herd (Hall 1992: 26).

representation of *Sus scrofa* in the archaeological record, is more a reflection of the fact that people were consuming pork in some other form, other than off the bone.

The 'invisibility' of certain forms of meat, however, is not limited to *Sus scrofa*, but extends to all domestic species, including *Ovis aries* and *Bos taurus* as well, which were discussed above. Among the South African archives, no diaries by butchers have been found, other than the more general discussion by D.G. van Reenen (1937) of his travels around the country and his discussion of the meat industry in particular. Despite the lack of detailed records, a percentage of meat sold by butchers to individuals or professional establishments, whether beef, mutton or pork, was either in preserved form (e.g. ham) or a selection of certain skeletal elements (e.g. spare ribs, shanks, hog's head or pig's feet). The implication is that there is a range of meat items which will not remain in the archaeological record as they were pre-processed (e.g. smoked/pickled meat, or sausage) or did not contain any bones (e.g. the sirloin and sheep's organs).

### 6.4.3. FISH.

Fishing contributed significantly to the well-being of the local community, some of whom occupied premises in lanes and alleys off Sea Street, with names such as Klipvisch-steeg, and Visch-steeg, which are shown on the 1804 map of Cape Town. In addition, the Wardmasters and Medical Officers report, later in the 19th century, noted that the people who lived in Ward 1 (in which Sea Street was situated), were "generally fishermen, and those who gain a livelihood of curing fish". Although a few 'mechanics' also lived in this ward, John Laing, Surgeon, was able to state emphatically that "Fish and rice appear to be the general and principles articles of diet" (CO 490 #159 and Annex, *Cape Archives*). Fish thus formed a major part of the diet of those who came to occupy the 'hire houses' of Sea Street, once they had been built.

Although the original fish analysis is not available (Hall 1995, *pers. comm.*), we do have some preliminary results available from the original report. It not only acknowledges the importance of fish as part of the daily diet, but notes its consistent representation in the Sea Street faunal assemblages. The report notes that "white stumpnose, steenbras, harder and kabeljou were all eaten, but snoek invariably accounted for about 95% of the fish fauna in any one assemblage" (Hall 1991: 52).

Fishermen required both a boat and a net. The share system by which slaves were able to fish has been noted by Mentzel (1944) above. In addition, individuals who had the financial reserves could also acquire boats by public sale. In one example, a public sale was held of "Fishing Boats, Fishing Nets, etc., etc., etc. in the Estate of the late Mr. Jacobus Theodoris Bruyns, Cape Town"<sup>8</sup>. Bruyns is listed as a tenant at Houses 3, 5 and 6 of the Sea Street block, as well as a fisherman (Hall 1991: appendix 1). Although the first reference to him, post-dates the printing of this newspaper clipping by two years, the occupants may have been the son or widow of the deceased in whose late husband's name it was held. In addition, one should note that fishing boats and nets were being auctioned, i.e. the plural and not the singular, indicating

<sup>8</sup>. *The Cape Mercantile Advertiser*. No. 900, August 11, 1858.

that he was an individual of some means, and that not all fishermen were of poor standing. However, the majority had to work long hard hours.

Although fish were caught *en masse* by some in and around Table Bay, they were also easily caught by visitors, amateurs and slaves, standing off the rocks or the jetty (see D'Oyly 1969; Gordon-Brown 1975). Robert Semple (1968: 62) remarked on the means of catching fish that: "[... On] Saturdays, numbers of slaves may be seen busy in catching a small delicate rock-fish named clip-fish, both with the rod and line, and with baskets, [...]". Deep-sea and shallow-lying fish from both Table Bay and False Bay sides were caught, which included geelbeck, kabeljauw, snoek, mackerel, harder, sardines, red and white steenbras, stockfish, galjoen, hottentot, klipfish, cat-fish, and white stumpnose among others. Despite this wide variety, hottentot, silver fish, steenbras, snoek and harders (Ewart 1970: 13) were the most common. Fish were sold off the boats and through hawkers (see Figure 6.6) and through the Fish Market, in the Waterkant, near Rogge Bay. Of all the locally caught fish, snoek was often caught in vast quantities and sold very cheaply (see Ewart 1970: 13). Its cheapness contributed to it becoming the preferred dish in the diets of the poorer individuals in the both the VOC and British periods of occupation (see above).

When thinking of fish we generally consider them in their natural and/or raw state once they had been reaped from the ocean's floor. But this is not exclusively the case. Fish could also have been imported in packaged form. Alternatively, it was dried or salted for local consumption. Figure 6.2 notes how a few tons of dried fish was available for sale.

As with meat, salted fish was also exported to Mauritius, where local producers made large profits. The establishment of the fish curing business of J.H. Lesar, who employed mostly the wives and children of poor fishermen, in the vicinity of Sea Street, is just such an example (see Figure 6.7 which gives a view of a later fish company near Sea Street; see Judges 1977: 23). Not only were people involved in fishing, but also sealing and whaling as part of the number of coastwise vessels employed around the Colony (see CO Blue Books). Saldahna had long been a haven for all types of fishermen (*pers. comm.* Cedric Poggenpoel 1995). Lichtenstein (1928: 44) notes that while seals and whales were not plentiful, Saldahna bay abounded in fish, that not only provided a valuable source of income to some, but was also exported to the interior, and possibly to Cape Town as well. Lichtenstein (1928: 45) noted that as slaves were exceedingly fond of fish '[...] many colonists have fisheries in the bay, or fetch in cart loads from the owners of the above mentioned fishing-huts, the provision for their household. The salted fish is sent from hence over the Tulbagh, even as far as the Bokkeveld and Goudinie'. Beyond Saldahna, in the vicinity of St. Helena, '[...] such vast quantities of fish are taken, that the trade to the inland parts in salted and dried fish contributes very essentially to the support of the inhabitants of the coast' (Lichtenstein 1928: 65). A fish curing business was still active later in the 19th century at St. Helena.<sup>9</sup>

As with other items of food, little is said in the historical records on food preparation. Some information is, however, provided by Mentzel (1921: 81-82) who comments on both the roman and galjoen fish. He goes into considerable detail as to how the fish is to be cut-up, and which spices and

<sup>9</sup> *South African Illustrated News*, 28 February 1885, p.106, Vol. II, No. 9.



Figure 6.6: An old and barefoot hawker selling his fish (unknown, n.d., Africana Museum, Johannesburg 326.920) (after De Beer 1992: 131).



Figure 6.7: View of the Fresh and Cured Fish Company in Dock Road, Cape Town, with scores of fishermen and fishing boats on the shore (PHA: CT. Rogge Bay. GNA 251. South African Library, Cape Town).

ingredients are to be added to make it a 'splendid dish'. Other evidence on food preparation comes from *The Magazine of Domestic Economy*, which contained articles on "Cheap Dishes" for the labouring classes, and how members of the proletariat were best able to succeed with their meagre earnings. One of the fish dishes proposed the use of fish heads from one's fishmonger by either frying or boiling them, thereby providing one of the cheapest dishes<sup>10</sup>. Not only were fish fried and boiled, but they also ended in soups, with turtle soup often being noted.

Thus the archaeological and historical information does suggest that fish and other marine sources were of great value to both labouring and middling classes, so that one should not believe that mutton was the prime consumable item to the exclusion of all others. The alternative access to food, other than off the bone, illustrates the wide selection of food items that people could choose from that which would leave no faunal remains. Furthermore, of the actual number of cut or butchery marks in relation to the original total number of marks that were inflicted during the butchering process, results in only a fraction of them being identified (Richard Milo *pers. comm.*). This is confirmed by Lyman (1982) who noted that although the presence of butchering marks is a seemingly good criterion as it presumably connotes food preparation, not all cultural or food bone will display butchering marks because it is quite possible to butcher an animal of any size without leaving a mark on the bone (after Guilday *et al.* in Lyman 1982: 351). Thus those butchery marks that are archaeologically invisible, as well as choice of food items which similarly leaves no trace, clearly suggests to us that we are only dealing with a fraction of the visible record, as well as the fact that the faunal record is truly "a minimum estimate" of the total selection of daily food.

#### 6.4.4. VEGETABLES.

'Pigs, fowls, geese, ducks, turkeys, pigeons, rabbits, and even cats and dogs' were imported from Holland, so too were vegetables, as well as fruits. As early as 1654, Jan van Riebeeck had offered his married employees private gardens to grow vegetables and keep poultry and pigs (Wilson and Thompson 1975: 193), while Evert van Guinee was the first Free Black to be granted land in July 1669 (Hattingh 1985: 39). These gardens were situated in the Table Valley and included land next to and above the Company gardens towards Table Mountain, as well as land towards Signal Hill and in the vicinity of the Castle (see Figure 1.1 above). They can be seen in the 1710 map of gardens in the Tafel Vallei (Hattingh 1985: 33), in the 1767 plan of Cape Town (in Mentzel 1921: appendix) and in the 1818 Renvooy map (*South African Library*, KCB: CT). In the 1767 map (in Mentzel 1921: appendix) they are specifically described as "gardens belonging to private individuals". Mentzel (1944: 187) also noted that the VOC had three large gardens, but does not provide their locations. He also noted that a number of fruit seedlings were brought to the Cape. They included the seeds of such fruits as plums, oranges, cherries, almonds, quinces, peaches, walnuts, apples and pears (Mentzel 1921: 53). Seeds were also acquired

<sup>10</sup> *The Magazine of Domestic Economy*, Vol. 2 (New series), 1844, March, pp.414-415. London: W.S. Orr & Co., Paternoster Row; and W. & R. Chambers, Edinburgh.

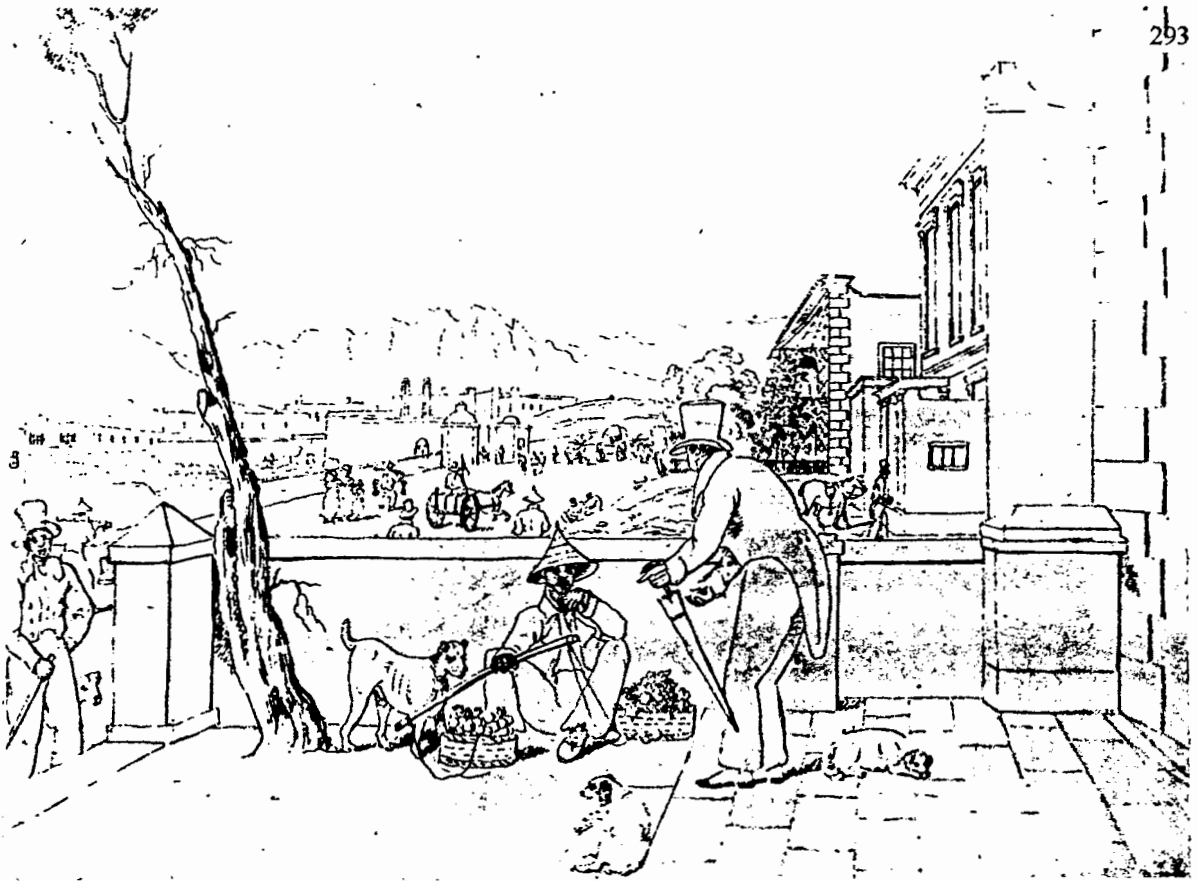


Figure 6.8: Pencil sketch by Sir Charles D'Oyly of a vegetable vendor sitting outside the steps of Gore Lodge, 11 May 1832 (D'Oyly 1968: plate 16).



Figure 6.9: Vegetable vendor, Sea Point (PHA: CT. Coloured people; employ. South African Library, Cape Town).

locally<sup>11</sup> or through passengers or friends<sup>12</sup>. In 1792, it was decided that the Company's gardens were to be leased out on public tender (Theal 1964: 267). Not only were vegetables grown for home consumption, but they were also hawked in town (see Figures 6.8 and 6.9). Mentzel noted that "[s]oup vegetables such as spinach, chervil, garden-tarragon, leek, orpine and many others [were ...] often hawked in lots at two stuivers" (Mentzel 1944: 193). Vegetables were even grown on Robben Island and sold to the residents of Cape Town (Van Burgst 1993: 27). Although they may successfully have been grown, the quality and supply of produce may have been lacking. Mentzel (1944: 31) noted that vegetables planted around the Tygerbergen and its gardens in their vicinity were of not very pleasant taste, and therefore were hardly brought to the city for sale. At other times it was noted that vegetables were plentiful and fetched lower prices than in England (Hattersley 1969: 100; Robinson 1994: 181). Although supply was locally based and originated from the various market gardens or from individual household gardens, it seems that supply did not extend much further past home consumption (cf. Mentzel 1921; 1944).

Whatever the exact position is on these items, fruit and vegetables did play a role in the local diet. To date there are no published historical archaeological reports in any of the South African archaeological journals, which relate to the recovery of botanical remains. This is partly a reflection of poor archaeological procedure than anything else. I would therefore recommend that greater care be taken in future with implicit archaeological goals of including such information into site reports and future publications (see Cheek 1986; Huelsbeck 1993: 48; and Reinhard, Mrozowski and Orloski 1986, on in-depth botanical analyses).

## 6.5. CONCLUSION.

Before closing this chapter, let us consider what knowledge we have gained and what we still seek. From the above it is rather clear that sources are available on issues of acquisition and consumption but less so on food preparation. Despite this there are still a number of issues which require further research. These include: (i) a greater understanding of the various breeds that are listed historically, and what anatomical differences and what different percentages of consumerable meat are present between different species; (ii) more information of different butchering units, as well as a greater understanding of what was included in the various forms of prepackaged food, and how this would impact on the archaeological record; (iii) a greater study of the different recipes that were available, to see how period-specific they were. Thus faunal analysis is by no means completed here. It requires a broadening out to issues on the periphery, which nevertheless impact the centre - that which results in what is left in the faunal record. As Jim Deetz (1977; see also Larkin 1989) stressed, one should not only look at the tangible remains - the historical and archaeological remains - but also understand the thought processes behind human choices. Faunal analysts should do the same, and go beyond what the mere bones represent and consider them as a commodity item that weaves its way through a whole range of human interactions.

<sup>11</sup>. A Dr. Upjohn and a Mr. John Napier, acquired seeds locally, the latter through A. Steedman & Co., St. George's Street (see *Cape Archives*, M106 #6, 44, and 73).

<sup>12</sup>. A Mr. Halron (sic) acquired seeds via a Capt. Holfe (see *Cape Archives*, M106 #6, 44, and 73).

## CONCLUSION.

Before discussing the original aims and results of this thesis, a brief overview is given of its structure. Chapter One broadly looked at the relationship between food and the end-user, the consumer. It asked what the nature of the Cape economy was? What was its structure? Who benefited from it? Who was involved in the production, supply and distribution of food as a resource commodity? Furthermore the chapter centered on the area of Sea Street: Who lived there? What occupations did these people pursue? What occupations were open to them? What was the nature of the household structure or composition?

Chapter Two provided the basis for the reader's understanding of the Sea Street site. It looked at the site's stratigraphy and any questions that emerged from it. The rationale behind the selection of faunal assemblages from certain layers above others was also considered. There was a discussion of the cultural material from the layers from which the faunal material was selected for analysis, so as to provide a temporal aspect to the site and the faunal material taken from it.

Chapter Three provided a review of analytical techniques used by zooarchaeologists. It looked at the disadvantages and advantages of the basic building blocks, such as MNI (minimum number of individuals) and NISP (number of identified specimens), but also considered other counting units, with a special emphasis later in the chapter on units of analysis utilized by historical archaeologists - a point to which we will return later. The chapter went further and investigated issues pertaining to taphonomy that plague all faunal collections and which invariably influences the retrieved data in some way. In short, both pre- and post-depositional biases were looked at, as well as factors which can be controlled by the faunal analyst, and those that are beyond his or her control.

Chapter Four provided the exact methodology by which the faunal material was analyzed, while Chapter Five provided the results gained from this methodology, as well as the answers to certain questions posed earlier. Lastly, Chapter Six looked beyond the mere bones and asked specific questions of food pathways, especially of those "consumables" which have not entered the archaeological record, as well as other sets of information gained from non-archaeological sources on the acquisition and consumption of food.

This thesis aimed to identify different butchery patterns between the assemblages from phases 2 and 3 on the assumption that they dated from the 18th and 19th centuries, and that any changes in the method of butchery patterns or acquisition would be noted. Although the cultural material dates to between *c.* 1780 and *c.* 1830, the microwear analysis of butchery patterns could not identify any *statistically significant* changes between older and younger assemblages. Despite this the thesis has resulted in a number of positive aspects.

The most important of these has been the laying down of a clear methodology, which will hopefully set the basis for future faunal analysis. At the heart of this clear methodology lay the structuring of a faunal datasheet which facilitated the later computerization of the data. This systematic methodology not only gives every faunal specimen a running number, identifies the specimen, lists whether it is from the right or left side of the carcass and whether it is from a juvenile or adult individual, but more importantly it identifies which sections of each faunal specimen are present, where each of the different forms of butchery had taken place, and from which plane and direction the butchery act had occurred. A further advantage of this datasheet and the zoning of all the skeletal elements is that the "methodology" can be amended by other researchers depending on their needs. Researchers can either add zones to the skeletal elements or merge zones together depending on the degree of information they seek. In addition, extra columns can be added depending on the questions they have of the faunal material. In my case the quantification of gnaw marks was not of considerable importance to the questions that I had posed, but other researchers may be interested in this particular area and may wish to add a column or two or additional columns on the burn stages of bones and wear stages of teeth.

By allowing all of this and more information to be collected and quantified, one is able to compare units or assemblages with those from other excavations and explain differences or show up similarities between the one and the other. The computerization of the data into either a worksheet or a database allows one to ask very specific questions of the faunal material. For instance, one could ask the programme to pull out all femora with chop marks in Phase 2 of Houses JAM and MAN. Furthermore, the list of femora with chop marks could be amended by asking the programme to select only those femora with chop marks in the zones around the ball-and-socket joint at the proximal end of the skeletal element. This may answer a specific question that the researcher has of the faunal material. Thus the datasheet has a number of adaptive practical applications, which may prove useful to other researchers as well.

Besides looking at the absence and presence of skeletal elements or the frequency and distribution of butchery marks on the faunal collection, percentage survivability and the distribution of individual types of butchery marks have also proven very useful. The percentage survivability of skeletal elements allows one to evaluate whether the observed pattern of survivability mirrors the expected pattern, taking into consideration issues such as taphonomy and bone density. Where gross differences are noted one has to attempt to answer these unexpected patterns in some rational way. In MAN Phase 2, for example, the percentage survivability of phalanges ranged between 55 and 72 percent - far above the average for phalanges. Similarly, if certain skeletal elements are totally absent, one has to ask why this phenomenon has occurred. For example, the lower percentage survivability of the humerus in JAM Phase 2 and in some other units was interpreted as the result of distal or proximal mid-shaft breakage with an ax/cleaver/chopper, with the explicit purpose of creating two separate butchering units, quartering the carcass at this specific point, or an attempt to get at the marrow.

In addition to looking at percentage survivability, the percentage distribution of individual types of butchery marks has proven particularly useful. The use of the distributional frequencies of butchery marks across the whole carcass has been adapted from the recently completed work of Richard Milo on the site of Klasies River Mouth. He was able to show that there was a definite positive relationship between, in his case, the distribution of cut marks and the systematic disarticulation and meat removal from the limbs of large medium and large bovids on the basis of the physical construction and arthrology of the joints. I have adapted this methodology slightly and have asked different questions of the faunal remains, concentrating on the distribution of cut, chop and saw marks. They provided some indication as to where certain butchery implements were more likely to be used or consistently used and where they were not used at all. For example, cut marks are more or less evenly distributed across the carcass, except among the ribs, with chop marks displaying a similar pattern, while saw marks are predominantly found on the axial skeleton. Furthermore the use of Spearman's *rho* correlation coefficient proved very useful in objectively stating whether two or more observable patterns were significantly different or not. In all cases a 95% significance level was utilized. In short, the above forms of analyses helped to establish a "*General Butchery Pattern*" which explains how the average sheep carcass was dealt with.

Most of the sheep that came to Cape Town were likely hybrids, that had been reared on farms in the interior and brought on the hoof to the Cape. After their long journey, they were fattened up for slaughter on farms near the town owned or leased out by the government, or belonging to private citizens. The sheep were then slaughtered within the confines of the town, at the Shambles, after which the discards were either thrown away or buried shallowly.

The "*General Butchery Pattern*" describes how sheep were slaughtered. After the animal had been killed, it was hung up by its feet and the hide was stripped off the carcass through transverse cut marks on the medial and lateral metapodials, carpals and tarsals. Thereafter the skull and mandible were severed from the vertebral column at the atlas or axis, more often with a saw than with an ax. A knife was used to facilitate the disarticulation of the skull from the atlas or between the atlas and axis. The mandible was often severed from the skull by chopping through it in the region of the ascending ramus, mandibular condyle and coronoid process. The skull may then have been sawn through posterior-anteriorly to get access to the brain. The forelimb was often severed by chopping through the cartilaginous region of the scapula and/or lateral spine, proximally or distally of the acromion. The next bone which was chopped through was the humerus. This was either done in the mid-shaft region or proximally or distally of the radial fossa. By chopping through the distal humerus, it often resulted in the proximal segments of the ulna or radius ending up in the archaeological record. Evidence of mid-shaft breakage on the humerus, radius and metacarpal may be secondary or tertiary butchery with the aim of marrow removal and does not necessarily relate to primary butchery. The carpals showed no evidence of "gross" forms of butchery, implying that the distal radius and the proximal tibia remained attached. The phalanges were either chopped through distally or proximally of their mid-shaft region or remained attached to the distal

metacarpals, or was severed by chopping through the metapodials. The hindlimb was severed in one of two places. The sacrum was either removed from the 6th lumbar vertebra by sawing through the anterior articular processes or it was longitudinally chopped between the wings and the sacral tuber of the pelvis. Alternatively the hindlimb was severed slightly posteriorly, through the ilium shaft. The femur was severed dorsally or ventrally of the acetabulum of the innominate, often resulting in the femoral head and/or neck remaining attached at the ball-and-socket articulation of the innominate. Alternatively, the femur was severed both distally and proximally of its respective ends, with evidence of disarticulation of the femur from the tibia as well. The tibia was in turn severed both proximally and distally of its mid-shaft region, but breakage could also have been the result of marrow retrieval as it has a high marrow index. The utilization of the metatarsal and the phalanges show similar patterns to that seen in the forelimb. The vertebrae and ribs were systematically dealt with. The vertebrae (the cervical, thoracic and lumbar) were exclusively sawn through the centrum and dorsal spines. Evidence of saw marks extend into the posterior articulations of the atlas through the 3rd cervical vertebra and axis. The transverse processes were sometimes either sawn or chopped through. Sawing or chopping through these processes in the thoracic vertebrae would have resulted in corresponding marks to or through the head, neck and/or tubercle of the dorsal ribs. The ribs were often turned on their lateral side, and chopped or snapped through either half or three-quarters of the way along its length, and often resulted in rib fragments between 10 and 15 cm in length. There are variations on this general pattern, but they should rather be seen as part of the background noise, and not as separate patterns.

The understanding of a "*General Butchery Pattern*" was aided by the limited available but yet useful historical records. They have brought to our attention the array of food resources which have not left any faunal traces, whether they were pre-packaged forms of meat in tins or barrels, or by-products from the butcher's shop, such as tripe, pluck and ox tails. They also place a more balanced emphasis on other sources of food, such as fish and vegetables, and how these two items contributed to the overall daily diet. Furthermore, they provided us with a hypothesis as to why *Sus scrofa* and *Bos taurus* play a less significant role in the faunal assemblage than does sheep. The historical records have nevertheless left a number of questions unsatisfactorily answered. More detail is required on the breeding of different species of sheep, their rearing, the distance traveled to market, the location of specific farms, the nature of continued supply, etc. In addition, more information is required on other faunal species, such as pigs. Although we are aware of the nature of their supply and demand, and the provisioning of cured pork from America and Ireland, little is known of the exact contents of these imported barrels, although some information has been gained on the differences between the different forms of preserved pork, as to what constituted forms of prime and mess pork. A clearer understanding of what constituted Irish and American provisions is still required (see discussion on archaeologically recovered pork above). The same goes for beef, which was exported from the Cape Colony to Mauritius. In some of the colonial tenders it was stipulated that the Cape-cured Salt Beef "both with regard to the number and size of the

pieces, to be as nearly comfortable to Irish Provisions as possible". Elsewhere it was demanded that none of the prime parts were to be disposed of, but does not qualify what constituted a prime part. In short, more detailed information is required on preserved forms of meat, what skeletal elements and cuts of meat were included, and how American and Irish provisions differed from each other.

In the discussions leading up to the methodology, a very important point was touched on and needs to be re-emphasized here again. In the past, and still no doubt in the present, there are many authors of publications who have a fixation with MNI in the belief that it formed and forms the basic unit of acquisition. No doubt there may have been cases where the whole animal was the "unit of acquisition", but in more cases than most only part or a portion of the animal was acquired. In both prehistoric and historical archaeology researchers are placing more emphasis on what was acquired. Therefore if only one proximal femur was found in the unit, then only one proximal femur was acquired and not the whole carcass.

The MNI data on body part frequencies suggest that the upper hind- and forelimbs, the pelvis and mandible often ended up in the archaeological deposit, as did the scapula. Despite this, portions from the lower extremities (metacarpals, metatarsals and phalanges) were not completely ignored. Thus selection included cheaper cuts of meat with lower meat yields. Two hyoid bones were also recovered with cut marks indicating that the tongue was also enjoyed. A reasonable number of vertebral and rib fragments were also found, but until more information on individual cuts are known, little can be said. In terms of MNI they do not feature well. Lastly, a number of specific elements show evidence of mid-bone breakage or chopping to facilitate access to the marrow cavity or so that bones could be put into the pot. These include the mandible, the humerus, radius, tibia, and metacarpals, and metatarsals.

In historical archaeology, where often the colonial setting was influenced by some form of market exchange economy, the unit of acquisition was influenced by both consumer choice and whether the butcher was an amateur or a professional. Thus the unit of acquisition may have been from pig's trotters to a leg of mutton, a rack of ribs, a quarter or half of the carcass. The consumer was influenced by his or her own personal circumstance to acquire certain units of acquisition and not others. The archaeological assemblage shows a fair mix of stewing units, communal and individual roasts, with a taste for waste units which comprised metacarpals and -tarsals and phalanges. If one ranks the cooking units, communal roasts were best preferred, followed by waste units and individual roasts, with stewing units ending up last in the food pot.

In Chapter Five it was argued that there were no significant statistical differences between each of the phases from both Houses JAM and MAN. Although no cultural change was noted, one would normally expect change under various general circumstances. Firstly, if one was dealing with two assemblages from for example Jewish and Christian households. Secondly, between rural and urban households one would largely expect differences in the faunal lists from both assemblages. Thirdly, one

would expect obvious differences if the assemblages arose from two dissimilar socio-economic households. *Fourthly, one would expect temporal differences between assemblages from for example 18th and 19th century households. And lastly, one could add, differences would be expected with the addition and use of new butchery tools.* To take a contemporary example, the use of the power saw has significantly influenced how the butcher deals with the carcass. Interestingly, the power saw is used to cut lamb or mutton chops, but the knife is still preferred in the slicing of pork chops. Nevertheless, the knife and the cleaver are used far less frequently. In addition, the carcass comes dressed to the butcher from the abattoir. The hide, most of the internal organs and the head usually do not end up in the butcher's shop. *As Sea Street was a dump site, and did not deal with assemblages from individual households, only the fourth and last general pattern could to be expected.* As neither played a statistically significant role, one is left to conclude that: (i) the space of time between the older and younger units was too short for cultural change to have occurred; and (ii) that no significant changes occurred in the method by which butchers' dealt with carcasses in the period under study. Although the samples chosen here were statistically similar, this does not mean that this turn of the 19th century pattern is identical to that of assemblages that date to the second or third quarter of the 19th century, or much earlier or later. This will have to be tested.

A further issue that was touched on was sample size. What is an adequate faunal sample? How large should the faunal assemblage be so as not to influence the final results seen as a result of inadequate sample size? Here it was decided that not only should comparative faunal collections be of similar size, but that they should not be less than 200 specimens, and that the optimal level is somewhere between 200 and 400 specimens per species. Furthermore, I would argue that comparisons should be on a general (macro) and not on an overly specific (micro) level, as there are too many variables beyond the archaeologist's control that may influence patterns between two units from the same phase.

One of the goals for future analysis would be the selection of temporally delineated assemblages, preferably from residential or commercial sites, and not from a dump site, where issues of cuisine, socio-economic status and differences between rural and urban households among others could be looked at. Linked with the analysis of specific assemblages is a better understanding of both the residential and commercial make-up of an urban area. This can be gained through the detailed analysis of the street directories at regular intervals, which also reflect the introduction of new groups of individuals into areas, the movement of people away from particular areas, the movement of people from the urban centre to the suburbs, as well as the varying nature of employment over time. This has successfully been done by Nan Rothschild in her seminal 1992 work, where she looked at the changing character of New York City's neighbourhood. Besides looking at a representative sample of the population in the 18th century from the street directories, she also looked at the spatial delineation of specific areas within the city, the use of space within the city, the growth of the urban city, the creation or non-creation of neighbourhood identity, the positioning of key religious, social and economic institutions on the landscape, as well as the

economic composition and occupational structure of New York City's inhabitants. These various issues have certainly aided her and her colleagues understanding of everyday life in the metropole. Various other researchers have touched on similar issues, one of which may be of particular interest to researchers in Cape Town, namely: What is the relationship between work and residence in the colonial city? Did people purposefully live close to their work place or did some other factor play a role, and how, when and why did this relationship change? These are just some of the issues that could still be analyzed.

One of the issues brought up in this thesis was that of consumer behaviour. This has remained a largely ignored topic in historical archaeology in South Africa. I know of no local historical archaeological publication that makes use of issues influencing consumer behaviour to explain patterns or discrepancies seen in the archaeological record. This may be a factor of the nature of excavations to date, as many have been dump site excavations and very few relate to a specific residential households. The importance of consumer behaviour lies in the fact that the structure of a household and its economic position may well vary over time. Although individuals or a household may fit into definitions of lower, middle and upper classes, their consumer behaviour may not be of either of these classes. Consumer behaviour is strongly influenced by the purchasing power of an individual or a household. It is this *purchasing power* that may vary through the general level of income of the household, the life cycle and structure of its members, and its income strategy. Thus the number of wage earners in the household, the number of dependents, changes in age, marital status, residential circumstances and the addition of children will all affect the purchasing power of that household. A large proportion of Cape Town house owners supplemented their income by renting out rooms to lodgers or increased their purchasing power through the presence of multiple wage earners. In Ward 1 for instance, where Sea Street is located, it was discovered that 72.7% of the residents listed in the 1799 *Burgerraad* census had boarders lodging with them. Thus it is not sufficient simply to assign an individual to a certain social category without investigating the circumstances around his or her life cycle.

One of the recommendations made in an earlier chapter was for a holistic approach to site analysis. Often no attention is given to the botanical remains from the site. As a result a particular dimension of the overall picture is lost. Often the reader gets the impression that people were only eating wild and domestic meat, and that fruit and vegetables never ended up on the household table. This is a perception that has to be remedied by historical archaeologists.

Another recommendation, which lies beyond the practical or experimental analysis of faunal collections, concentrates on the cultural and temporal influences on people's attitudes towards food and overall diet. In the United States a considerable degree of research has gone into the analysis of recipes. It is through recipes that people's perceptions and changing perceptions of food can be gained. Often recipes reveal which dishes were in vogue. For example, crayfish is today seen as a delicacy, but during the 19th

century it was often thrown away by fishermen or used as bait to catch fish. Recipes also not only reveal what types of food were preferred, but also how they were treated or cooked. Thus by understanding which types of meat were the choicest and the manner in which they were cooked, it may add an additional angle to a broader understanding of the use of food to faunal analysis. Elizabeth Reitz (1987; 1991) has done this in part for the early Spanish colonial settlements in the Americas, where diet and foodways and/or "cuisine" played a vital role in the external recognition and self-recognition of a social or cultural group and was usually one of the last areas to be modified. By extension, a broader understanding of contemporary local and foreign, and indigenous and ethnic cuisine will aid researchers in the pursuit of what was eaten in the absence of detailed accounts of individual journals or account books by butchers.

The central theme through this thesis, permeating both the historical and archaeological analysis, has been the role that food has played in the everyday lives of people in Cape Town. So as to clearly decipher the hidden code in the faunal material, a greater understanding of the utilization of food, in both processed and raw forms, has been required. The deciphering of patterns on the faunal material has been aided and abetted by a series of specific questions of the faunal material and a clear methodology which aimed to answer these questions. This thesis, therefore, provides a systematic in-depth analysis of butchery patterns of historical archaeological material in South Africa. Its contribution to the discipline lies in the structuring of a methodology which aids the in-depth analysis of faunal material, and from which the patterns alluded to above would not have been noted. Furthermore, this thesis has shown that faunal material from a dump site can positively be utilized to look at butchery patterns and explains how the average sheep carcass was dealt with at the primary and secondary butchery level.

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**APPENDIX A: Slave population of Cape Town and the Cape District by Occupation, 1816-1834.**

<b>Occupation</b>	<b>No. of slaves</b>
<i>Bakers</i>	87
<i>Barbers</i>	2
<i>Basketmakers</i>	4
<i>Billiardmakers</i>	3
<i>Blacksmiths</i>	94
<i>Boatmen</i>	22
<i>Brickmakers</i>	28
<i>Butchers</i>	45
<i>Butlers</i>	3
<i>Cabinetmakers</i>	2
<i>Carpenters</i>	203
<i>Caulkers</i>	3
<i>Cellar "boys"</i>	18
<i>Charcoalburners</i>	1
<i>Clerks</i>	1
<i>Cooks</i>	456
<i>Coopers</i>	46
<i>Coppersmiths</i>	7
<i>Fishermen</i>	59
<i>Florists</i>	1
<i>Gardeners (and 1 garden "maid")</i>	131
<i>Glaziers</i>	5
<i>Goldsmith</i>	1
<i>Gunmakers</i>	2
<i>Habitmakers</i>	1
<i>Hatters</i>	7
<i>Hawkers</i>	50
<i>Haymakers</i>	1
<i>Herdsmen</i>	263
<i>Horsekeepers/Grooms</i>	60
<i>House "boys"</i>	657
<i>House "maids"</i>	2500
<i>Husbandmen</i>	85
<i>Jewellers</i>	1
<i>Knitting "maids"</i>	59
<i>Labourers</i>	2499
<i>Laundresses</i>	98
<i>Limeburners</i>	1
<i>Lockmakers</i>	2
<i>Masons</i>	265
<i>Milk "boys"</i>	11
<i>Millers</i>	17

<b>Occupation cont.</b>	<b>No. of slaves</b>
<i>Miners</i>	12
<i>Musicians</i>	5
<i>Nursey"maids"</i>	99
<i>Overseers</i>	8
<i>Painters</i>	43
<i>Porter/"Coolies"</i>	26
<i>Potters</i>	3
<i>Saddlers</i>	29
<i>Sailmakers</i>	1
<i>Scullions</i>	7
<i>Seamstresses</i>	191
<i>Shepherds (and 1 shepherdess)</i>	52
<i>Shoemakers</i>	167
<i>Silversmiths</i>	9
<i>Soapboilers</i>	1
<i>Tailors</i>	312
<i>Tallowchandlers</i>	14
<i>Tanners</i>	44
<i>Thatchers</i>	5
<i>Tinsmiths</i>	3
<i>Tobacconists</i>	5
<i>Turners</i>	4
<i>Vintagers</i>	13
<i>Waggoners/Coachmen</i>	272
<i>Waggonmakers</i>	38
<i>Wash"maids" (and 3 wash"boys")</i>	236
<i>Watchmakers</i>	1
<i>Watercarriers</i>	1
<i>Winemakers</i>	1
<i>Woodcutters</i>	25
<b>Total</b>	<b>9428</b>

(Source: Bank 1991: 237-239, appendix 6).

**APPENDIX B: CO 490 #159. Report of the Special Wardmasters and Medical Report for Ward No. 1., 27th April 1840.**

Ward No. 1.

Report of the Special Wardmaster appointed by proclamation of 27th April last to inspect, and report on the state of the above ward as to cleanliness and the extent of small pox.

The Wardmasters beg to refer to the accompanying detailed account of their proceedings from which it will be found under the following heads.

- | Head | No. |  |
|------|-----|--|
|      | 1.  | That they have visited 182 habitations almost exclusively occupied by the poor.                          |
|      | 2.  | That these habitations contain 477 rooms.  |
|      | 3.  | That they are occupied by 1493 individuals.  |
|      | 4.  | That of this number 518 have had or are now labouring under the disease of small pox.                    |
|      | 5.  | That of the 518 afflicted 42 had died up to the 4th inst. the day on which the inspection was completed. |

In regard to Head No. 1 the Wardmasters report, that these habitations (houses would be an improper term for a considerable portion of them) and more especially those situated in the rear of Strand Street comprising chiefly "hire houses" are in a dirty, crowded and unventilated state, living around inside and out, with drying fish, the occupants being generally fishermen, and those who gain a livelihood of curing fish. The drains in the Gangs or "Steegs" - the most crowded situations - are filled with putrid masses of filth, to which the neighbourhood appears accustomed for "which is everyone's business being no ones" each complains of this neighbours filth which no one removes. These "hire houses" for the purposed yielding to the proprietors the greatest possible amount of rent. are so crowded together, back to back that many are without any expedient for draining off the filth - and more instance (No. 133). The only means of disposing of it is by a hole dug in the centre of an area a few square feet called a yard, where the deposit is left to purify until full, when it is paled out, ready for a fresh supply! The Houses in Long street (no<sup>s</sup> 21 and 26) have no outlet in the rear, the engendered filth being conducted by means of sprouts down into the yard of and joining row of houses (built on a lower level) in Klip Visch Steeg (no<sup>s</sup> 2 and 8). These spouts being what is termed a servitude on the last named premises the occupants of which are thus compelled to receive the dregs of others, having no proper outlet for their own. The total haul of water for cleaning and the poverty pleaded by the people, as an excuse why they cannot afford to have it brought from the distant public pumps - is the great cause of the immense accumulation of dirt which occurs.

As prominent specimens (s)ituated (*sic*) atmosphere caused by over crowded population in improperly constructed buildings - the Wardmasters beg to refer to the following numbers of the detailed account. viz. No. 1, 40 and 46. 49 {Where amongst other abominations a leprous woman was found}. 51.91.107 \* 110. 130 (a curiosity) and 137. 168 and 169.

After thus stating the Condition of the poorest (Comprising the greatest portion) of the ward, they must in justice to others state that many houses and especially those of the better classes of Malays were kept in very clean and wholesome condition.

Under the 2nd and 3rd heads it will be seen that 477 Rooms are inhabited by 1493 individuals, and there is reason to believe that this number is considerably underrated, from the very great difficulty experienced in making the occupants give up children and lodger as inhabitants of the house. The Return as it stands, gives an average of considerably more than Three persons to each room (the precise calculation being  $3^{62}/_{477}$ ths). Comparing this, with the average number inhabiting the houses of the upper classes (a calculation which every one can easily make) and which have moreover the advantage of large and airy apartments, it will at once be discovered what a dense mass of "unwashed" population the above average may be considered to disclose.

Head No. 4. 518 persons out of 1493 have been proved to have taken the small pox, and of these, some had recovered more than a month since! Thus skewing, not only the great extent to which the disease had spread, but also, the long time that it has been lounging the town. So completely was it diffused over the ward, that the Wardmasters were convinced, that preventive measures came too late. Out of 182 houses only 32 could not be substantiated to have received the disease.

Head No. 5. Shows 42 deaths out of 518 afflicted, and this return if it is to be feared is much underrated for reasons stated in explanations No. 2 and 3. Deaths are still daily occurring and new cases appearing.

—•—

To sum up - the Wardmasters are of opinions that the principle benefits of the labours have been

- 1st. To induce for the present a greater degree of cleanliness, but for the continuance of this primary object a better supply of water is imperative.
- 2nd. The vaccination of some children and the promises obtained from parents to attend to the necessary operation in regard to their families. They may observe that vaccination has been much more general than they here led to expect nor could they discover any prejudice against it amongst the Mohammedans or their priests.
- 3rd. They are of opinion that some municipal regulations are required to prevent the improper construction of dwelling and to restrict the occupation of holes and cellars unfit for human habitation.

The Wardmasters cannot close their report without acknowledging the very able assistance of Dr. Laing who volunteered for this duty and who accompanied them through the whole ward into every room, cellar and back lane.

Tho<sup>s</sup> Ausdell

J<sup>n</sup> Albertus

Cape Town

7 May 1840

Medical Report for Ward No. 1.

The population in this ward consists generally of coloured people, who are principally fishermen with a few mechanics, it is very dense, and these apartments are small and ill inhabited, but many of the houses are clean.

Fish and rice appear to be the general and principal articles of diet.

Small pox in this ward, both in the simple and confluent form has been very general. the third of the population has been attacked. it is impossible to get at correct data on this head, but this proportion is evidently under the mark. Vaccination has been unusually adopted, both amongst the Christian and Mohammedan persuasions. Many have been prevaccinated. The few exceptions to vaccination were amongst children that had come from the country.

The confluent form of the disease has in this ward been very prevalent as is evident from the number of deaths, and the numerous cases still convalescing from it.

The females have suffered in greater proportion than have the males both as respects the frequency and severity of the complaint.

Several children had the confluent kind who had been vaccinated.

In some families there was a marked fatality amongst the members arising from some constitutional peculiarity.

The natives from St. Helena where vaccination is strictly enforced have all suffered severely. In conclusion the disease still exists to some extent amongst the lower classes, and several fatal cases have occurred in this ward since the report of the Wardmasters and from the numerous cases seen and reported. I am of opinion that the vaccine virus here, has evidently degenerated, so much so, as to offer no great protection against small pox, and that every endeavour ought to be and as speedily as possible to get a supply of fresh matter either from England or elsewhere.

John Laing

Surgeon

May 14th, 1840.

**APPENDIX C: AMENDED REGULATIONS TO THE LOCAL ORDINANCES WHICH AFFECTED THE OCCUPATIONS OF BUTCHERS.**

**Meeting of Wardmasters. Monday Evening, June 12th. [1848] [...]** The consideration of the amended regulations with respect to the sale of meat and fat [...] Mr. Collard argued [...] that there did exist a necessity for the removal of the shambles outside the town, and that the voice of the public was in favour. [The amendment was not carried]. [...]

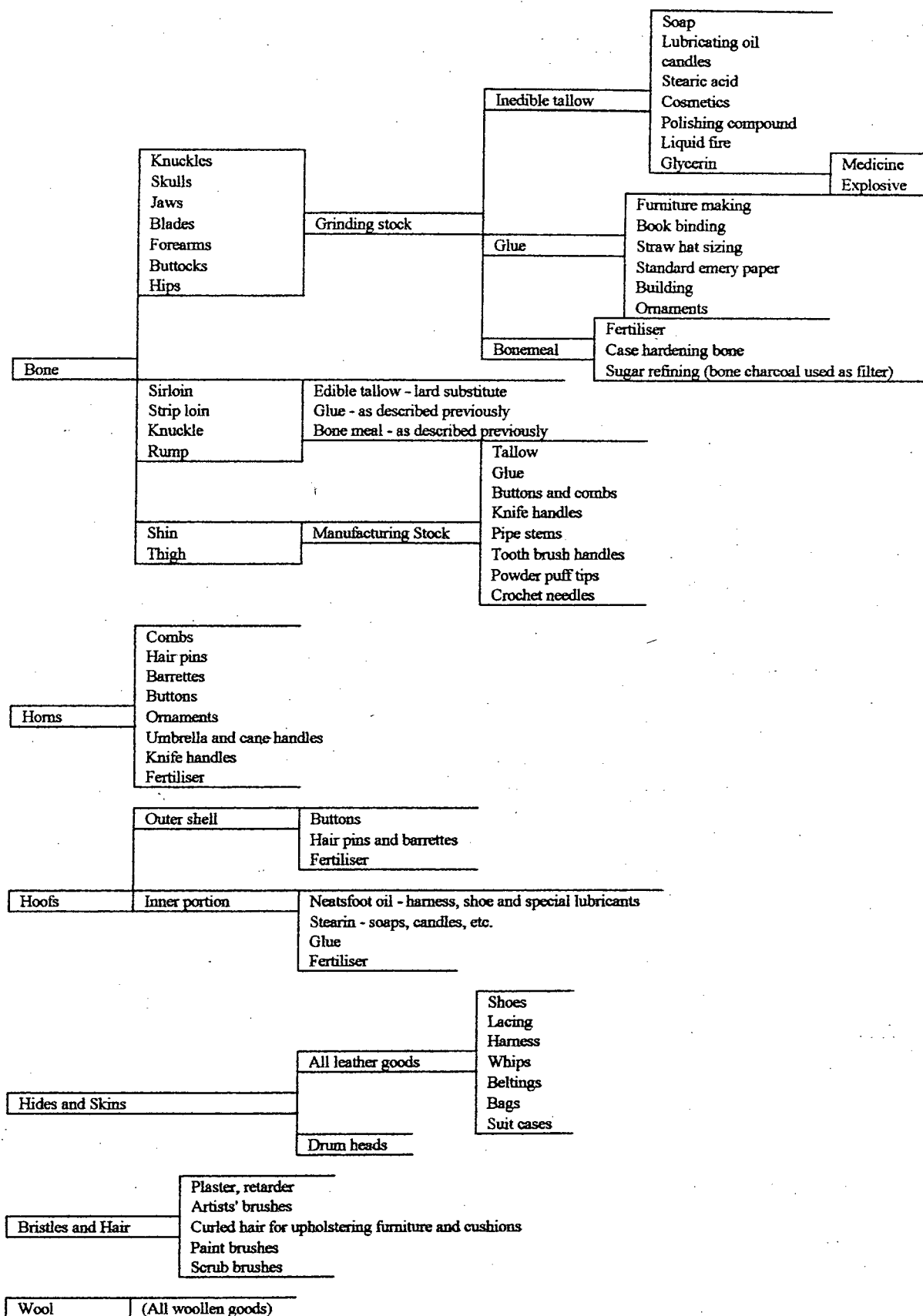
*Amended Regulations touching the sale of Meat and Fat.*

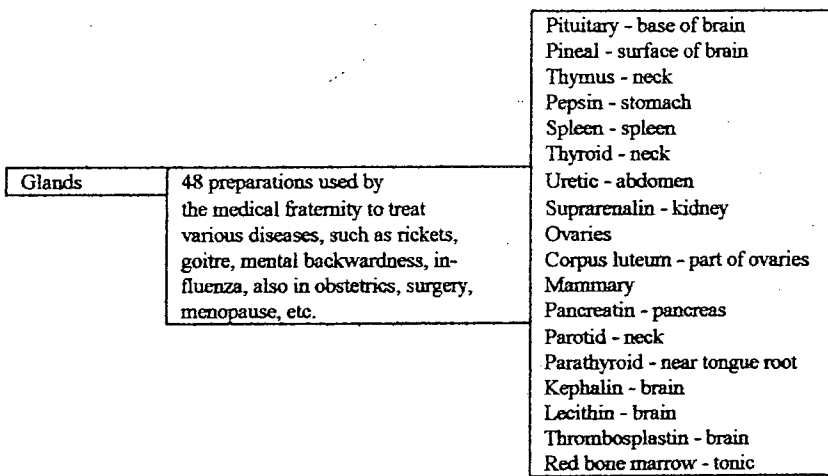
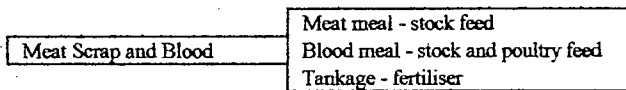
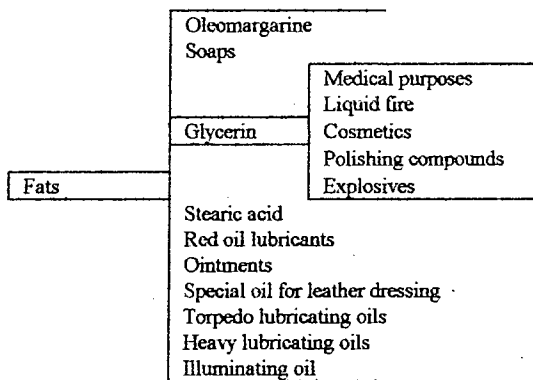
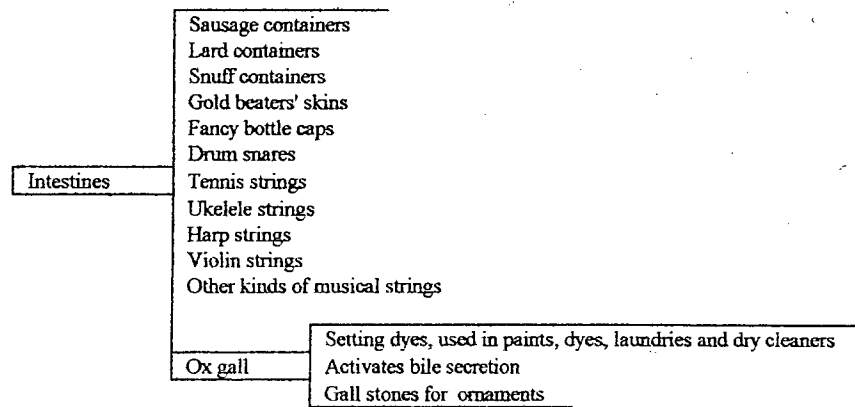
1. Every person desirous of carrying on the trade of a butcher, or to vend meat and fat within the municipality of Cape Town, shall apply for a licence from the commissioners for the said municipality, for which he shall pay the sum of 2*l.* - and every person carrying on the trade of butcher, or vending meat or fat, within the said municipality of Cape Town without such licence as aforesaid, shall for every offence be liable, upon conviction, to a penalty not exceeding the sum of 5*l.* Adopted, - one half of the fine to be paid to the informer, not being a municipal officer.
2. Every person, after having obtained such licence, shall be bound to affix upon some conspicuous place before his door or shop, a board or notice, containing his name, and the words - "Licensed Butcher". And every person carrying on the trade of a butcher, or vending meat or fat, within the municipality of Cape Town, without having such board or notice affixed, shall for every offence be liable, upon conviction, to a penalty not exceeding the sum of 5*l.* Adopted, - as in No. 1, the name to be placed *over* the door.
3. No person shall be entitled, by virtue of a licence so obtained, to carry on the trade of a butcher, or to vend meat or fat in more than one shop or place; but every person desirous to carry on such business, or to vend meat or fat in more places than one, shall be obliged to apply for and obtain a licence for every shop, as above directed. And every person selling meat in any other shop except at that for which he has obtained such licence, shall, upon conviction, be liable to a penalty not exceeding the sum of 5*l.* Adopted, - as in No. 1, with respect to the fine.
4. No person shall be allowed to slaughter any horned cattle, calves, sheep, goats, lambs, or pigs, within the municipality of Cape Town, except at such place or places as shall have been approved of by the board of commissioners; provided, that, upon any application for permission to slaughter at any one or more places being received, a notice of at least 14 days shall be given thereof by the said commissioners, in any one or more of the public newspapers, in order to ascertain, before taking any such application into consideration, whether there exist any objection on the part of the resident householders to such permission being granted, or otherwise. And it shall be the duty of every person, having obtained such permission to slaughter within the municipality of Cape Town as aforesaid, and of every vender of meat or fat, to deposit, or cause to be deposited, before sun-set, every day, all offal and other offensive matter, on the sea beach, between high and low water mark, behind the Amsterdam Battery, or at such other spot or spots as may be allowed by the commissioners for that purpose; and every person contravening this regulation, shall, for every offence, be liable, upon conviction, to a penalty not exceeding 5*l.* Adopted, - adding the words - "at the town shambles, and at such other places as the commissioners deem fit to allow." That 8 days' notice be given, - adopted.

5. Every butcher, having obtained permission to slaughter within the municipality as aforesaid, or vender of meat or fat, shall be obliged to keep his shop, and other premises occupied for the purpose, in a clean and wholesome state; and that every person contravening this regulation, shall, for every offence, be liable, upon conviction, to the penalty not exceeding 5*l*. Adopted, - as in No. 1, as to the fine.
6. Every butcher, having obtained permission to slaughter within the municipality, as aforesaid, or vender of meat or fat, shall cause to be fixed in some conspicuous part of his shop, on or near the counter, a beam and scales, (in such manner that both the scales can touch the counter), with standard weights, or other sufficient balance, in order that all meat and fat there sold may from time to time be weighed in the presence of the purchasers thereof, if they shall so require; and if any butcher or vendor of meat or fat, shall neglect to fix such beam and scales, or other sufficient balance, in manner aforesaid, or shall not weigh meat or fat sold in his shop, when required so to do by a purchaser, he shall for every offence, be liable, upon conviction, to a penalty not exceeding £5. Adopted- as in No. 1, as to the fine.
7. It shall be the duty of the commissioners, or of any one of them, or of any person specially appointed by them for that purpose, from time to time, to visit the several shops in which the trade of a butcher is carried on as above, in order to ascertain whether the same is kept in a clean state, and whether the meat or fat sold therein be good and wholesome; and every person who shall sell, or offer or expose for sale, any bad or unwholesome meat or fat, or who shall otherwise contravene this regulation, shall be liable, for every offence, upon conviction, to a penalty not exceeding the sum of £5; and it shall be lawful for the commissioners to order all such bad and unwholesome meat or fat to be confiscated and destroyed. Adopted- as in No. 1, as to the fine.
8. Upon the publication of the above regulations touching the sale of meat and fat, in terms of the provisions of Ordinance No. 1, 1840, the regulations published in the Government Gazette of the 12th March, 1841, shall be wholly void and of no effect. Adopted, - as in No. 1.

(Source: *The Shopkeepers' and Tradesmen's Journal*, Vol. 2, No. 64, June 16, 1848, p.3).

**APPENDIX D: BY-PRODUCTS GAINED FROM THE WHOLE USE OF THE CARCASS.**





(after Clemen 1923: 377-378).

## APPENDIX E: PERCENTAGE SURVIVABILITY OF VARIOUS SKELETAL ELEMENTS.

Table 1: Percentage survivability above 75% for skeletal elements by unit.

	JAM 4L	JAM 7L	JAM 8L	MAN 3AL	MAN 4AL	MAN 4L	MAN 7L
<i>astragalus, left</i>	-	-	-	-	-	-	75.0
<i>calcaneum, left</i>	-	-	-	-	-	-	75.0
<i>calcaneum, right</i>	-	-	-	-	-	-	75.0
<i>femur, right</i>	-	-	-	100.0	-	-	-
<i>mandible, left</i>	-	100.0	100.0	100.0	-	-	-
<i>mandible, right</i>	-	-	-	-	-	100.0	-
<i>naviculo-cuboid</i>	-	-	-	-	-	-	100.0
<i>3rd phalanx, right</i>	-	-	-	-	-	-	78.1
<i>radius, left</i>	100.0	-	-	-	-	-	87.5
<i>radius, right</i>	88.2	85.7	-	-	100.0	-	75.0
<i>scapula, left</i>	-	-	-	83.3	-	-	-
<i>ulna, left</i>	-	-	-	-	-	80.0	-

Table 2: Percentage survivability above 75% for skeletal elements by phase.

	JAM PHASE 2	MAN PHASE 2	JAM PHASE 3	MAN PHASE 3
<i>astragalus, left</i>	-	75.0	-	-
<i>calcaneum, left</i>	-	75.0	-	-
<i>calcaneum, right</i>	-	75.0	-	-
<i>femur, right</i>	-	-	-	100.0
<i>femur, ind.</i>	-	-	-	90.9
<i>mandible, left</i>	100.0	-	-	-
<i>naviculo-cuboid, right</i>	-	100.0	-	-
<i>3rd phalanx, right</i>	-	78.1	-	-
<i>radius, left</i>	-	87.5	100.0	-
<i>radius, right</i>	-	75.0	88.2	-

Table 3: Percentage survivability between 50% and 75% for skeletal elements by unit.

	JAM 4L	JAM 7L	JAM 8L	MAN 3AL	MAN 4AL	MAN 4L	MAN 7L
<i>astragalus, ind.</i>	-	-	-	-	50.0	-	-
<i>astragalus, right</i>	-	-	-	-	-	-	50.0
<i>atlas</i>	64.7	-	-	66.7	-	-	-
<i>calcaneum, left</i>	-	-	-	-	50.0	-	-
<i>calcaneum, right</i>	-	-	-	50.0	50.0	-	-
<i>femur, ind.</i>	-	57.1	-	-	-	60.0	62.5
<i>femur, left</i>	-	-	-	50.0	-	-	-
<i>femur, right</i>	-	-	-	-	50.0	-	-
<i>humerus, right</i>	-	-	-	-	50.0	-	-
<i>humerus, left</i>	70.6	-	-	-	-	-	50.0
<i>innominate, left</i>	64.7	-	-	50.0	-	-	-
<i>innominate, right</i>	52.9	57.1	-	66.7	-	-	50.0
<i>mandible, left</i>	-	-	-	-	-	-	50.0
<i>mandible, right</i>	-	57.1	61.5	-	-	-	-
<i>metacarpal, ind.</i>	-	-	-	66.7	-	-	62.5
<i>metacarpal, left</i>	-	-	-	-	50.0	-	-
<i>metatarsal, ind.</i>	-	-	-	-	-	60.0	50.0
<i>metatarsal, right</i>	-	57.1	-	-	-	-	-
<i>metatarsal, left</i>	-	-	-	50.0	-	-	62.5
<i>naviculo-cuboid, right</i>	-	-	-	50.0	50.0	-	-
<i>1st phalanx, left</i>	-	-	-	-	-	-	65.6
<i>2nd phalanx, right</i>	-	-	-	-	-	-	65.6
<i>3rd phalanx, left</i>	-	-	-	-	-	-	65.6
<i>scaphoid, left</i>	-	-	-	-	-	-	50.0
<i>scaphoid, right</i>	-	-	-	-	-	-	50.0
<i>scapula, left</i>	58.8	-	-	-	-	-	-
<i>scapula, right</i>	64.7	-	-	-	-	-	-
<i>tibia, left</i>	-	-	53.8	-	-	-	-
<i>tibia, right</i>	-	-	-	-	50.0	-	50.0
<i>ulna, right</i>	-	-	-	-	-	60.0	-
<i>ulna, right</i>	58.8	-	-	-	-	-	-

Table 4: Percentage survivability between 50% and 75% for skeletal elements by phase.

	JAM PHASE 2	MAN PHASE 2	JAM PHASE 3	MAN PHASE 3
<i>astragalus, right</i>	-	50.0	-	-
<i>atlas</i>	-	-	64.7	-
<i>calcaneum</i>	-	-	-	63.6
<i>femur, ind.</i>	-	62.5	62.5	-
<i>humerus, left</i>	-	50.0	70.6	-
<i>humerus, right</i>	-	-	-	54.5
<i>innominate, left</i>	-	-	64.7	54.5
<i>innominate, right</i>	50.0	50.0	52.9	54.5
<i>mandible, left</i>	-	50.0	-	-
<i>mandible, right</i>	60.0	-	-	-
<i>metacarpal, ind.</i>	-	62.5	-	-
<i>metacarpal, left</i>	-	50.0	-	-
<i>metatarsal, left</i>	-	62.5	-	-
<i>metatarsal, ind.</i>	-	50.0	-	-
<i>naviculo-cuboid, right</i>	-	-	-	54.5
<i>1st phalanx, left</i>	-	65.6	-	-
<i>2nd phalanx, right</i>	-	65.6	-	-
<i>3rd phalanx, left</i>	-	65.6	-	-
<i>radius, right</i>	-	-	-	63.6
<i>scaphoid, left</i>	-	50.0	-	-
<i>scaphoid, right</i>	-	50.0	-	-
<i>scapula, left</i>	-	-	58.8	63.6
<i>scapula, right</i>	-	-	64.7	-
<i>tibia, right</i>	-	50.0	-	54.5
<i>ulna, right</i>	-	-	58.8	-

Table 5: Percentage survivability between 25% and 50% for skeletal elements by unit.

	JAM 4L	JAM 7L	JAM 8L	MAN 3AL	MAN 4AL	MAN 4L	MAN 7L
<i>astragalus, ind</i>	-	-	46.2	-	-	-	-
<i>astragalus, left</i>	41.2	28.6	-	-	-	-	-
<i>astragalus, right</i>	41.2	-	-	-	-	-	-
<i>atlas</i>	-	42.9	-	-	-	-	37.5
<i>axis</i>	41.2	42.9	-	-	-	-	-
<i>calcaneum, ind.</i>	35.3	28.6	-	-	-	-	-
<i>calcaneum, left</i>	47.1	28.6	-	-	33.3	-	-
<i>caudal vertebrae</i>	-	-	-	-	-	-	41.7
<i>external unciform, left</i>	-	28.6	-	-	-	-	-
<i>external unciform, right</i>	29.4	-	-	-	-	-	37.5
<i>femur, ind.</i>	29.4	-	30.8	-	33.3	-	37.5
<i>femur, left</i>	29.4	42.9	30.8	-	-	-	-
<i>femur, right</i>	-	28.6	-	-	-	40	37.5
<i>humerus, left</i>	-	28.6	-	-	-	-	-
<i>humerus, right</i>	-	42.9	-	-	-	40	25
<i>innominate, left</i>	-	42.9	-	33.3	33.3	-	37.5
<i>innominate, right</i>	-	-	46.2	-	-	-	-
<i>lateral malleolus, left</i>	35.3	-	-	-	33.3	-	-
<i>lumbar vertebrae</i>	-	28.6	-	-	-	-	-
<i>lunate, left</i>	29.4	-	-	-	-	-	-
<i>lunate, right</i>	-	-	-	-	-	-	37.5
<i>magnum, left</i>	29.4	28.6	-	33.3	-	-	37.5
<i>mandible, right</i>	-	-	-	-	-	-	25
<i>metacarpal, ind.</i>	29.4	28.6	38.5	-	33.3	-	-
<i>metacarpal, left</i>	29.4	28.6	30.8	33.3	-	-	-
<i>metacarpal, right</i>	35.3	28.6	46.2	33.3	33.3	-	23
<i>metapodial, ind.</i>	-	-	-	-	-	-	28.1
<i>metatarsal, left</i>	29.4	42.9	-	-	-	-	-
<i>metatarsal, right</i>	-	-	-	33.3	-	40	37.5
<i>naviculo cuboid, left</i>	35.3	-	-	-	-	-	37.5
<i>naviculo cuboid, right</i>	29.4	-	-	-	-	-	-
<i>patella, left</i>	-	-	-	33.3	-	-	-
<i>1st phalanx, left</i>	-	25	-	-	25	-	-
<i>1st phalanx, right</i>	32.4	-	-	-	-	-	43.8
<i>2nd phalanx, left</i>	-	32.1	-	-	-	-	43.8
<i>2nd phalanx, right</i>	32.4	25	-	-	-	-	-
<i>radius, left</i>	-	42.9	46.2	-	-	-	-
<i>rib, right</i>	-	-	-	-	-	-	26.9
<i>scapula, left</i>	-	28.6	-	-	33.3	-	-
<i>scapula, right</i>	-	28.6	-	-	-	40	-
<i>tibia, right</i>	29.4	28.6	-	33.3	-	-	-
<i>tibia, left</i>	47.1	28.6	-	-	-	40	25
<i>ulna, right</i>	-	-	-	-	-	-	25
<i>unciform, left</i>	-	28.6	-	-	-	-	-
<i>unciform, right</i>	29.4	-	-	-	-	-	-

Table 6: Percentage survivability between 25% and 50% for skeletal elements by phase.

	JAM PHASE 2	MAN PHASE 2	JAM PHASE 3	MAN PHASE 3
<i>astragalus, left</i>	40.0	-	41.2	-
<i>astragalus, right</i>	-	-	41.2	36.4
<i>atlas</i>	-	37.5	-	45.5
<i>axis</i>	-	-	41.2	-
<i>calcaneum, ind.</i>	-	-	35.3	27.3
<i>calcaneum, left</i>	-	-	42.1	27.3
<i>caudal vertebrae</i>	-	41.7	-	-
<i>cervical vertebrae</i>	-	-	-	25.5
<i>external cuneiform, right</i>	-	37.5	29.4	-
<i>external cuneiform, left</i>	-	37.5	-	-
<i>femur, left</i>	35.0	-	29.4	45.5
<i>femur, ind.</i>	40.0	37.5	29.4	-
<i>humerus, left</i>	25.0	-	-	36.4
<i>humerus, right</i>	30.0	25.0	-	-
<i>innominate, left</i>	-	37.5	-	-
<i>lateral malleolus, left</i>	-	-	35.3	-
<i>lunate, left</i>	-	-	29.4	-
<i>lunate, right</i>	-	37.5	-	-
<i>magnate, left</i>	-	37.5	29.4	27.3
<i>mandible, right</i>	-	25.0	-	45.5
<i>mandible, right</i>	-	-	-	45.5
<i>metacarpal, ind.</i>	35.0	-	29.4	-
<i>metacarpal, left</i>	30.0	-	29.4	45.5
<i>metacarpal, right</i>	40.0	25.0	35.3	45.5
<i>metapodial ind.</i>	-	28.1	-	-
<i>metatarsal, ind.</i>	-	-	-	36.4
<i>metatarsal, left</i>	-	43.8	-	-
<i>metatarsal, left</i>	-	-	29.4	36.4
<i>metatarsal, right</i>	25.0	37.5	-	45.5
<i>naviculo-cuboid, left</i>	-	37.5	35.3	27.3
<i>naviculo-cuboid, right</i>	-	-	29.4	-
<i>patella, left</i>	-	-	-	27.3
<i>1st phalanx, right</i>	-	43.8	32.4	27.3
<i>2nd phalanx, left</i>	-	43.8	-	-
<i>2nd phalanx, right</i>	-	-	32.4	-
<i>radius, left</i>	45.0	-	-	27.3
<i>radius, right</i>	30.0	-	-	-
<i>rib, right</i>	-	26.9	-	-
<i>scapula, left</i>	25.0	-	-	-
<i>scapula, right</i>	-	-	-	36.4
<i>tibia, right</i>	25.0	-	29.4	-
<i>tibia, left</i>	45.0	25.0	47.1	36.4
<i>ulna, left</i>	-	-	-	45.5
<i>ulna, right</i>	-	25.0	-	36.4
<i>unciform, right</i>	-	-	29.4	-