THIS MUTTONOUS DIET. ASPECTS OF FAUNAL ANALYSIS
AND SITE COMPARISON
IN AUSTRALIAN HISTORICAL ARCHAEOLOGY.

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A thesis submitted as partial fulfilment for the requirements of the degree of Batchelor of Arts (Hons.) in Historical Archaeology Four, University of Sydney 1991.
Mutton (stewed) or chops for breakfast - dry and tasteless, boiled in fat,
Bread or brownie, tea or coffee - two hours graft in front of that;
Leg of mutton boiled for dinner - mutton greasy warm for tea,
Mutton curried (gave my order, beef and plenty greens for me),
Breakfast, curried rice and mutton, till your innards sacrifice,
And you sicken at the colour and the very look of rice.

- Extract from Henry Lawson, "The Greenhand Rouseabout."
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1.1 INTRODUCTION.

The analysis of food bones from archaeological sites has the potential to yield significant behavioural information about nineteenth century Australia. By understanding the forces which have produced faunal assemblages we can begin to ask questions which relate archaeology to the passage of past human existence. This should be the aim of any form of archaeological interpretation as our data does not exist merely in an academic limbo between the laboratory and the inventory.

Lawson's lament illustrates very sharply the power of diet in shaping our morale and self-identity hence the adage, one suspects, "You are what you eat."

The definition of dietary behaviour from archaeological remains has the potential therefore to shed light upon a fundamental aspect of the human condition. It can be argued that diet will reflect membership of a social class or ethnic group, as well as patterns in the nature of resource availability. The branches of enquiry are many.

This thesis does not aim to provide a broad discussion of nineteenth century eating habits. Rather, it focuses upon a specific food type, meat, and seeks to define and explain the butchering and dietary patterns evident in the faunal assemblages from three historic sites. These are the wreck of the William Salthouse, Unit 151 Regentville, Penrith, New South Wales, and Unit 2.12 of the Pickett Cottages, Footscray, Melbourne. Data was recorded for another three sites, namely the Hyde Park Barracks, Sydney, and the Bridge and Stanley Arms Hotels, Footscray. Only the first three sites are
discussed in this thesis as a means of outlining the methodology of enquiry that the thesis establishes.

It represents the first consolidated attempt in Australian Historical Archaeology to examine faunal material from this perspective and it does so by

(a) developing the methodology of faunal analysis in the Australian context.

(b) examining in detail the taphonomy of excavated material.

(c) testing archaeological and historical contexts against each other.

(d) tackling the problems; archaeological and administrative, that are involved in site comparison.

This thesis can be divided into two primary components. The first represents an exploration of the methodology of faunal analysis generally. This was included due to the exploratory nature of the thesis and places the second component, the analysis of specific assemblages, in a meaningful context.

A central aspect of this thesis is the comparison of material at both inter and intra site levels. Variation within and between assemblages has been observable as a result. Analysis at this scale has been scarce, to the detriment of our archaeological resource which has been largely examined
from within the boundaries of the single site. The development of innovative research designs and the coordination of recovered information has been hampered by this methodological constraint.

Faunal analysis has been given little attention by practitioners of Australian Historical Archaeology in general. Within the fields of research and consultant archaeology its use has been sporadic and segmented. Undergraduate projects, carried out for example at the University of Sydney, have raised many interesting issues but were obviously limited in their ability to encompass detailed research (Poulos and Young, 1987, Willingham, 1986 and English, 1989).

Consultant analysts have had to face constraints on time and resources. This has resulted in work being limited in many cases to lists of identified species accompanied by scanty discussions of diet and meat processing behaviour. Piper commented upon this state of affairs in 1990 when he listed the meagre collection of published reports which have dealt with faunal analysis beyond an elementary level (Piper, 1990). Coutt's and Aplin's study of the material from Captain Mill's Cottage was the only solid example (Coutts, 1984).

He overlooked Colley's report on the bones from First Government House, Sydney, which provided an analysis of greater depth both in terms of methodology and the generation of research topics (Colley, 1987). Nevertheless this study was limited to a working period of two weeks and hence could not be comprehensive.
By comparison, work produced in Europe, America and New Zealand has moved at a steadier pace. Urban archaeology, the study of slave plantation sites and Anglo-Saxon settlements for example have exhibited detailed analyses examining a range of questions such as the ability of faunal remains to reflect social status, ethnicity and acculturation (McKee 1984, Henry 1991, Crabtree 1985).

This study represents an initial step toward rectifying the neglect of faunal analysis in Australian Historical Archaeology and illustrates the potential of such analysis to advance our understanding of the past. It focuses upon the butchering marks and fragmentation patterns present on the bones of three domestic species, (Ovis aries, Bos taurus and Sus scrofa) and clearly gives voice to the possible breadth of research and interpretation to be found in the study of bone deposits from our archaeological sites.

By employing a standardised classification system and site comparison this thesis allows us to create a stronger link between our general theory and recovered data. What emerges is a broadly based fund of information which will strengthen the ability of Historical Archaeology to contribute to our perceptions of life in Australia, last century and this.
1.2 ACKNOWLEDGMENTS.

Many people have been actively involved in helping to produce this thesis. Thanks must go to Andrew Wilson of the Department of Prehistory and Historical Archaeology, University of Sydney, for supervising the study and providing continuous inspiration and encouragement. He must also be thanked for producing the MINARK program used to manipulate the data recovered. His friendship and enthusiasm are greatly appreciated. Dr. Sarah Colley, also for supervision and for providing me with access to her own detailed knowledge of faunal analysis. Iain Stuart of the Victoria Archaeological Survey for arranging access to the material from the William Salthouse and the City Link sites, for putting me up at his house during two of my stays in Melbourne, giving me a tour of the docks, and providing funding from VAS to allow data entry. Maggie Baron, conservator at VAS for assisting me in the laboratory and giving me detailed information about the condition of the William Salthouse bones. Dena Garret, Shirley Strachan and Cos Cosminos, all of the MAU at VAS for providing details concerning the excavation of the William Salthouse. Mark Staniforth, curator of the National Maritime Museum, Sydney, for information concerning the history and 1983 excavation of the William Salthouse. Dana Mider, Barbara Fitzroy, Ilma Powell and Stephanie Moser for their encouragement and friendship. The staff of the School of Butchery, East Sydney Technical College, for taking the time to discuss with me the nature of the trade. Their interest in this project was inspiring. Kylie Hickling of the Meat and Allied Traders Federation for arranging use of that organisation's library. Margot Reilly, curator of the Hyde Park Barracks collection for providing every assistance in my use of the bone material and for perking me up when I got a bit sick of it all. The Historic Houses Trust for funding to allow data entry.
Katrina Proust for data entry. John Burge, local historian in the Camden district, for arranging the interview with Vic Boardman. Vic Boardman for his time and valuable information concerning his family's long involvement with the meat trade. Dominic Steele for discussing the scope of faunal analysis in consultant archaeology and his efforts to clarify the type of material present on the Lilyvale site. Old friends for dragging me to and away from sundry pubs when I began to take myself too seriously. Sonny Terry and Brownie McGhee. Bulla. Especial thanks and love to my family who have given me love and support for 21 years. Thanks to Mum for typing my bibliography and all my love to Louise for the love and happiness that she has inspired and given to me.
1.3 GLOSSARY OF ANATOMICAL TERMS.

A number of osteological terms are used in this thesis to facilitate the description of butchering marks and bone morphology. They are essential to a proper understanding of the data and will be defined only in this section.

(1) **Proximal**: the end of the element closest to the origin of the limb.

(2) **Diaphysis**: the mid or shaft section of a limb.

(3) **Distal**: the end of the element furthest from the origin of the limb.

(4) **Epiphysis**: the segment(s) of a skeletal element which fuse or ossify with age.

(5) **Anterior or Cranial**: the forward face of a skeletal element.

(6) **Posterior or Caudal**: the rearward face of a skeletal element.

(7) **Dorsal**: the top face of a skeletal element.

(8) **Ventral**: the lower face of a skeletal element.

(9) **Median sagittal plane**: a line of orientation which runs cranio-caudally and divides the body into two equal parts.

(10) **Medial**: the inner face of a skeletal element. That which is closest to the median sagittal plane.
(11) *Lateral:* the outer face of a skeletal element. That which is furthest from the median sagittal plane.
Figure One: The Sheep Skeleton, a naming of parts.

Figure Two: Anterior view of a cow humerus.
2.1 RESEARCH DESIGN.

The terms employed in the research design are explained in 2.2

(a) The food bone remains from Australian historical archaeological sites will indicate the methods of butchery used to segregate carcasses for consumption.

(b) Butchery is a process and not a set of static events. It functions at three broad levels:

- Primary

- Secondary

- Tertiary

All three levels will leave distinctive traces upon bone material in the form of butchering marks and fragmentation patterns.

(c) The presence or absence of a butchering pattern will be definable through the study of large samples.

(d) The definition of a butchering pattern and associated butchering units will allow partial reconstruction of the meat diet of site inhabitants. This requires the quantification of unit types and species ratios.
(e) Variation in the meat diet represented within and between sites will be produced by:

- Social class
- Ethnicity
- Availability
- Differential disposal
- Differential preservation
- Sampling procedure
- Method of interpretation

(f) The morphology and spatial context of faunal remains has the potential to indicate:

- methods and variations of waste disposal
- site formation processes and levels of site disturbance

(g) Faunal material from historic sites will provide significant behavioural information in its own right yet must be studied in relation to other artefact types indicative of site function and occupant status.
2.2 DEFINITION OF TERMS.

The following section provides a lucid definition of the central terms employed in the research design. Detailed discussions of their use in past research is to be found in Chapter Four.

(a) Food Bones.

Not all the bones from species consumed for meat will necessarily be left with a butchering mark or specific form of fragmentation. It is unrealistic to ascribe only such elements to the category of food bones. Knowledge of butchering methods clearly illustrates that bones may be left intact even after meat processing and consumption.

(b) Butchery.

Butchery has been defined as "the human reduction and modification of an animal carcase into consumable parts" (Lyman, 1987, p.252).

It involves the interaction of technology and biomechanics to produce distinctive signatures upon bone material as well as fragmentation types (morphology, location, orientation and frequency).

As stated butchery represents a process rather than a collection of static events. A vast range of products may be extracted from an animal carcase, skin and meat being but two of them. In order to acquire one meat cut or material, for example the sweet-breads, other cuts or organs may have to be dealt with first as part of a general process of reduction and modification. This greatly affects the functional classification of any butchering mark for in effect a single mark may be related to the extraction of a number of meat cuts or materials.
For the purpose of this thesis the term butchery is used to cover the professional trade as well as slaughtering and dressing on site by untrained individuals. In other words it refers to the commercial production and distribution of animal products as well as self sufficient methods of meat procurement. The thesis focuses upon the treatment of the three domestic species of sheep, pig, and cattle.

Three levels in the butchering process are defined. This has an interpretative value as the treatment of the carcase at each level and hence the resulting bone residue may be distinct or at least broadly recognisable. A detailed discussion of butchering techniques will be presented in Chapter Five. This section provides baseline definitions only and relates primarily to the production of meat cuts for consumption.

PRIMARY BUTCHERING.

Primary butchery covers stunning, skinning, and the removal of internal organs. Initial dressing of the carcase may also take place at this point involving removal of the head, division down the centre line and the removal of elements poor in meat covering. In a broad commercial sense primary butchering is that which is carried out by the "carcase butcher." In some cases however retail butchers may have undertaken the slaughtering and initial dressing of beasts, especially in rural areas. It needs to be kept in mind that the breadth of variation in butchering methods is extensive, even within single ethnic groups or geographical regions, and that the application of a tripartite definition of butchery is used only as a means of ordering observed data into interpretative categories.
SECONDARY BUTCHERING.

Secondary butchery involves the further subdivision of the carcase into smaller cuts for home consumption. Commercially this is carried out by local butchers in their shops. The products of this process are termed here Butchering Units, examples being the brisket, leg, ham, and steak.

Again there is a huge range of variation possible in the lines of division used to define these smaller cuts. Cutting procedures may vary according to local consumer tastes and will be influenced by the weight and quality of beasts available for dressing. Such influences have militated against the establishment of uniform cutting.

TERTIARY BUTCHERING.

Tertiary butchery covers the further modification of these units for cooking and consumption. This may involve trimming, carving, boiling, frying, roasting and marrow extraction. Basically this term is used to encompass any human treatment of a butchering unit which affects its morphology and structure prior to discard.

The division between secondary and tertiary butchering may not always be clear. This can be seen by considering a simple scenario. A butcher, according to demand, may sell either an articulated and halved loin section of an animal carcase, or separate loin steaks. In the first case the loin may be divided into steaks by the consumer. It may have been more economical to purchase meat in this fashion and then process it. It will be difficult in this case to reconstruct the consumer behaviour represented by the recovered faunal material as the remains may possess the same morphology in either case.
Nevertheless this does not prevent us from quantifying butchering unit types on a broader level. Further, historical context may supply us with information allowing us to distinguish between different human agents of modification. Examination of the bones themselves may also reveal differences in cut mark morphology and placement derived from variation in skill and technology indicative of either household or retail modification. We can postulate that in an urban setting tertiary processing will have been restricted largely to reduction of retail units for marrow and cooking, these units having been first defined by a commercial butcher.

Obviously we find ourselves having to deal with determining the possible methods of meat procurement employed by those responsible for the excavated bone material from a site.

(c) Butchering Marks.

The visible signatures of butchering found on skeletal elements produced by the tools employed in this process such as knives, saws, choppers and cleavers.

They may derive from either primary, secondary or tertiary butchery and will be associated not simply with cut surfaces but also with forms of bone breakage such as spiral fragmentation.

Ascribing function and meaning to butchering marks is a complex undertaking due to variation in cutting methods and the fact that different stages of the butchering process may leave similar signatures on the same skeletal element. Similarly variation in mark location and frequency may be due to differences in skill and the application of different tools.
This requires us to quantify perceived marks and breakage types in great detail, taking careful note of their location, orientation and surface morphology. This will allow us for example to distinguish between skinning and filleting marks. For this purpose we will require large sample sizes as reliance upon small samples may obscure subtle variation in the meaning of butchering marks which are the product of significant differences in butchering techniques and emphases.

Our understanding of butchering marks may be increased by study of butchering manuals and the meat structure of the domestic animals (see Chapter Five). Differences in meat quality occur across all carcases and this dictates to a great extent lines of cut segmentation and the subsequent treatment at the tertiary level of butchering units. Some meat may be better boiled than roasted.

Historical context therefore is very important and interpretation will be advanced by a critical use of written, pictorial and oral information. This leads to a more informed assessment of the context of use in which butchering units were defined and consumed.

(d) Ethnicity.

The cognitive and physical expression of individual membership of a cultural group. It constitutes not only the maintenance of cultural tradition but also the response to new social and natural environments. Ethnicity is therefore a process capable of flexibility and change over time involving the interaction of groups within a plural society and concerns itself not merely with the behaviour of minority groups (McKee, 1984, p.8) Within this society racial groups will co-exist
and be influenced by with other affiliations such as occupation, social class, neighbourhood and religion.

Affiliation with a cultural group may be traceable in excavated material culture. Diet has been shown to be one of the primary tools of racial expression and solidarity. Conservatism or specific patterns of adaptation may be embodied in dietary behaviour and result in meaningfully constituted faunal assemblages. The types and ratios of meat eaten, as well as the methods and tools of processing may express ethnic differences.

(e) Socio-economic Status.

This refers to an individual's place or standing in society determined by a combination of occupation, income, education, religion and ethnicity. It is defined by that person's behaviour and treatment of the individual by others. It involves the expression of beliefs and a purchasing behaviour which indicates membership of a social class. Hence it embodies a combination of economic and cognitive elements. Social classes are defined as defined as "levels in the social stratification hierarchy, which is based on differential access to resources, goods and skills available to the society as a whole" (Henry, 1991, p.7).

(f) Availability.

The measure of resources and individual or household access to them within a defined environment. As applied to rural sites it will encompass the nature of the biotic resource and the energy that must be expended in acquiring individual components. In an urban setting it measures the nature of consumer supply, the market, and similarly the energy involved in procurement and consumption of goods.
The presence of numerous adaptive strategies of resource acquisition and processing is considered under this term in relation to the other variables set out in the research design.

(g) **Import.**

The presence on a site of meat imported from overseas or other geographical regions which has necessitated the preserving and packing of that meat for transport.

(h) **Site locale.**

The definition of a site's environmental and geographic context, for example rural or urban.
FAUNAL REMAINS - LINES OF ENQUIRY.

FOOD BONES

ELEMENTS REPRESENTED | SPECIES REPRESENTED

SOURCES OF MEAT

BUTCHERING PRACTICE

WASTE DISPOSAL

SOCIAL STATUS (PROCESS) | ETHNICITY (PROCESS)

STUDY OF FOOD RELATED ASSEMBLAGE

STUDY IN RELATION TO WHOLE ASSEMBLAGE

SITE COMPARISON

HISTORICAL AND ORAL CONTEXTS EMPLOYED THROUGHOUT
DIAGRAM ONE- EXPLANATION. FAUNAL REMAINS-LINES OF ENQUIRY.

This diagram provides a simple description of one method of faunal analysis associated specifically with the identification and explanation of butchering and dietary behaviour.

Food Bones. We proceed from the sample of food bones excavated from a site to identify the species of animal present and the elements by which they are represented.

Sources of Meat. This allows us to determine the range of species consumed and to consider the methods site inhabitants used to acquire meat. Were animals being slaughtered on site or was commercially processed meat being consumed? The types and ratios of skeletal elements will be important in this respect.

Butchering Practice. By analysing the methods used to segregate carcasses for consumption further detail about the meat diet represented is obtainable. What butchering units were being consumed and how were they modified for consumption?

Waste Disposal. Assessment of the functional context of bone deposits may indicate the methods of waste disposal used by site occupants, and the spatial relationship of this activity to other areas of the site.

Social Status and Ethnicity. All the above information has the potential to relate to the socio-economic status and ethnic background of site inhabitants. This may be traceable in the ratios of species consumed
and the quantification of cost ranked meat cuts. Cost is defined by their price per pound.

The term "process" indicates that these variables are not static but rather are capable of change. For example peoples' prosperity and purchasing power may rise or fall, and ethnic affiliation may be expressed by a process of acculturation over time. Archaeological deposits may encompass time depth and hence reflect this change. Food remains, being representative of items bought frequently, may be a more sensitive indicator of process than more durable items such as ceramics and other household goods. Their discard may relate more directly to occupant status at that point in time due to the fact that food is less likely to represent conserving or recycling behaviour.

The Food Related Assemblage. Meat cuts will form only one part of occupant diet, and some cuts will not themselves be recoverable archaeologically due to the fact that they were purchased as de-boned pieces. A broader picture will be provided by the analysis of botanical remains and tin and bottle food containers.

Study in Relation to Whole Assemblage. Food bones and diet generally must be studied in relation to other artefact types indicative of occupant status and site function. Segregation of lines of enquiry will obscure the likelihood of producing a realistic picture of past lifestyles.

Site Comparison. By comparing deposits from different archaeological and historical contexts we will increase our understanding and expand the meaning of butchering and dietary patterns found within single sites. This encompasses both an understanding of archaeological factors (taphonomy and sampling), as well as the relationship between diet and other aspects of the human condition such as status, ethnicity and trade.
2.3 METHODS.

The faunal material from the following sites was examined:

- Regentville, Unit 151, midden deposit dated circa 1848-1869.

- The Hyde Park Barracks, internal deposits relating to the full life of the structure, 1819 to the present.

- The Stanley Arms Hotel, Footscray, incorporating remains from the Victoria Hotel, 1840-1966.

- The Bridge Hotel, Footscray, 1855-1967

- The Pickett Cottages, Footscray, 1872/5-1898

- The wreck of the William Salthouse, Port Phillip Bay, 1841

The material was identified with the aid of a number of written sources providing information on the anatomy and ageing of domestic animals and involved three hundred hours data recording (Sisson and Grossman 1961, Silver 1969, May 1964, Grigson 1982, Grigson and Payne 1982, Bull and Payne 1982).

A limited osteological collection held by the Department of Prehistory and Historical Archaeology, University of Sydney, was consulted throughout the year. A more extensive collection was made available in the laboratory of the Victoria Archaeological Survey, Albert Park, Melbourne.
As a result the author feels confident about identifications made to both species and element level. Any mistaken identifications would not have been of sufficient number to bias the final interpretation.

It needs to be noted that osteological identification, even within the categories of the three species examined here, may be skewed by the effects of sexual dimorphism, the presence of different breeds, and age variation. As a result no faunal analyst should be without access to a reference collection and if possible it is suggested that analysts acquire for their purposes a collection containing animals whose age and sex are known. This will provide greater confidence in basic identification and ultimately increase the scope of our enquiry for the ability to define patterns of meat production and consumption is strongly dependent upon skill in ageing and sexing animal bones. Variation within these patterns exhibiting significant behavioural information may not otherwise be detected.
2.4 BONE AND BUTCHERING MARKS CLASSIFICATION SYSTEM.

A detailed classification system was developed to allow the ordered recording of all bone fragments after discussions with Sarah Colley and Andrew Wilson from the Department of Prehistory and Historical Archaeology at the University of Sydney.

The system allows analysis of deposits from an intra and inter site perspective. All data was fed into the MINARK database program to facilitate its manipulation. The sheer volume of material precluded a system of manual examination and importantly the database prompted the generation of questions capable of being asked of the assemblages, thereby increasing the scope of this study considerably.

The main aims of the system were to record:

(a) bone condition

(b) the location, orientation, frequency and morphology of butchering marks found on skeletal elements

(c) breakage patterns

(d) sample context

It is hoped that it will serve as the basis for a bone recording technique capable of being employed on any Historical Archaeological site in Australia which will bring about a coordinated approach to excavated and
as yet unexcavated faunal remains.

Twenty one separate variables were defined. An alphabetic rather than a numeric code was employed to allow ease of recording and a more readable and direct representation of information. The classification system is set out in Appendix One. The computer code is situated on the right side of the page in each section.

In order to be successful any method of artefact classification must be capable of structuring and supplying the information necessary to answer the original research questions.

The possibility of blanketing data within type-series or other broad groupings always exists, creating the danger of a rigid academic construct which may obscure significant avenues of enquiry.

As archaeologists we cannot escape the fact that we apply to artefacts a subjective interpretation of their form, function and meaning, simply by the manner in which we record them. We determine what we think is worth noting, measuring and drawing in accordance with perceived theories of artefact structure and use. For this reason a number of classification systems have been developed and applied to what is essentially the same material culture, ceramics being an example. This has not all been caused by generation of different research questions. Rather it has been the result of different description techniques and an aversion to the use of standardised classification criteria. This has made it difficult to obtain a picture of the broader archaeological record.
Any system of classification must therefore be explicit. One cannot argue that standardised classification systems will necessarily be beneficial. New questions in archaeology often require the development of new methods of classification. Bone is no less complex than other artefact classes in terms of the range of questions that can be asked of it and the associated levels of descriptive detail. A simple proximal sheep femur may be described in a number of ways with emphases being dictated by the structure of the research design.

We can ask of a bone sample "were sheep being eaten by site occupants?", or again "how many sheep are represented and how were they butchered and cooked?".

In the first case it may simply be enough to note the presence of sheep elements and detect that they bear evidence of having been butchered. In the second situation however we would need to consider more closely the effects of sampling and differential preservation and develop a system to describe in detail the nature of all butchering marks and fragmentation patterns.

This thesis argues that we need to go beyond the level of enquiry typified by the first case and instead seek to draw more insight into human behaviour from excavated faunal remains. This requires the use of innovative research questions and a system of classification capable of funding the development of such analysis.

The system of classification employed here is used to answer specific questions of the material. Nevertheless it represents an opening up of our
breadth of investigation, prompting rather than precluding other forms of enquiry. That this is so will be made clear in the sections dealing with the results of this study.
# Bone & Butchering Marks Classification Form

Tony English  
Department of Prehistory & Historical Archaeology University of Sydney 1991

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CHAPTER THREE. FACTORS AFFECTING INTERPRETATION.

3.1 TAPHONOMY.

Any interpretation of a faunal sample must proceed with an awareness of the taphonomic forces which have acted upon it prior to and after final deposition.

These forces may be either cultural or natural, physical and chemical. Their levels of interaction may be highly complex and their detection is dependent upon an understanding of bone structure and the context of deposition.

Taphonomy, a term coined by the Russian scientist Efremov in the 1940's, encompasses the study of the passage of organisms from the biosphere into the lithosphere and roughly translated means the "laws of burial" (Olsen 1980, p.6).

Taphonomy was largely neglected within archaeological interpretation until the early 1970's when analysts suddenly became aware of the complexity of site formation processes active in producing the archaeological record. It became recognised that the systemic context of any artefact could be altered or destroyed during the taphonomic interval (Gifford 1981).

Early analyses of bone from prehistoric sites were produced under the assumption that the ratios of different skeletal elements, species, and the nature of fragmentation types, were a direct reflection of hominid
behaviour. Dart went so far as to erect on the basis of spiral fragmentation, an Osteodontokeratic culture in which Australopithecines acted out a violent existence using bone weapons. He failed to consider the possibility that this form of long bone breakage could be caused by non-human agents of modification (Dart 1949, 1956).

This was proven by Brain who was able to relegate Dart's bones to the activity of carnivores (Brain 1967, 1968, 1981). He established also that the assumption that bone accumulations were necessarily the result of hominid behaviour was false, pointing to the effects of fluvial movement and carnivore den behaviour.

Archaeology is now faced with the need to unravel the relationship between taphonomic forces and archaeological residues. The sheer volume of natural and cultural attritional processes which can destroy or alter a single artefact appears at times to be disheartening. Today we are attempting to isolate the effects of individual taphonomic agents upon bone by way of the intensive study of biomechanics and the natural environment.

Patterns of breakage, element ratios, spatial distributions and species presence may easily be produced by either human activity or natural events, or their combination. We need to be aware of the fact that a range of agents may interact to produce similar patterns in our data.

It needs to be remembered that our perspective in this sense must initially be site specific. The possibility that sites even within the same geographic environment, not the least in different environmental zones, may have been witness to widely differing formation processes is a vital
consideration. Much has been written about the danger of applying
generalised taphonomic laws to explain assemblage morphology. The extreme
variability of depositional contexts and artefact response to stress has
prevented any such leap of faith.

Actualistic research has been carried out in order to examine the
effects upon bone of fluvial movement, fire, groundwater leaching,
trampling, gnawing, aeolic weathering and butchering. This analysis has
provided us with valuable information concerning the possible effects of
certain taphonomic events, yet it has proved impossible to replicate the
sheer multitude of taphonomic processes and their combinations. Immutable
laws it would seem are out of reach (Gifford 1980, 1981, Hill 1976, Potts

When analysing butchering and fragmentation patterns we must be quite
clear about our description and explanation of bone morphology. Does for
example a preponderance of spirally fragmented long bones derived from food
animals represent the intensive processing of bones for marrow extraction,
or rather the effects of trampling or carnivore gnawing?

What features are diagnostic of cut surfaces? How might they be
obscura by post depositional events? How do we explain the absence of
particular skeletal elements or the differential fragmentation of bones
between species? All these questions are posed by even a cursory
examination of a bone sample and require not only intuitive but also
quantitative resolution.
One way in which to expand our understanding of the archaeological lives of faunal remains lies with deposit and site comparison. This thesis, examining as it does the assemblages from six sites, provides us with the opportunity to test this theory. By developing a comparative dataset we find ourselves able to consider a range of bone conditions in relation to separate and hopefully well defined archaeological contexts.

A finer appreciation of the linkage between bone structure, assemblage composition, human behaviour and natural attrition will be arrived at by the association of bone patterning with specific taphonomic regimes and site histories.

It may prove possible to assign types of breakage for example to individual taphonomic events or their interaction. The presence of spiral fragmentation in primary underfloor deposits isolated from carnivore activity and other types of physical modification may be ascribed at length to human behaviour, possibly marrow extraction. By assessing the morphology, frequency, location and orientation of the fractures, as well as the evidence of secondary damage, a specific example of human modification will be defined. This can then be tested against deposits also exhibiting spiral breakage but which have been open to a broader number of attritional agents capable of inducing such fragmentation. The separation of taphonomic events may be possible as a result.

Caution must however be maintained for we cannot presume that human or natural modification of bone will be uniform across different contexts. The incentive behind the modification may have differed, the technology used to affect processing may have varied, and different social traditions
may have come into play.

This was illustrated by Noe-Nygaard in her study of four Mesolithic site in Europe (Noe-Nygaard 1977). The sites all showed differences in the method of obtaining marrow, different locations and frequencies of fractures on elements expressing this functional variation. In each case the detection of human modification was based upon a clear delineation of the taphonomic environment of the individual sites. This study illustrates the danger of taking a generalised approach to the definition of attritional agents and their residues. We come back to the realisation that each bone fragment, let alone assemblage, needs to be assessed in its own terms prior to the development of comparative analysis.

We are faced therefore with the reality of handling material which may have been affected by a number of pre and post depositional events which have interacted to make the isolation of specific forms of cause and effect an difficult or impossible task. This complexity only makes it more vital that we become aware of the essential nature of taphonomic interpretation. Without it we will be unable to properly understand what it is that an assemblage represents in terms of human behaviour.

This thesis has dealt with the material with this need strongly in mind. Bone condition has been compared within and between sites and the results are presented later in this study.

The following sections provide a brief discussion of bone structure and the results of recent neo-taphonomic research.
3.2 BONE STRUCTURE AND ITS RESPONSE TO PHYSICAL AND CHEMICAL STRESS.

In this section bone structure is discussed in order to allow an understanding of the types of bone condition found at the sites studied.

Living Bone.

Bone in the living animal forms a complex structure capable of adapting throughout life to physiological and physical stress. It consists of a mixture of organic protein, collagen, and inorganic hydroxyapatite crystals formed by calcium phosphate and calcium carbonate. In adult bone the ratio of collagen to hydroxyapatite is 1:2. The organic constituent provides flexibility whilst the inorganic element confers strength (Hare 1980, pp.208-210, Cronyn 1990, p.14).

The mammalian skeleton consists of a combination of elements of varying structures, densities and strengths. Variation in these properties occurs within single elements and hence it is difficult to apply generalised laws to the ability of bone to survive in a depositional context.

The structural unit of bone is the osteon which is made up of concentric layers of hydroxyapatite embedded in collagen fibres. They take cylindrical branching forms orientated along element long axes. They provide strength and their distribution and organisation is dictated by the age of the bone and its function within the skeleton (Hare 1980, p.210)
Similarly the distribution of compact or cortical bone across an element is determined by its role in the skeleton and the stresses applied by locomotion to which it must adapt.

Cancellous bone makes up the other type of bone structure present within skeletal parts. It is made up of a network of plates and columns (trabeculae) whilst cortical bone consists of a composite of laminated haversian bone and holds osteons, interstitial lamellae, lacunae, and Volkmann's and Haversian canals (Johnson 1985, p.166). The balance and distribution of these two bone structures varies between elements and as a result individual parts of the skeleton will react differently to similar forms of chemical and physical strength.

As an animal ages its skeletal structure undergoes growth and change. Osteogenesis, or the ossification of cartilaginous sections occurs in a number of sections. Epiphyseal fusion takes place in long bones (endochondral ossification), and vertebrae. Intermembranous ossification; the osteogenesis of fibrous tissue, takes place in areas such as the cranium.

The ages at which individual elements complete this process varies considerably between and within species. The proximal and distal ends of individual long bones may fuse at significantly different time periods.

Ossification produces mature bone capable of being preserved in the archaeological record and which in life will react to stress in particular ways. Cartilaginous bone may also survive in some contexts. The differential preservation of food bones within an archaeological deposit is
determined to a great extent by the age at death of the animal as well as element structure and density, factors which are themselves greatly influenced by age.

The other governing factor is the context of deposition and the forces of modification which have acted upon the bone prior to discard such as roasting and boiling and segmenting.

Bone therefore is a heterogenous, composite material and is both viscoelastic and anisotropic. In other words it possesses contrasting mechanical properties which react differently to external force but in combination form a stronger body than the sum of its individual parts (Johnson 1985, p.165).

Listed below are some of the most commonly occurring taphonomic forces and their observed effects upon bone material.

Taphonomic Agents and Archaeological Residues.

(a) Fragmentation.

Fracturing represents a local mechanical failure in bone structure created by the application of force, static or dynamic, which has overcome element tensile and/or compressive strength. The response of bone to such stress is governed by (Johnson 1985, p.164):
the nature of the force being applied
bone size
bone shape
bone curvature
cortex width
marrow content
moisture content
the technology employed

Fragmentation may be a direct result of butchery; primary, secondary and tertiary. By isolating fracture types associated with this process we may be able to detect the presence of human modification in our samples.

Interpretation of a fragmentation pattern and the delineation of causal factors involves the clear description and explanation of fracture morphology. In a recent article Johnson argues that our approach to this need has been overly simplistic, an argument taken up also by Gifford.

Johnson discusses the phenomenon of spiral fragmentation, often ascribed to the effects of human modification (Johnson 1985). Although her discussion relates principally to the debate concerning the visibility of hominids in the prehistoric record, her discussion of biomechanics and the classification of spiral fragmentation is of vast interpretive value for Historical Archaeology. She criticizes the blanket use of the term spiral which she feels has been fostered by an ignorance of the response of bone to stress as well as ill directed actualistic research. Her definition of this fracture type is as follows:
"The spiral morphology is helical, and is the shape of a curve through a series of planes as it circles around the diaphysis" (Johnson 1985, p.157).

Such breakage she contends only occurs in fresh bone which is characterised by a high water content, a viscoelastic and ductile nature, and the ability to resist great amounts of stress. A spiral break is induced when stress waves extend outward from the point of impact and circle the diaphysis following lines of structural weakness. These stress waves are diffused by the epiphyseal ends whose spongy structure is capable of absorption. Resultant fragments are usually longer than they are wide due to the fact that they have fragmented along the longitudinally aligned collagen bundles or osteons (Johnson 1980, pp.172-176).

She distinguishes this form of breakage from transverse types which she contends only occur in bone which has suffered moisture loss and split line weathering. Force applied to bone in this condition radiates along fracture fronts, jumping at split line cracks to produce jagged, stepped edges. Triangular and rectilinear fragments may result with the break surface being at ninety degrees to the long axis of the element (Johnson 1985, p.176).

This has great implications for our analysis of nineteenth century food bone assemblages. Meat cuts are taken from animals immediately after death. Their consumption in the absence of refrigeration if not salted, smoked or pickled, must occur within one or two days depending upon the nature of the climate and storage facilities.
It may be postulated that bone associated with meat cuts will be unweathered, and although having been subject to some moisture loss will respond to certain types of force with spiral fragmentation. Bones broken by the application of force after discard, if containing sufficient moisture, will respond in the same fashion. Can we argue that transverse fragmentation therefore will only rarely be associated with butchering?

Humanly induced marrow extraction involving the chopping across of long bone diaphyses must occur at a time when the marrow is still edible, the optimum period appearing to correlate with bone existing in an unweathered or slightly weathered state. Spiral fragments will therefore be produced. Tool marks may also be detected to reinforce the interpretation.

This does not mean to say that spiral breakage can only be produced by human action. Experimental research has shown that carnivore gnawing of fresh bone can produce this fracture type (Hill 1976). The detection of such activity can however be undertaken by way of the isolation of secondary damage produced by these animals' teeth. One can postulate also that it might occur during waste disposal if for example a pit or well was being used as a repository and objects possessing sufficient weight and momentum were dropped onto bones recently discarded.

The meaning inherent in bone fragmentation types must be unravelled by the examination of archaeological context, the quantification of breaks on individual elements and across species, and the detection of diagnostic secondary damage.
We do not know enough about the rates of moisture loss from bone in specific depositional environments to be able to state with any certainty that spiral fragmentation will only occur in recently deposited bone. This point is made clear by Johnson:

"At what point fresh bones a few days old change to dry bones depends on the environment and topographic, sedimentary and other taphonomic factors" (Johnson 1985, p.188).

The potential to use fragmentation patterns as a means of detecting human processing of meat and bone should however be kept in mind as an important line of enquiry.

(b) Carnivore Gnawing.

Carnivores such as dogs may subject bone remains to intensive processing for the consumption of meat, marrow, and bone protein.

Actualistic research has shown that they tend to attack the epiphyseal ends of long bones first in preference to gnawing across the diaphysis. The epiphysis offers a blood rich source and their reduction represents the path of least resistance to the medullary cavity.

Articular ends may be partly or completely removed by this process, leaving a thin jagged wall of cortical bone. If the end has been removed then the animal may proceed to splinter the shaft longitudinally or spirally. Associated with this destruction will be evidence of chewing, crushing, pitting, splintering, and partial digestion of fragments deposited in faeces. The latter may exhibit a polished and rounded surface.
In short the movement of canine and carnassial teeth across the surface of the bone will leave distinctive traces separate from damage produced by human modification.

Gifford and Binford have suggested that intensities of carnivore processing will be influenced by the environment (Gifford 1982, p.382). If interspecific competition is fierce due to a scarcity of food resources then bone destruction may be more intense than in settings of relative surfeit.

The intensity of destruction will also be influenced by the context of bone discard, some deposits being more open to access by carnivores. Remains may for example be quickly buried or find their way beneath floors.

Patterns of carnivore destruction have been sought but unestablished. Obviously some elements, long bones especially, will be favoured yet this does not preclude the reduction of other osteological types. Levels of bone survival will therefore be influenced by:

- bone strength, there being variation between elements and species.
- carnivore competition.
- carnivore jaw strength.
- depositional context.
(c) **Rodent Gnawing.**

Rodents may also subject bone deposits to intensive processing, often to the point of the complete removal of elements or the weakening of others such that they become susceptible to other forms of attrition.

The residue of this behaviour is very distinctive. It takes the form of groups of sub-parallel furrows possessing a roughly semi-circular cross section in an unweathered state. They may exist as overlapping sets with various orientations and commonly occur on the exposed articular surfaces of vertebrae and long bones, rib borders, fracture edges and cut surfaces.

(d) **Artiodactyl Gnawing.**

Sheep, deer and other species have also been known to gnaw bones as a means of obtaining salts in environments where this resource is lacking. Their teeth will leave a different mark morphology from the species discussed above.

(e) **Root etching.**

Bones may become etched with irregular patterns by way of the secretion of acids by plant roots which have come into contact with bone surfaces. The resultant marks are easily distinguished although at times it may be possible to interpret them as being shallow knife marks.
Their irregular alignment, morphology and random distribution across skeletal elements allows rapid detection in most cases. In an unweathered state the marks have a u-shaped cross section.

(f) Sedimentary Context and pH.

Bone survival in archaeological soils will be affected to a great extent by the pH of the matrix. Acidic deposits militate against the preservation of material due to the destruction of element's organic constituent. This may lead to complete removal from the archaeological record.

Bone will survive best in calcareous soils where pH is above 6.4, the bases in the soil neutralising the effects of carbonic acid's entry into the matrix from the atmosphere (Limbrey 1975, p.211). Such soil requires a rainfall level of below 200-300mm a year, higher levels inducing the leaching from the profile of calcareous material.

Different elements and species will suffer destruction at different rates according to their density and structure. Similarly the bones of young animals, incompletely ossified and hence with a low density, will be removed more quickly than ossified material in the same taphonomic setting.

Extremes of acidity and alkalinity are rare although they may occur naturally or as a result of human action. A high pH may be produced by the decay of organic remains found in middens or ash dumps from hearths.
In underwater or water-logged sites pH may be sufficiently high to allow the excellent preservation of organic material. Sea water has a constant pH of 8.2 due to its stabilization by a carbonate buffer. The anaerobic nature of the sea bed and deep waters also increases the likelihood of bone survival due to the restriction of microbial decay that this lack of oxygen induces (Cronyn 1990, p.20).

No sample should be studied from either maritime or terrestrial sites without a clear statement of its sedimentary context. The representative nature of the assemblage will not otherwise be properly understood.

(g) Burning.

A number of studies have been conducted to examine the effects of fire upon bone in an effort to determine whether this event produces distinctive bone morphologies (David 1990, Gilchrist and Mytum 1986). Attempts have also focused on the possibility of distinguishing culturally burnt bone from that burnt in natural or unintentional fires. Attention has been given to measuring the intensities of temperature present in different situations and the response of bone material in terms of physical and chemical alteration.

David (David 1990, p.65) points out that bone may be burnt as a result of:

- food preparation
- methods of waste disposal
- accidental association with hearths
To this we may add the scenario of house fires which may cause the destruction of a site or the burning of discarded waste deposits.

It is instructive to consider the results of two studies carried out on the effects of fire on faunal remains. The first, conducted by David, took the form of a bushfire experiment in which careful measurement of fuel type, residence time, smouldering time, temperature and bone response was made.

Two Grey Kangaroo (Macropus giganteus) tibiae were placed at the base of a tree and a fire lit. This had a residence time of 20-30 seconds, a smouldering time of three minutes and a maximum temperature of between 450-500 degrees centigrade. The results were interesting.

Both elements snapped transversely at points on the shaft. The diaphysis also collapsed longitudinally. Transverse hairline fractures radiated from the breakage points.

No calcination occurred yet fragmentation was extensive nevertheless. He therefore concluded that bone breakage can be significant even under low temperatures in fires of short duration (David 1990, pp.68-70).

He next carried out a number of controlled burning experiments in fires with peaks of 840 degrees centigrade. Bone fragmentation was again found to be predominately longitudinal and transverse with squared fracture
surfaces. Different elements were found to react differently to the same heat, some, such as vertebrae and pelves suffering complete destruction or extensive fragmentation, whilst the ends of long bones such as the proximal ulna were little fragmented. Types of colour change and the extent of calcination also varied between elements (David 1990, pp.70-71).

The length of burning in his Quadrat Four was three times that of the normal residence time of a fire in an average dry open sclerophyll forest. Nevertheless, despite extensive carbonisation, calcination was minor. Greater levels of calcination were found in Quadrat One where bones were subject for sixty-five minutes to temperatures of up to 840 degrees centigrade followed by five hours smouldering (David 1990, p.72).

He concluded that calcination will rarely occur in natural fires involving the burning of fresh or weathered bone due to the requirement of extreme heat for a lengthy period of time (David 1990, pp 74-75). Such a situation may occur in cooking fires or hearths. This forces us to consider the incidence and quantity of calcined bones in our assemblages. Does it directly reflect human behaviour? Meaning will only be obtained, as in the case of spiral fragmentation, by a consideration of archaeological context. Does our deposit for example include sweepings from cooking areas where bone may have come into contact with fire?

The second study involved the conducting of burning experiments as an aid to better understanding the burnt bone assemblage from the Iron Age promontory fort at Castell Henllys (Gilchrist and Mytum 1986).
Fresh cattle, sheep and lamb bone was burnt in an open, stone lined fire, with careful attention being given to the recording of changes in bone structure, colour and size. The maximum temperature reached was 800 degrees centigrade, each sample being burnt for approximately four hours at temperatures between 400 and 600 degrees. Once calcined, bones were removed from the fire. The following results were arrived at:

- transverse and longitudinal breakage patterns on long bones (cattle and sheep).

- the complete destruction of significant portions of their sample, namely fifty percent of the lamb ribs and vertebrae, and 13.4 percent of the cattle long bones.

- at between 350-400 degrees centigrade articulated lamb ribs and vertebrae separated, vertebral epiphyses unfused, and ribs split longitudinally.

- between 500-600 degrees centigrade bone began to warp and colour change ranged from dark blue-grey to light grey.

- between 500-600 degrees centigrade colour passed to pinkish grey and longitudinal cracks appeared in long bones.

- between 700-750 degrees centigrade calcination of elements began to occur.

- considerable shrinkage of elements occurred according to the distribution of compact and cancellous bone in individual elements (Gilchrist and Mytum 1986, pp.31-38).
In summation, what emerges from these two studies is that fire appears to inflict longitudinal and transverse fracturing as opposed to spiral breakage. It will bias the representative nature of a sample by differentially removing some elements over others, namely ribs and vertebrae. Similarly it will cause the preferential destruction of young animal bones as opposed to those fully ossified. Calcination will not normally be produced by natural fires unless bones are in close proximity to a burning tree or log leading to extended exposure to high temperatures.

Fire has a marked effect upon bone structure as heat reduces the organic constituent and causes its carbonisation between 360-525 degrees centigrade. At this point bone will turn brown/grey/black.

Microscopic morphological change also occurs due to the alteration of the hydroxyapatite component. These crystals will undergo melting at around temperatures of 800 degrees centigrade (David 1990, p.75).

Extended heating will remove the organic fraction completely, resulting in calcination and the melting and recrystallisation of hydroxyapatite.

Bone is left brittle by this process and hence becomes subject to further destruction by other physical and chemical processes. Some strength may however be conferred by burning prior to the stage of calcination, charred organic matter being capable of cementing the mineral components of bone together (David 1990, p.75).
Both these studies provide us with much needed information about the effects of fire upon bone. Further experimentation is require to measure the relative responses of different elements and species to similar temperatures and burning events. We also require analysis of the effects of fire upon bone already modified by other agents such as butchery and trampling. We cannot presume that bone will always have suffered fire treatment in an unmodified fresh or dry state.

(b) Aeolic Weathering (Exfoliation).

Bone may suffer extensive weathering on land surfaces or middens prior to burial at the hands of wind borne particles. The visible effects of such an event have been little discussed yet the interpretive value of detecting such action is great (Tappen and Peske 1970, Gifford 1980). If traceable we will gain a better appreciation of the context of bone discard and the speed of incorporation within the archaeological matrix. This will also allow us to assess site formation processes generally as they have affected individual deposits.

The type and speed of weathering will be dependent upon the environment and bone strength. Johnson cites the appearance of split line cracks and delamination of the bone surface as being results of such exposure. Presumably this relates to the removal of bone moisture content and the reduction of the organic constituent. Such bone will be more susceptible to attrition by other means. Gifford notes that exposure to sunlight will also induce decay.
Much of the work done in this area has occurred on the African continent in the form of extensive surface surveys examining rates of skeletal disarticulation in the natural environment. Examination of bones in a variety of Australian climates would enhance our ability to detect such attrition as this form of weathering is very much environmentally specific.

(1) Fluvial Movement.

Bone transported over a land surface by water may suffer a rounding and abrading of natural and cut surfaces. This event will also create bone concentrations which will not directly reflect human discard behaviour as it has occurred on a site. The passage of water can incorporate into a spatially discrete area objects derived from a number of activity areas or waste disposal points. On maritime sites the force of currents may also have the same effect. Extensive abrasion may result due to movement of objects across the sea bed or the passage of sand and other like substances over the archaeological remains.

Studies into the susceptibility of individual elements to transport have failed to develop any useful generalisations. The form of such an event will be influenced by:

- fluid velocity
- fluid viscosity
- bone density
- bone size and shape
- the nature of the transport bed; abrasive/non-abrasive.
Traceable orientations of elements may be detected as an end result although these may prove to be random.

Detailed analysis of sedimentary context is required to properly assess the likelihood of this action having occurred.

(j) The introduction of non-cultural remains.

Animal remains may be incorporated into a site by the activity of dogs, birds, for example in faeces, and the behaviour of other species. Fluvial movement may also cause the deposition of this material.

Animals may die naturally on a site and not as a result of human activity. Distinguishing between bones representing human consumption or modification, and those which do not will be dependent upon the analysis of bone morphology and context. The relative quantity of species within an assemblage will also be important in this respect, as will an understanding of species behaviour. Some animals such as rodents and dogs are well developed commensals capable of accumulating bone deposits by scavenging. This may significantly affect the distribution of bone material across a site and hence cannot be overlooked in any spatial study being undertaken. Other animals such as marsupials may also be attracted to areas of human habitation and find their way into the assemblage.
3.3 HUMAN MODIFICATION AND THE RECOGNITION OF CUT SURFACES.

Traces of the human modification of bones the result of butchery; primary, secondary and tertiary, will exhibit a range of detectability. Cut surfaces may be obscured by taphonomic forces such as gnawing and post depositional breakage.

The classification system lists a number of cut surface types determined by the tools used in the butchering procedure:

Chopped.
Marks produced by cleavers, choppers and other like tools with a broad cutting edge. The marks may be typified by either a shearing off of the cortical surface produced by blows delivered dorso-ventrally or on an angle, down the long axis of bones, or a depression in the bone surface possessing a square, triangular, or semi-circular cross sectional morphology. This will be determined by the shape of the blade edge and the nature of the force being applied, be it static or dynamic.

Secondary damage such as flaking or chipping may be found in association. Actual fracturing of bones may or may not occur. Spiral breakage will occur if force is applied to fresh bone (See 3.2).

Sawn.
Produced by saws. Marks are typified by flat planar surfaces bearing roughly parallel striations left by the passage of the implement's teeth through the bone.
Knife Marks.

These take the form of shallow depressions in the bone surface of varying length, with a semicircular or triangular cross-sectional morphology. They differ from chopping marks in their relative shallowness, constrained width, the possibility of no actual removal of bone material, and the likely absence of secondary damage.

3.4 ARCHAELOGICAL CONTEXT.

A bone sample, or indeed any archaeological material, which lacks a spatial or temporal context is severely limited in its ability to inform us about the human behaviour it may once have represented.

Unprovenanced finds may be the result of poor excavation techniques or the acquisition of artefacts derived from amateur fossicking. No matter how inherently interesting such pieces may be, we will be at a loss to properly comprehend their context of use and social meaning.

Archaeological context is defined as the meaningful setting in which artefacts are found; a floor surface, a sub-surface rubbish accumulation, a construction fill, and so on. These depositional units must be identified during excavation and their functional relationships in time and space assessed. Within these units the type, quantity, and spatial arrangement of artefacts must be recorded, and site formation processes, where possible, defined. This will allow us to better appreciate whether a deposit is a primary, secondary or tertiary accumulation, or a redeposited unit derived from elsewhere on site or even beyond.
Deposit composition, as well as location (horizontal and vertical), is important. A quantitative analysis of artefact fractions within each deposit will aid in the identification of its meaning. Wilson and Birmingham have developed a model whereby six deposit types, not mutually exclusive, have been classified using rubble size fractions, amounts of reusable building materials, and other artefact types. Sampling produces a statistically representative sample of each deposit allowing delineation as either surface fills, primary structural remains, secondary structural debris, refuse fill, midden deposits and mixed fill. This process has been employed at Regentville.

Temporal context refers to the date range of accumulation. The dating of artefacts and the recording of their spatial arrangements will possibly allow the association of deposits with periods of site use and occupation.

Spatial and temporal contexts are also supplied by historical information; photographs, diaries, auction advertisements and maps being but a few examples. The linkage between historical and archaeological information should be achieved by critical assessment of the biasing elements of each information type.

Urban sites will often produce a complex picture. The intensity of land usage in this environment, alteration of property boundaries, and short periods of occupancy will make the delineation of meaning from archaeological deposits an involved process. We are faced with the need to consider which units of analysis will provide a valid linkage between our theory and data. This is typified by the debate concerning the use of the household or neighbourhood as a correct level of enquiry.
Honerkamp has pointed out that urban sites may present a subsuming of synchronic artefact patterning within diachronic contexts. In other words it may be impossible to separate accumulations associated with different periods of site use. He argues that the application of household analysis will become futile at this point, with emphasis being better spent on a broader level of enquiry commensurate with the scale of the data.

In some situations it may be possible to discern the relationship between deposits and separate occupations. The seeming benefits of this event belie the complications created as a result. These will be discussed in 4.2.

3.5 ARCHAEOLOGICAL METHODS.

The nature of the archaeological context available to us will be determined by the excavation techniques employed. Different deposit types will require different techniques, a well for example being very different from a floor surface in terms of physical structure.

Excavation will be governed largely by the nature of the research design. Maximum information will be gained if units are excavated in such a way as to reveal their horizontal and vertical extent, their relationships with other units, and the amount sampled.

Ideally open area excavation involving the exposure of functional areas will be used in the case of structures and land surfaces. A trench or
grid system by comparison may present information, but in a limited fashion, the morphology of depositional units being obscured by baulks or the excavation of isolated sections of a site which may be difficult to link together.

In some situations use of the open area technique may be untenable due to the nature of the site or logistical constraints. It is however clear that broad horizontal excavation presents us with a more representative sample of site structure for it proceeds in a logical relationship to peoples' use of land and living surfaces. A brief example will suffice.

Open area excavation of the interior deposits of a structure will provide a meaningful picture of the spatial distribution of separate deposits. Their composition and form may represent significant differences in use of the structure over time. These differences may be expressed both horizontally and vertically. A trench or pit excavation will uncover only an isolated segment of this interior which cannot form the basis of a discussion about occupant behaviour except in a limited fashion. In a sense it parallels the emphasis on vertical excavation employed on many prehistoric sites. Discussions about occupant use of space, rates of artefact accumulation and so forth are limited by the limited nature of horizontal exposure. Changes in the locations of activities and their residues on a site over time may not be detected and this can seriously bias any interpretation made using vertical exposure. This is not a criticism of prehistoric investigation techniques, rather it is merely an expression of the relationship between the structure of the archaeological record and methods of excavation.
The nature and extent of sampling undertaken must be explicitly defined, otherwise the representative nature of excavated assemblages cannot be assessed. What is the relationship between the scale of the deposit and the excavation technique employed? Site comparison is dependent upon a clear understanding of the factors which will bias interpretation. The comparison of sites which have been excavated differently provides many biases which must be distinguished. Variation in our data may be produced by archaeological methods as well as natural and cultural site formation processes.

3.6 SUMMARY.

The aim of the preceding sections were to provide a general discussion of some of the primary taphonomic agents and biasing factors capable of acting upon faunal material. It serves as a starting point for the more detailed analysis of assemblages derived from the six sites dealt with by this thesis.

It is obvious that we cannot view a sample as necessarily being a direct reflection of human behaviour. The forces of differential preservation and, it will be argued, differential recovery, force us to view our data with a critical eye. Any site comparison concerning dietary behaviour and butchering practices must take into account the likelihood that assemblage composition and meaning may differ due to the exposure to different taphonomic events, not necessarily as a result of behavioural variation in the living system.
Bone reports need to be more explicit in their description and explanation of bone taphonomy. This will increase the sum of our knowledge about how best to undertake faunal analysis from historic sites generally. More attention must be given to the cumulative creation of information in Historical Archaeology.

It is not enough to say that long bones were broken for marrow extraction without justifying this interpretation with a description of fracture types and the elements so affected (Guilday 1977, p.130). Similar absences of fundamental detail have occurred in other reports.

The lack of neo-taphonomic research carried out in Australian environments must also be rectified if faunal analysis is to gain a sound footing in the discipline.
FACTORS AFFECTING INTERPRETATION

IDENTIFICATION

FRAGMENTARY/NON-fragmentary  REFERENCE COLLECTION

ARCHAEOLOGICAL CONTEXT

TAPHONOMY  SPATIAL  TEMPORAL

ARCHAEOLOGICAL METHODS

SIEVED/UNSIEVED  GRID  OPEN AREA  TRENCH
DIAGRAM TWO-EXPLANATION. FACTORS AFFECTING INTERPRETATION.

Identification. Levels of identification will be influenced by the extent of bone fragmentation within a sample, and the presence or absence of an osteological reference collection.

Archaeological Context.

Taphonomy. We need to define the taphonomic forces which have affected our samples before and after deposition. Our ability to appreciate what it is that a deposit represents in terms of human behaviour is greatly dependent upon this analysis.

Spatial. The spatial or functional context of deposits needs to be defined. Is the material part of a primary refuse accumulation or redeposited from elsewhere on site? If the deposit derives from an underfloor area to what extent does it derive from the activities which occurred in the rooms above? Could it be an accumulation produced by fluvial movement or carnivore behaviour? The linkage here with taphonomic analysis is obvious.

Temporal. The ability to define a date range for a deposit's accumulation is of immense interpretative value as it allows us to associate remains with historically defined occupants or site functions and hence test the relationship between archaeological and historical information.
Archaeological Methods.

Our ability to define a meaningful context for a deposit will be greatly affected by the techniques of excavation and sampling employed on the site.

**Sieved/Unsieved.** Deposits which have been sieved will usually be more representative in terms of the skeletal elements, bone fragments, and species recovered than those which have been hand sorted. The differential recovery of larger elements or those with distinctive shapes has been shown to be an aspect of unsieved deposits. Obviously this affects our interpretation of how representative our sample is of the site and this must be taken into account especially when undertaking site comparison. Variation in results between sites may be the product of different sampling procedure. Results may also differ between wet and dry sieving, the level of recovery being higher if the first method is used.

**Grid/Open Area/Trench.** The same applies to the meaning that is capable of being extracted from different excavation techniques. For example the trench and open area excavation of a functional area or living surface will allow different levels of interpretation and spatial analysis.
CHAPTER FOUR: CASE STUDIES IN FAUNAL ANALYSIS. THE DEVELOPMENT OF COMPLEXITY.

4.1 Introduction.

Over the last decade the use of faunal remains as a source of information about the past has gained momentum. This is despite the fact that bone analyses often still tend to form isolated appendices at the rear of archaeological site reports.

An increasing number of monographs and other publications have appeared in which faunal analysis has been applied and developed within the context of broad archaeological questioning in Historical Archaeology. The majority of this work has been associated with the excavation of slave plantations in America's southern states, and the practice of urban archaeology generally.

Thought has been given to the context of use in which archaeological food residues once operated. Efforts are being made to clarify the units of analysis best suited to the development of research questions. The complexities behind understanding consumer choice behaviour and its representation archaeologically has become a focus of analysis. The meaning of terms such as socio-economic status and ethnicity is being more rigourously examined.

That this process has involved a new level of archaeological theory is made clear by Klein and LeeDecker's comment upon the 1987 meeting of the American Society for Historical Archaeology where analysts were unable to
synthesize the data from a number of urban sites.

"In retrospect, lack of standard analytical methods was not the real problem. The problem was that the workshop participants did not know how to interpret the patterns observed in the synthesised data, since no clear historical context or model of consumer behaviour existed to form a basis for any interpretation" (Klein and Lee Decker 1991, p.1).

What then are we confronting? It appears that we are gradually becoming aware of the complexity and scope of information generated by the excavation of historic sites. We are beginning to develop theory which opens up a whole range of questions not previously considered. These relate to a consideration of the relationship between consumer goods and human behaviour from a new perspective. Faunal analysis and the examination of meat dietary and butchery patterns is at the forefront of this shift in approach.

It needs to be pointed out that any development of theory must be accompanied by an awareness of the need to link it with appropriate methods of data retrieval and storage. Without this the lot of Historical Archaeology will be akin to that of the tourist who suddenly finds himself above the snow line in a pair of shorts with only a cold beer for company; lonely, frustrated and with a low life expectancy.

This chapter serves as a brief introduction to a number of case studies presented in Appendix Three. It is important to have an understanding of the manner in which faunal analysis has been approached by archaeologists elsewhere. A great deal of work has been undertaken to clearly indicate the value of studying bones from archaeological sites.

4.3 SUMMARY.

Recent work has outlined the need to clearly define what we are attempting to assess when we study the faunal remains from an historic site. Mere species lists have been superceded by considerations of socio-economic status and ethnicity, yet this has brought with it an associated level of complexity in need of being modelled along meaningful lines. It is argued that meaning will be obtained by assessing in detail the context of use (cost, availability, household lifecycle, and group membership), as well as the limits of our data produced by taphonomy, sampling bias, and written subjectivity.

The analysis of butchering marks and patterns clearly can generate information on methods of meat acquisition and the units of consumption. As a result it forms a valuable tool in the use of faunal analysis as an indicator of past lifestyles, a fact which this thesis will illustrate.
CHAPTER FIVE: THE AUSTRALIAN CONTEXT-A HOME AWAY FROM HOME.

5.1 Introduction.

Chapter Five examines the structure of the meat trade as it existed in Australia last century and provides a context for distinguishing those factors which affected consumer choice behaviour such as the cost of meat and its quality.

5.2 The Commercial Structure of the Domestic Animal Carcase.

This thesis discusses in detail the meaning of food bone assemblages in relation to the meat diet and butchering methods that they represent. For this reason the nature of the domestic animal carcase needs to be clarified, with attention being given to:

(a) the distribution of meat types across a carcase

(b) the affect that this has upon butchering practice and pricing

The quality and tenderness of meat is determined by the age of the animal at death, carcase weight, and muscle size, shape and taste. Different areas of the body are served by muscles of differing structure and density. They will be tough if in possession of a high connective tissue content. This is dictated by the role of individual muscles in assisting movement and absorbing stress. As a result tougher muscles are located in the neck and lower legs (Swatland 1984, p.50).
By comparison those muscles situated in the loin and rump area are tender. The longissimus dorsi which runs dorsally to the transverse processes of the lumbar vertebrae and the ribs of the thoracic region is a prime example. It is known in the butchering trade as the "eye muscle" and occurs in rib steaks and other cuts from this portion of the carcase (Swatland 1984, p.97). It ceases just prior to the anterior face of the ilium. The other tender muscle in this area is the psoas major which runs ventral to the transverse processes of the lumbar vertebrae. The muscles of the upper limbs and chest are moderately tender by comparison (Swatland 1984 pp.97-98).

Individual animals will be graded according to a number of criteria:

(a) the sex and type of animal
(b) age
(c) the quality of the lean and amounts of intermuscular or marbling fat
(d) yield relative to weight
(e) the estimate of the cross sectional area of the longissimus dorsi

Muscle tenderness determines to a great extent the relative pricing of meat cuts. Retail butchers will divide animals so as to clearly separate meat cuts of low and high quality. This ensures the best possible economic return. These cuts are produced by seaming between the major muscle groups to produce pieces which will hold together during cooking and carving. The grain will be cut across to facilitate chewing.

The most expensive portions from the carcases of the three species dealt with in this thesis are those drawn from the rump and the loin. (See
Pricing is also influenced by the amount of labour that is put into reducing a carcase for sale. The production of small, and especially boned cuts, increases labour costs considerably and will also result in a certain amount of waste. This forces the price of these cuts higher, a fact which holds true for any species being butchered.

Fluctuations in the economic climate and patterns of meat consumption can have a significant impact upon cutting procedure. This was reflected by the events of World War One which led an Adelaide butcher to state the following to the Interstate Prices Commission:

"When meat can be sold at reasonable prices the consumer buys large joints. In the case of mutton and lamb for instance, he would be induced to take the full quarter. In this case the butcher practically gets rid of the carcase without much trimming or waste and is able to sell at a less margin on cost than if he has to cut the carcase into small joints and pieces. On high prices the public are forced to buy small quantities, and there is a big demand for chops, steaks and small cuts. As a result there is waste and loss, and a quantity of prime meat suitable for joints finds its way into the factory.

It is significant that the average household now has a roasting joint for the Sunday dinner only, whereas it used to be customary to have these joints perhaps two or three times a week" (Australian Interstate Commission, Prices Investigation, 1918, p.47).

Cutting methods are therefore determined by the nature of consumer demand. Variation is to be expected between regions and over time as a response to changing economic setting, stock numbers and carcase quality.

5.2 Archaeological Implications.

Purchasing power will be reflected by dietary behaviour. Archaeologically this allows us to trace levels of socio-economic status...
and ethnicity by defining the context of consumption and the form of consumed goods. Examples of such analysis were provided in Chapter Four.

The Adelaide butcher's words illustrate the importance of historical context as a means of delineating past economic conditions and levels of market availability. This information can then be tested critically against archaeological remains, yet should never be used at face value for to do so would constitute giving primacy to this form of information over archaeological data.

The research design states that quantification of butchering unit types and species ratios will reflect a range of variables including socio-economic status and ethnicity. This is based on the assumption that purchasing behaviour will reflect income and certain social beliefs, be they conservative or adaptive.

It also operates under the theory that price differences between separate butchering units and species were significant enough to mirror hierarchical purchasing. This does appear to have been the case, as Tables One and Two show. This leads us to consider the nature of nineteenth century Australia's meat supply and the structure of the meat trade.
## TABLE ONE

**PRICE PER POUND OF STANDARD RETAIL BEEF CUTS: SYDNEY 1921**

<table>
<thead>
<tr>
<th>CUT TYPE</th>
<th>SHILLINGS</th>
<th>PENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>FILLET STEAK</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>RUMP STEAK</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>SIRLOIN STEAK</td>
<td>0</td>
<td>10</td>
</tr>
<tr>
<td>TOPSIDE STEAK OR ROAST</td>
<td>0</td>
<td>8</td>
</tr>
<tr>
<td>CORNED SILVERSIDE</td>
<td>0</td>
<td>7 1/2</td>
</tr>
<tr>
<td>BEST RIB ROASTS</td>
<td>0</td>
<td>7</td>
</tr>
<tr>
<td>BEEF SAUSAGES</td>
<td>0</td>
<td>6 1/2</td>
</tr>
<tr>
<td>ROUND AND SKIRT STEAK</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>BLADE BONE STEAK</td>
<td>0</td>
<td>5 1/2</td>
</tr>
<tr>
<td>BEST CHUCK STEAK</td>
<td>0</td>
<td>4 1/2</td>
</tr>
<tr>
<td>CHUCK OR RIB ROASTS</td>
<td>0</td>
<td>4 1/2</td>
</tr>
<tr>
<td>NECK CHUCK STEAK</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>MUSCLE OR SHIN BEEF</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>CORNED BRISKET</td>
<td>0</td>
<td>3</td>
</tr>
</tbody>
</table>
### TABLE TWO

**PRICE PER POUND OF STANDARD RETAIL MUTTON CUTS: SYDNEY 1921**

<table>
<thead>
<tr>
<th>CUT TYPE</th>
<th>SHILLINGS</th>
<th>PENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>SHORT LOIN CHOPS</td>
<td>0</td>
<td>9</td>
</tr>
<tr>
<td>CHUMP CHOPS</td>
<td>0</td>
<td>9</td>
</tr>
<tr>
<td>LEGS</td>
<td>0</td>
<td>6 1/2</td>
</tr>
<tr>
<td>BEST NECK CHOPS</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>RIB LOIN CHOPS</td>
<td>0</td>
<td>5 1/2</td>
</tr>
<tr>
<td>HIND QUARTERS</td>
<td>0</td>
<td>5 1/2</td>
</tr>
<tr>
<td>SHOULDERS</td>
<td>0</td>
<td>4 1/2</td>
</tr>
<tr>
<td>SCRAG (ROUND NECK)</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>FOREQUARTERS</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>CORNED BREAST</td>
<td>0</td>
<td>3</td>
</tr>
</tbody>
</table>
Tables One and Two show the prices per pound of standard beef and mutton retail cuts in Sydney during October 1921. This information was drawn from the City and Suburban Cash Butchers Journal of that year and reflects an attempt to establish uniform meat cut pricing.

Despite the unprecedented nature of such an event the tables offer a fine indication of the relative cost of beef and mutton and that of their cuts. This was the earliest comprehensive information found by the author after historical and oral research.

The tables can be used to discuss nineteenth century meat pricing as the form of the cuts and their relative cost did not vary significantly over the period after 1840 - 1850 when stock numbers had reached levels capable of staving off scarcity and sudden fluctuations in price.

Moreover the skeletal and commercial structure of the main meat animals has remained constant hence this has induced uniformity in the relative pricing of cuts.

It can be seen from the tables that price differences between some cuts, especially those from the loin, rump and leg, as opposed to those from the neck, forequarter and lower limbs was significant.

Nevertheless it must be stated that if we are to use faunal analysis as a means of measuring the status of site occupants we will need to examine large samples capable of revealing a distinct pattern of
consumption. Small samples will fail to provide a realistic picture of the quality of diet as the price differences between cuts are not on such a scale as to immediately reveal differences in status.

For example if we are presented with an assemblage containing a wide range of skeletal elements but which is nevertheless small in size we will not be able to determine whether a distinct pattern of consumption favouring high, middle or low cost ranked cuts was present. The same applies to the case of measuring the relative importance of species within a diet.

We need to analyse and carefully quantify the ratios of skeletal elements in our assemblages and then detail the nature of the butchering marks they bear.

The consumption of meat in this country has always been voracious. Current aversions to high cholesterol diets and the arguments of vegetarians have not dulled this fact. The notion of getting meat on your plate is not one that is easily rejected by most, and this is despite the fact that our diet this century has become more diversified due to migrant intake and a growing internationalism.

The history of meat production in this country is, after an initial period of scarcity, one of rapid acceleration. In the 1820's and 1830's the Australian colonies began to increase their numbers of stock. The introduction of improved breeds and the development of animal husbandry suited to the Australian environment resulted in a burgeoning of our meat supply.

During the "Hungry Forties" in Europe our diet was used as an incentive for people to emigrate to Australia's shores. By 1860 the continent possessed four million cattle and twenty million sheep, by 1870 seven and a half million cattle and sixty-two million sheep, and by 1890 over ten million cattle and nearly one hundred million sheep. Pig numbers were consistently lower for in 1860 Australia possessed only three hundred and fifty thousand animals, and in 1900, only nine hundred thousand. Pigs were the concern mainly of small farmers and were used to make the running of dairying operations more economical (Birdseye and Edgell 1984, p.29).

We moved therefore to conditions of surfeit which were to induce the creation of an export frozen meat trade as a means of increasing the economic value of such vast herds and flocks. In the hard economic times of
the 1840's growers had to resort to tallow production due to the low selling price of wool and meat.

The figures for the number of sheep and lambs killed at Sydney's Glebe Island abattoir between 1897 and 1899 similarly tell a tale of apparent plenty (The Clarion May 1901, p.44):

1897. Sheep: 1,095,810
    Lambs: 33,891

1898. Sheep: 1,106,476
    Lambs: 34,221

1899. Sheep: 1,152,987
    Lambs: 35,660

By the end of the nineteenth century Australia's consumption of meat per head of population was equal to that of America and the United Kingdom combined. This led Henry Muskett to claim scathingly that the steak, chop and sausage were the faith, hope and charity of Australian life.

How then was the production and distribution of meat organised? No comprehensive history of the meat trade in Australia exists. Patches of information are to be found in secondary sources such as social histories. Context is also provided by legislation, press reports and agricultural journals.
In general however this reflects the absence of a strongly centralised body in the trade for much of its history. Variation in pricing and cutting procedure existed over time and space, and continues to exist. Attempts to establish standardised retail pricing for example have always fallen on stony ground. This is expressed by a trade journal of 1921 which argues with vehemence against pricing regulation:

"Whilst it is an easy thing to fix the selling price of a tin of milk of known quality and cost, it is quite different to do the same with an article, differing in quality, and size, and bought in bulk at a certain figure and then cut up into many parts, some saleable, others less so; also, being perishable, and subject to the vagaries of the weather as to whether the housewife will purchase" (City and Suburban Cash Butchers Association Journal August 1921, p.73).

This variability in the nature and quality of meat products militated against the establishment of uniform trade practice. Individual butchers catered to consumer taste and made the most of carcases of differing weights and yield. The situation was the same in America and England and this is important to note when we consider that the influx into this country of trade skill was initially from these continents.

Nineteenth century legislation relating to the meat trade does exist. Slaughtering, being a noxious trade, was given some attention by the New South Wales Governor. The Act for Regulating the Slaughter of Cattle (fourth of July,1834), ordains that all slaughtering places and houses used to facilitate the sale and barter of meat goods must be licenced. It appoints inspectors for the towns of Sydney, Paramatta, Liverpool, Windsor and Richmond, and requires slaughterers to keep a weekly record of the number of beasts killed (1834, pp.400-403).
Importantly, the Act did not extend to anyone slaughtering for their family, servants and labourers. Hence some meat production was beyond the scope of regulation.

Similarly no attention is given to methods of cutting or hygiene in the handling of meat beyond giving the right to any Justice of the Peace or Constable to order the cleaning of shambles and slaughterhouses situated within town boundaries (1834, p.403).

The Act of 1851 (15 Vic. 13), An Act to Amend the Laws for the Slaughtering of Cattle and to Secure the Immediate Destruction of Animals Dying of Disease, did not significantly expand the regulations of 1834 beyond forbidding the sale of diseased meat. It is also interesting to note with regard to the export trade, that no meat destined for either tallow production or exportation required inspection. In all these Acts the term "cattle" is used to refer to beef, mutton and pork.

The Noxious Trades and Cattle Slaughtering Act of 1894 (57 Vic. 21), brought about an important change in the establishment of public abattoirs governed by the Board of Health and municipal councils. All meat destined for trade or business within a district had to be slaughtered in such an abattoir. The drainage of premises and control of emissions is also discussed (57 Vic. 21, pp.13-14).

The impact of this legislation does not appear to have been very embracing. Although the establishment of public abattoirs mirrors the organisation of the trade at a wholesale level, the industry continued to
operate in a largely non-centralised fashion. Butchers in urban and rural areas continued to slaughter animals in their shops, and at any rate these Acts were concerned more with the noxious aspects of the trade than the methods of retail cutting and distribution.

Moreover, control of public abattoirs such as that at Glebe Island was lax. The conditions in which animals were kept and slaughtered here were by all accounts appalling. This led the editor of the Australian Meat Traders Journal to claim that Sydney meat was "not only the worst in Australia, but really the worst in the world" (Australian Meat Traders' Journal, 9, Sydney, April 1901, p.4).

This was exacerbated by the ten mile trek that animals had to cover between the sale yards at Homebush and the abattoir. These animals had already been driven over many miles from country areas and arrived in an exhausted condition with no access to paddocking or watering facilities. Not only was this a public nuisance for the residents of Homebush and Glebe, but it resulted also in a significant loss of condition and weight among stock (Overton 1893, Pearse 1909).

Overton, a New Zealander, commented upon the problems of supplying Sydney with meat. He stated the following in 1893 after a visit to the yards at Homebush:

"...as you look upon the stock offered they all show signs of having been without food for several days, dreadfully tucked up and travel stained, for once there they must be slaughtered for one purpose or another; and while looking upon them it was very easy to see that they had come off good country, but at the same time their hungry look could but make one think of our little New Zealand with its many advantages" (Overton 1893, p.408).
The debate about how best to supply Sydney with meat raged during the 1880's and 1890's until the closure of Glebe Island and the re-establishment of the abattoir at Homebush, adjacent to the sale yards. By 1911 these yards appear to have been revamped, with attention being given to matters of handling and hygiene. Gone were the days when an observer could comment:

"The yards are so bad that, after a few hours rain, you can see the cattle bogged to their bellies and sometimes trampled to death from their inability to extricate themselves" (Buchanan 1877, p.124).

An exaggeration? Possibly, yet one gains a clear impression that throughout the nineteenth and early twentieth centuries, regulation of trade practice and awareness of disease was rare.

The situation was the same at the retail level. Meat was regularly sold out of carts covered merely by a piece of hessian (Vic Boardman pers. comm.), and was also hung on shop fronts exposed to the dust and flies of the street (see figures Six and Seven).

The sheer size of the industry and the pace of production made it difficult to regulate. In May 1901 there were sixty-two slaughtering places in the Sydney metropolitan area and one thousand, seven hundred and fifty eight in the surrounding country districts (The Clarion, May 1901, p.44).

A spate of legislation was passed in all states between 1905 and 1911 yet it is difficult to measure the impact that this had upon trade practice. Even a brief reading of contemporary trade journals, however, illustrates that the members of the profession were beginning to recognise...
the value of hygiene and organisation. A tone of pride is present which indicates that self identity as an established trade was rapidly emerging. Workers campaigned for better working conditions at this time and were vociferous in their opposition to Government pricing regulation. Power was seen to lie in the collective voice.

The growth of an export trade prompted by large stock numbers and the development of canning and then refrigeration, also necessitated greater organisation. In 1895 Australia was responsible for thirty four percent of the United Kingdom's frozen meat imports.

Overall this produces a situation archaeologically where we can expect the butchering methods represented by the faunal assemblages from our sites to exhibit variation over time and space. This does not prevent us from reading patterns from single sites and then proceeding to undertake site comparison.

The basis of interpretation is the musculo-skeletal structure of the domestic species which dictates the boundaries of butchering methods at all of the three levels of its operation. In other words we read meaning from the type and location of butchering marks on bones. Our analysis does not rest solely upon number and proportion of different skeletal elements in an assemblage. Combined with this is the need to be aware of the market context of the site. What sources of meat were available and what were the costs of procurement?
### TABLE THREE

**SKELETAL DEFINITIONS OF EUROAMERICAN BEEF CUTS. After Lyman, 1987.**

<table>
<thead>
<tr>
<th>Cut</th>
<th>Skeletal Structure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Short Loin</td>
<td>Lumbar Vertebrae</td>
</tr>
<tr>
<td>Rib</td>
<td>Dorsal rib 6-13, thoracic vertebrae 6-13</td>
</tr>
<tr>
<td>Sirloin</td>
<td>Ilium, sacrum</td>
</tr>
<tr>
<td>Round</td>
<td>Distal femur and diaphysis</td>
</tr>
<tr>
<td>Rump</td>
<td>Acetabulum, pubis, ischium, proximal femur</td>
</tr>
<tr>
<td>Chuck</td>
<td>Thoracic vertebrae 1-5, dorsal rib 1-5, scapula</td>
</tr>
<tr>
<td>Arm</td>
<td>Proximal humerus and diaphysis</td>
</tr>
<tr>
<td>Cross/short rib</td>
<td>Ventral rib 1-13</td>
</tr>
<tr>
<td>Brisket</td>
<td>Sternebrae, costal cartilages 1-5</td>
</tr>
<tr>
<td>Short plate</td>
<td>Costal cartilages 6-13</td>
</tr>
<tr>
<td>Flank</td>
<td>None</td>
</tr>
<tr>
<td>Neck</td>
<td>Axis, cervical vertebrae 3-7</td>
</tr>
<tr>
<td>Foreshank</td>
<td>Distal humerus, radius and ulna</td>
</tr>
<tr>
<td>Hindshank</td>
<td>Tibia, astragalus, calcaneum, distal fibula, naviculo-cuboid</td>
</tr>
</tbody>
</table>
TABLE FOUR

SKELETAL DEFINITION OF A METHOD OF BRITISH BEEF CUTTING.

From Cole and Laurie 1975 and Gerrard 1958

<table>
<thead>
<tr>
<th>Cut</th>
<th>Skeletal Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sirloin</td>
<td>Lumbar vertebrae</td>
</tr>
<tr>
<td>Fore Rib</td>
<td>Thoracic vertebrae 10-13, dorsal rib 10-13</td>
</tr>
<tr>
<td>Back Rib</td>
<td>Thoracic vertebrae 7-10, dorsal rib 7-10</td>
</tr>
<tr>
<td>Thin Rib</td>
<td>Mid rib 6-11</td>
</tr>
<tr>
<td>Thick Rib</td>
<td>Mid Rib 1-5</td>
</tr>
<tr>
<td>Brisket</td>
<td>Distal rib 6-11: sternebrae 6-11, costal cartilages 6-11</td>
</tr>
<tr>
<td>Chuck</td>
<td>Thoracic vertebrae 1-6, dorsal rib 1-6, scapula</td>
</tr>
<tr>
<td>Neck</td>
<td>Axis and cervical vertebrae</td>
</tr>
<tr>
<td>Clod (Arm)</td>
<td>Humerus</td>
</tr>
<tr>
<td>Shin</td>
<td>Radius and ulna, carpals</td>
</tr>
<tr>
<td>Thin Flank</td>
<td>Ventral ribs 10-13, sternebrae 12-13, costal cartilages 11-13</td>
</tr>
<tr>
<td>Thick Flank</td>
<td>None</td>
</tr>
<tr>
<td>Rump</td>
<td>Ilium, sacrum coccygeal vertebrae</td>
</tr>
<tr>
<td>Round</td>
<td>Acetabulum, ischium, femur</td>
</tr>
<tr>
<td>Leg</td>
<td>Tibia, fibula, astragulus, calcaneum, naviculo-cuboid</td>
</tr>
</tbody>
</table>
The tables outlining the skeletal definition of Euroamerican and British beef cuts clearly illustrate through comparison, the extreme variability that affects the practice of segregating carcases for consumption.

Lyman’s table indicates the American preference for sawing through joints to produce square cuts, whilst the British definitions reveal a use of round cutting involving the disarticulation of joints.

The British data is drawn principally from two sources which discuss cutting methods and are based upon the London and Home Counties procedure. This is but one of many butchering methods employed in the United Kingdom and hence this table can only be used to provide a general indication of the dietary meaning of beef bones found in assemblages from Australian historic sites. Further detail must come from the analysis of butchering marks on individual elements, which reveals their morphology, location, orientation and frequency.

The discussion of the Australian meat trade clearly indicated that the variation in butchering methods seen in other countries existed here also due to the non-centralised nature of the trade in the nineteenth century, especially at the retail level.

The cuts presented in these tables are general also in the sense that they can undergo further modification at the retail level as a response to consumer taste and the skill and background of individual butchers. For
example blade steaks can be cut from the scapula, and toside and silverside stripped from the femur.

Tertiary butchery undertaken by consumers themselves can also leave marks on bones and this will only be traceable through detailed analysis of butchering marks and breakage patterns.
TABLE FIVE

SKELETAL DEFINITION OF AN AUSTRALIAN METHOD OF PORK CUTTING.

From Rixson, 1972

<table>
<thead>
<tr>
<th>Loin</th>
<th>Lumbar vertebrae</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leg and Long Loin</td>
<td>Lumbar vertebrae, sacrum pelvis, femur, tibia, fibula, tarsals</td>
</tr>
<tr>
<td>Belly</td>
<td>Ventral ribs, sternebrae</td>
</tr>
<tr>
<td>Hand</td>
<td>Scapula, humerus, radius, ulna carpals</td>
</tr>
<tr>
<td>Neck</td>
<td>Axis, atlas, cervical vertebrae</td>
</tr>
<tr>
<td>Head</td>
<td>Skull</td>
</tr>
<tr>
<td>Trotters</td>
<td>Phalanges</td>
</tr>
<tr>
<td>Back</td>
<td>Thoracic vertebrae, dorsal ribs</td>
</tr>
</tbody>
</table>

Again this is but one method of cutting open to significant variation, especially at the retail level.
TABLE SIX

A GENERAL SKELETAL DEFINITION OF MUTTON CUTS

<table>
<thead>
<tr>
<th>Head</th>
<th>Skull, atlas</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neck</td>
<td>Axis, cervical vertebrae</td>
</tr>
<tr>
<td>Middle Neck</td>
<td>Thoracic vertebrae 1-5, ribs 1-5</td>
</tr>
<tr>
<td>Best End Neck</td>
<td>Thoracic vertebrae 6-12, ribs 6-12</td>
</tr>
<tr>
<td>Loin</td>
<td>Lumbar vertebrae, ilium</td>
</tr>
<tr>
<td>Leg</td>
<td>Acetabulum, ischium, femur, astragulus, calcaneum</td>
</tr>
<tr>
<td>Shoulder</td>
<td>Scapula, humerus</td>
</tr>
<tr>
<td>Shank</td>
<td>Tibia, fibula/Radius, ulna</td>
</tr>
</tbody>
</table>

As with beef and pork the cuts detailed above can be segregated along many different lines in order to produce large or small joints, chops, or cutlets, in accordance with consumer taste and purchasing power.
TABLE SEVEN

PRIMARY RETAIL BEEF CUTS AND THEIR USES

<table>
<thead>
<tr>
<th>Sirloin</th>
<th>Roasts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Loin</td>
<td>Steaks</td>
</tr>
<tr>
<td>Rump</td>
<td>Steaks</td>
</tr>
<tr>
<td>Aitch Bone (Pelvis)</td>
<td>Boiling</td>
</tr>
<tr>
<td>Topside/Silverside</td>
<td>Roasting, boiling, steaks</td>
</tr>
<tr>
<td>Thick flank</td>
<td>Boiling</td>
</tr>
<tr>
<td>Thin Flank</td>
<td>Boiling</td>
</tr>
<tr>
<td>Fore Rib</td>
<td>Chops, cutlets, roast</td>
</tr>
<tr>
<td>Top Rib</td>
<td>Chops, cutlets, roast</td>
</tr>
<tr>
<td>Middle Rib</td>
<td>Roasting</td>
</tr>
<tr>
<td>Chuck</td>
<td>Second Quality steaks, pies, puddings</td>
</tr>
<tr>
<td>Leg of Mutton Cut</td>
<td>Roasting</td>
</tr>
<tr>
<td>Brisket</td>
<td>Boiling</td>
</tr>
<tr>
<td>Neck and Clod</td>
<td>Soups, gravies, pies, stocks, sausage mince</td>
</tr>
<tr>
<td>Shin/Shank</td>
<td>Stew, puddings, beef tea</td>
</tr>
</tbody>
</table>
TABLE EIGHT

PRIMARY RETAIL MUTTON CUTS AND THEIR USES

<table>
<thead>
<tr>
<th>Cut</th>
<th>Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scrag</td>
<td>Stew, broth, rosettes,</td>
</tr>
<tr>
<td>Round Neck</td>
<td>Stew</td>
</tr>
<tr>
<td>Middle Neck</td>
<td>Poor quality ribs and chops</td>
</tr>
<tr>
<td>Best End Neck</td>
<td>Cutlets, chops</td>
</tr>
<tr>
<td>Loin</td>
<td>Chops, joint roast</td>
</tr>
<tr>
<td>Chump</td>
<td>Chops, stew</td>
</tr>
<tr>
<td>Leg</td>
<td>Steaks (round cut), joint roast, boiling</td>
</tr>
<tr>
<td>Shank</td>
<td>Stewing, poor quality roast, soups</td>
</tr>
<tr>
<td>Marrow Bones</td>
<td>Metacarpals, Metatarsals, coccygeal</td>
</tr>
<tr>
<td></td>
<td>vertebrae</td>
</tr>
</tbody>
</table>

TABLE NINE

PRIMARY RETAIL PORK CUTS AND THEIR USES

<table>
<thead>
<tr>
<th>Cut</th>
<th>Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Head</td>
<td>Boiling, roasting, soups</td>
</tr>
<tr>
<td>Leg</td>
<td>Boiling, roasting, chops, soups</td>
</tr>
<tr>
<td>Loin</td>
<td>Chops, roast</td>
</tr>
<tr>
<td>Spare Rib</td>
<td>Chops, roast</td>
</tr>
<tr>
<td>Trotter</td>
<td>Boiling, soups</td>
</tr>
</tbody>
</table>
Figure Four: Diagram Illustrating a British Method of Wholesale Beef Cutting.
Figure Five: Diagram illustrating variation in British Retail Cutting of Beef Forequarters.

Figure Six: H. Higham, Family Butcher, Retail Shop Footscray. From Seelaf, G. 1989, p. 78.
Figure Seven: Carcases displayed in and outside the shop of J.P Kennedy, Barkly Street Footscray, 1906. From Seelaf, G. 1898, p.78.
CHAPTER SIX: THE WILLIAM SALTHOUSE

6.1 Introduction.

Two faunal samples excavated from the wreck of the William Salthouse were examined during the course of the year in the Francis Street laboratory of the Victoria Archaeological Survey.

The William Salthouse is a significant archaeological site as analysis of its cargo will tell us a great deal about the nineteenth century shipping trade and methods of shipboard packing. Being a shipwreck with a known date of destruction, it provides an opportunity to examine archaeological remains which have been trapped in a time capsule. We can say with certainty that most, if not all of the material recovered from the wreck co-existed in the year 1841. Such sites provide a control in the determination of the temporal and spatial distribution of artefacts which is not always possible when dealing with a terrestrial assemblage with a broad date range of deposition. The value of combining the information drawn from underwater and land sites is therefore immense.

Significant also is the fact that the cargo clearly indicates that salted meat need not be invisible in the archaeological record. She carried 355 barrels of salted pork, 143 tierces and 83 barrels of prime mess beef and 15 barrels of beef briskets (Staniforth and Vickery 1984, p.19) The grading and packing of this meat was governed by legislation, namely An Ordinance to regulate the curing, packing and inspection of Beef and Pork (Vic. Cap 15 1839 Lower Canada). The faunal material dealt with in this excavathesis are the remains of this cargo.
The vessel was built in 1824 for the Liverpool based Salthouse and Company, and is listed in the Lloyds Register of Shipping, 1824, as a two hundred and fifty one tonne brig, copper sheathed and single decked (Staniforth and Vickery 1984, p.4).

Her first years saw her travelling through the West Indies. In 1831 she changed to trading between the ports of Mauritius, India, Singapore and Batavia. In 1841, under the ownership of Green and Company, she was sent to Canada and then on to the settlement at Port Phillip, Australia. As such she was the first trading vessel to travel directly between Canada and Australia, and she did so in contravention of the British Navigation Acts which forbade direct trading between the colonies (Staniforth and Vickery 1984, p.4).

On Saturday, the 27th of November, 1841 the William Salthouse struck a submerged rock whilst attempting to enter Port Phillip Bay. With her rudder badly damaged and her hull breached, she was boarded by the Port Phillip pilot who attempted to sail her up the bay. This attempt proved unsuccessful and she ran aground on the Pope's Eye shoal inside the bay. The crew abandoned ship with no loss of life taking the ship's sails and papers. The vessel was then left to the efforts of salvaging parties.

She carried a varied manifest valued at twelve thousand pounds, including wine, champagne, flour and gunpowder and hence salvaging could have proved to be very lucrative. Due however to stormy seas all attempts failed to be more than moderately successful, and eventually the ship and her cargo vanished from the historical record (Staniforth and Vickery 1984, p.5).
In August 1982 two divers came across the wreck and alerted the Maritime Archaeological Association of Victoria, and the Maritime Archaeology Unit of the Victoria Archaeological Survey. The ship was gazetted under the *Historic Shipwrecks Act 1981 (Victoria)*, on the 22nd of December 1982. In 1983 a test excavation was undertaken which recovered a range of artefacts. In 1991 a further excavation occurred to remove the contents of a salted meat barrel.

The faunal material studied represents remains of the salted meat which formed a significant portion of the cargo. Analysis was aimed at:

(a) defining a nineteenth century meat salting and packing procedure and measuring the level of agreement between the legislation governing the packing and the recovered archaeological material. The legislation ordained that different meat grades be packed in separate barrels.

(b) defining the butchering pattern associated with this procedure. This information can be used to assess the detectability of salted meat bones on terrestrial sites.

(c) providing as a result, further information concerning dietary patterns and the workings of trade.

(d) understanding the taphonomic forces active upon faunal material in a marine environment. Comparison with terrestrial site formation processes will increase our understanding of bone drawn from archaeological
contexts generally and also isolate the biases involved in comparing assemblages from marine and terrestrial settings.

6.2 Archaeological Context: General.

In 1982 the wreck was found to be situated in twelve metres of water and buried in a two to three metre high sand ridge in the path of the tidal stream (Staniforth and Vickery 1984, p.5).

Surface scouring and the activities of sports divers had destroyed large portions of the vessel. The midships area was preserved to a height of between two and three metres above the keel, whilst the bow and stern had been more extensively removed. The port bow extended two metres above the keel and the starboard stern between one and two metres (Staniforth and Vickery 1984, p.6).

Despite this damage the cargo in the hold was amazingly intact, tiers of intact barrels being preserved in place. The site is obviously of a fragile nature and its consolidation has been an ongoing process. It lies today in a protected zone and is monitored by the Maritime Archaeology Unit of the Victoria Archaeological Survey.

Archaeology underwater is fraught with many difficulties not encountered on land. Short working periods, currents, poor visibility, and problems of recording and communication, make maritime archaeology an art in itself. This, along with the existence of a different taphonomic environment, makes comparison with terrestrial assemblages a complex process.

In 1983 a five week excavation season was undertaken between March and April. Strong tidal currents made the work very difficult and close attention had to be given to diver safety. The main aims of the excavation were to produce an accurate plan and photomosaic of the site, and to run two transect trenches across the vessel as a means of sampling its cargo.

The trenches passed port to starboard and measured nine metres by two metres. Trench One was run across the main cargo hold forward of the main mast. Trench Two was situated just aft of the main mast in the area where general cargo could be expected (Staniforth and Vickery 1984, p.9).

Artefact recovery involved the use of hookah powered airlifts to remove spoil, and then hand fanning of the sand matrix. The faunal remains (Sample One), excavated during this period derive from a poor archaeological context which does not allow us to trace any of the elements to specific barrels. They were collected primarily from the surface of trench one between points a-d in association with a number of marked casks bearing the lettering 'W. Moore Montreal 1840 Dec 200 Prime Mess Pork (Stuart and Staniforth pers comm.).
Discussion of bone taphonomy will indicate that these bones represent disturbance of the site by natural and cultural forces. Their use in interpreting meat grading and packing procedures must take this into account.

The 1991 Excavation.

A second excavation occurred in August 1991, designed to recover the material from an intact barrel and to record the spatial distribution of skeletal elements within it.

Again difficulties were encountered which made the recovery of detail difficult. The barrel was lying on its side and orientated along the bow to stern axis. Between one half and two thirds of the barrel was missing due to scouring by tidal action (Cosminos, pers comm.).

The excavation involved dividing the barrel contents into three units or spits which were hand fanned (see Figure Ten). The precise definition of spits was impossible however due to the unconsolidated nature of the matrix and the absence of height recording. Nevertheless some control over the spatial distribution of elements was possible, although the video camera designed to record the event broke down after only five minutes of footage.

All the bone recovered (Sample Two) derives from within the barrel. The lid facing the bow was recorded as being marked 'Prime Mess Beef.' The lid facing the stern was not recorded.
Figure Eight: Map illustrating the location of the William Salthouse in Port Phillip Bay. From Staniforth 1987, p.23
Figure Nine: Site plan of the 1983 test excavation of the William Salthouse. From Staniforth and Vickery 1984, p.6.
6.4 Taphonomy and Site Formation Processes.

Wrecks, by nature, are usually located in areas subject to significant disturbance by the elements. The formation processes active on a wreck site are defined by a similar line of deduction as that employed on land. The conditions of excavation, levels of preservation and the form of the archaeological matrix will however be vastly different.

Muckleroy has summarised the primary phases of wreck site formation in diagram form (Muckleroy 1985, p.47):

**SHIP**

**PROCESS OF WRECKING** material floated away

**SALVAGE OPERATIONS** material salvaged

**DISINTEGRATION OF PERISHABLES**

**SEA BED MOVEMENT**

material subsequently deposited on site

**CHARACTERISTICS OF EXCAVATION**

**OBSERVED SEA BED DISTRIBUTION**

Levels of preservation will be influenced by the speed of tidal movement across the site, maximum and minimum water depth, the depth of the
main deposit, the nature of the coarsest and finest material in the se
bed, and underwater topography.

As stated in Chapter Three the preservation of organic materials on
wreck sites may be excellent. This is exemplified by the William Salthouse
where wooden, fibrous and bone materials all survived to be recovered in
excavations.

The following discussion of bone taphonomy is divided into the
analysis of Sample One and Two. This should not obscure the fact that both
derive from the same site. This method was used however as each was
examined at a different phase in the conservation process. Sample One was
in a dry state whilst Sample Two was still undergoing desalinisation in the
wet lab at the time of analysis.

SAMPLE ONE.

The following bone condition was observed:

Surface Flaking: all elements showed signs of a general surface flaking of
their cortical bone structure. This has affected elements of different
forms and densities equally. Long bones, skulls, ribs and vertebrae all
exhibit this weathering.

There was similarly no difference between the two species present
(Sus scrofa and Bos taurus).
Rounding and Abrading: many elements also bore evidence of rounding and abrading, especially on exposed and articular surfaces.

Exposure of Cancellous Bone: some elements show a considerable exposure of their cancellous bone structure. This is also evident across the spectrum of skeletal parts.

Explanation.

The bones from this sample exhibit a high degree of weathering commensurate with their having been collected from an exposed context on the surface of the site. Movement of bones and abrasive sand across the wreck by strong tidal action has caused the observed rounding and abrading, exposure of cancellous bone, and the extensive occurrence of general surface flaking. The incidences of irregular breakage witnessed especially on pig long bones, ribs and vertebrae can be explained as having been caused by tidal forces leading to bone's collision with solid objects, the activities of sport's divers, and possibly the process of wrecking itself.

This sample's analysis will greatly benefit the study of bones drawn from within a barrel, as the analysis of Sample Two illustrates.

SAMPLE TWO.

This sample derives from a different context on site and hence we might expect the elements to different types or ratios of weathering and breakage.
Comparison of the two samples was made difficult by the wet state of the second sample examined. This made it difficult to properly detect degrees of surface flaking. It would be worth studying the second sample again when dry.

Although the 1991 excavation set out originally to recover the bones from an intact barrel, that which was chosen for excavation had in fact suffered significant damage due to scouring. We can postulate therefore that the barrel contents will have been greatly disturbed. Not only will some elements have been removed, but others may have been introduced from elsewhere on the site.

This is certainly supported by an analysis of bone condition. The following discussion will examine each of the three units in turn as the distribution of elements and weathering stages across them is crucial in determining the level of disturbance that the barrel has undergone.

Unit One.

All the elements from this unit bore signs of cancellous bone exposure and irregular breakage as witnessed in Sample One. Another important factor was the presence of pig bones. Neither the legislation nor the barrel markings allow for the packing of salted pork and beef within the same barrel. Hence we are faced here with evidence of a disregard for trade practice or the effects of site disturbance.

The taphonomic condition of the bones parallels that of the first sample, whose context has been defined. This would indicate that some, if
not all of the bones in this unit have been redeposited by tidal action within the barrel which has acted as a form of sediment trap. Any number of broken barrels could have contributed material to this process.

We need to consider whether the bones could have been so weathered in situ. Analysis of the other two units and study of the spatial distribution of bones in general will clarify this issue.

Unit Two.

All the elements from Unit Two have suffered irregular breakage, cancellous bone exposure and general surface flaking. Pig bones are again present, and in greater proportion.

That this second unit, located deeper in the barrel, should exhibit bones with the same type and degree of weathering as Unit One, indicates that both units represent the accumulation of material from elsewhere on the site.

A copper pin was also located in Unit Two. It bore a strong dark patina which was interpreted by the divers as indicating that it had been buried for a considerable period of time. This indicates that the scouring of the barrel has itself been an irregular rather than a rapid process. The ebb and flow of the tide has allowed some parts of the original and redeposited remains to become consolidated within the barrel. There is a possibility that the pin, rather than indicating an accumulation of remains rather than a continual process of replacement, may itself have derived from another context of burial which has been disturbed. This artefact may
then have found its way down into Unit Two through the unconsolidated sand matrix.

Unit Three.

Interestingly no pig bones were recovered from this unit, and the degree of cancellous bone exposure and general surface flaking was less than that seen in the two units above.

This suggests that the third unit has suffered less disturbance and may in fact be a true representation of what was originally packed in the barrel. The presence of irregular breakage even in this context does however require explanation.

The only elements present in this unit are cow vertebrae and rib pieces. Rib shafts and vertebral spines are especially susceptible to breakage caused by physical movement due to their low robusticity. These elements may have been affected by the scouring which caused the build up of material in the upper units, yet at the same time may have remained in situ.

It needs to be remembered that the definition of the units themselves was very arbitrary due to the problems faced by the excavators. Some elements projected through two or more units but were in fact only ascribed to one (Cosminos pers. comm). We therefore only have a rough impression of the actual distribution of elements through the barrel and this limits the interpretation of context considerably.
It can however be argued that units one and two represent largely disturbed and introduced material whilst unit three may in fact more closely represent the original contents of the barrel. This is based upon an assessment of bone condition. We require the recovery of bones from an intact barrel before we can begin to determine clearly the effects of tidal action upon bones from within a barrel. Can bones in such a context also suffer irregular breakage and surface flaking? Sample Two in comparison with Sample One presents a picture of site disturbance.

6.5 SPATIAL ANALYSIS.

The divers noted that the orientation of elements within the barrel appeared to be largely random, and this agrees with the interpretation of the presence of a high level of disturbance.

A number of articulated vertebrae strings were observed with an average of three elements in each. They were orientated differently in each case and may have been carried there by the tidal force.

Some pattern was however found in the placement of ribs. Where they were not too fragmentary they were seen to lie against the sides of the barrel with their convex faces conforming to the curve of the container (Cosminos pers comm.). This is a valuable observation as it illustrates that some of the contents are in fact original and preserved in such a way as to indicate the packing procedure used. It can be argued that such a pattern is not likely to be produced by irregular natural disturbance.
There is no apparent pattern to the distribution of pig elements across the three units. Lighter and less dense elements such as ribs occur in Unit Two, thereby indicating that we are not presented with a deposit in which elements have sunk differentially down through the unconsolidated matrix after a single depositional event. Rather it would appear that the process of scouring has undertaken a number of stages in the removal and introduction of elements over time. This militates against the view that the pig skeleton may originally have been packed in the barrel. This is supported by the absence of pig parts in Unit Three.

In general the lack of control in the excavation has prevented a clear picture being formed of the exact location of individual elements within the barrel. The disturbed nature of the deposit also hinders the interpretation of packing procedure. Section 6.6 discusses the principles of packing and meat preservation and in 6.9 the observed butchering marks are explained in detail. This allows us to finally assess the nature of the information to be gained from the excavations concerning salted meat in 6.10.

6.6 BUTCHERING PATTERNS AND MEAT PACKING METHODS.

The faunal material from the William Salthouse has been studied to determine the Canadian butchering methods used to produce a salted pork and beef cargo packed in containers of varying sizes. Combined with spatial analysis we can attempt to reconstruct the manner in which items were packed inside the barrels.
The preservation of meat for storage and later consumption is dependent upon the arresting of anaerobic microbial decay which, within the living animal, is held in check by metabolic processes (Ziegler 1956, pp. 157-168). Salt has been used to achieve this for a great part of human history for it acts as a preservative by inducing desiccation and, like smoking, removes much of the water content of the meat which could fund decomposition (Van Wijngaarden-Bakker 1984). The addition of sugar or pickle will reduce the astringent effects of the salt, and saltpetre may be added to retain meat colour.

The Canadian legislation provides for the addition of seventy five pounds of good quality coarse grained salt, an amount of pickle, and four ounces of saltpetre to every barrel of pork and beef. This was held to be sufficient to cure two hundred pounds of meat (Vic. C.14-15, 1839, p.162).

Spoilage will occur if the salt fails to penetrate to the centre of the meat within a limited period of time. The retention of bones within the cuts may in fact assist in preservation by preventing the evaporation of all meat water content and the penetration of micro organisms to the heart of the packaged cuts. The possibility of decay is also lessened by the fact that bone in cuts require far less handling and processing. Moreover labour costs will be lessened by the avoidance of boned cuts. Deboning can increase significantly the time required to process a carcase by as much as two or three hours (Strother 1975).

It should be remembered also that bones themselves have significant dietary value derived from marrow extraction and their use in stews and broths. If indeed some meat was boned and rolled prior to being placed in
barrels then this should be evident in the absence of those elements from those barrels labelled as holding particular cuts or meat grades. To be taken into account however are the forces of differential preservation and recovery.

In effect the cargo from the William Salthouse puts paid to the statement in a recent publication on the site of First Government House, Sydney, that salted meat will be invisible archaeologically due to the fact that it involved only boned cuts (Proudfoot 1991). This statement ignored the observations of Colley upon the possibility of detecting salted meat on terrestrial sites (Colley 1987, p.11). The cargo contains not only a significant number of bones, but also a wide range of skeletal parts. This was found to be the case also by Wijngaarden-Bakker in her study of the salted meat remains from the seventeenth century Dutch whaling settlement of Smeerenbergen, Spitsburgen (Van Wijngaarden-Bakker 1984).

Unlike the settlement of Smeerenburg the William Salthouse remains have not been further processed on land and so we have a unique opportunity to record the primary cutting and packing procedure used to facilitate shipboard transport. Our picture is not confused by the effects of later cooking and disposal practices, and we are in a position to define also the taphonomic forces which have affected bone morphology.

6.7 THE IMPLICATIONS FOR TERRESTRIAL FAUNAL ANALYSIS.

This cargo forces us to consider the possibility that we will be able to detect the presence of salted meat within land assemblages through the analysis of butchering patterns and historical context.
In terms of assessing how evident such meat may be we are faced with the problem that once a cask had been broached the meat will most probably have been subjected to processing capable of making salted provisions indistinguishable from those procured fresh. The dictates of specific eating habits could theoretically nullify the distinguishing features of bones derived from salted cuts.

Nevertheless, packing requires the efficient use of space and methods likely to lessen the possibility of damage being done to barrel contents by movement or chemical action. The size and shape of packed items was important in this respect, and it comes as no surprise that the Act of 1839 required all pieces of pork and beef to be cut into segments "as nearly square as may be" (Vic. C.14-15, 1839, p.162). This makes sense if we consider the space available within a barrel and the shape of standard meat cuts (see 6.10). This will produce butchering cuts particular to the necessities of packing. The location and orientation of butchering marks on specific elements should differ from those derived from other forms of wholesale and retail meat.

The dictates of successful preservation will have been especially relevant in this regard. The Act sets forth standard weights for each cut type, presumably to ensure that the curing solution would not have to penetrate sizeable pieces which would take longer to preserve hence be more prone to decay. This will also have left distinctive butchering patterns the result of specific lines of segmentation.
The results presented in this chapter will illustrate the likelihood of being able to detect the presence of salted meat within terrestrial assemblages. It is worth noting in passing that the retention of bones in salted meat may be influenced by the grade of meat being sold and also the distance over which it is being sent. Further research is required to assess the possibility that meat not exported overseas may in some cases have been boned. We are here looking at only one example of a salted meat procedure. The presence of variation produced by economic and other factors needs to be taken into account.

6.8 THE ARCHAEOLOGICAL RECOGNITION OF MEAT GRADING.

The principles of meat grading were discussed in section 5.2. It is clear that we can use the practice of grading as a means of assessing the socio-economic status of site inhabitants by quantifying the types of meat cut and species present in our faunal samples. The sexing and ageing of animal bones, where possible, will also assist us in this endeavour.

The William Salthouse presents us with the opportunity to test historically defined grades; set out in the Canadian legislation, against archaeological samples from the well defined contexts of individual barrels. The legislation establishes a grading system based upon carcase weight and the age of animals at slaughter. Separate grades were to be packed in separate barrels.

This should be evident archaeologically in epiphysial and tooth eruption patterns, and the presence of particular elements in individual
110 barrels.

Mess Beef, ranked highest in the legislation, is made up of the "choicest pieces only", namely briskets, thick flank, ribs, rumps, and sirloins from well-fatted and properly aged animals. No necks, shanks, or other low-quality parts are included in this grade, they being relegated to Prime Beef and Cargo Beef in increasing proportions (Vic. C.14-15, 1839, p.164).

Pork is treated in the same fashion; quality being defined by weight, age, and cut type.

Archaeologically therefore the presence and absence of skeletal parts will indicate which areas of the carcase were packed into specific barrels. It is unfortunate that the poor context of the two samples excavated thus far from the wreck, does not allow us to pursue the recognition of meat grading to any significant level. The second sample does provide some scope yet the disturbed nature of the deposit precludes any great confidence in interpretation.

It would be interesting to assess whether the meat inspectors and packers of Lower Canada upheld the letter of the law. The lengths to which the Act goes to outline a system of punishment for inspectors failing to meet a defined code of conduct suggests that opportunism or laxity were indeed problems faced by the governing authorities. It is important to note that this was certainly the picture presented by the analysis of the barrels themselves.
6.9 ANALYSIS OF BUTCHERING MARKS: SAMPLE ONE.


Only two beef elements were identified.

(1) Lumbar Vertebra

- sawn cranio-caudally down the medial sagittal plane through the body and the base of the spinous process.

- Sawn on the anterior face of the body. The mark is angled obliquely up at an angle to the sagittal plane.

Explanation

The vertebra represents the practice of "cutting down" or dividing the carcass in two down the length of the backbone prior to the further subdivision into smaller cuts. This is an age old practice applied uniformly within Anglo-American butchering practice.

The anterior sawing mark represents the further division of the side into either loin or sirloin steaks or an articulated loin section separated from the thoracic area. In the absence of other vertebrae it is impossible to determine whether the meat was packed as single steaks or halved loin sections. The latter seems more likely due to the smaller amount of labour required and the reference in the legislation to "sirloins of oxen, cows or
steers, well fatted" (Vic. C.14-15, 1839, p.162). It is also important to remember that the Act requires all pieces to be no more than eight and no less than four pounds in weight. This would have occasioned division of the loin section for this part of the carcase weighs well over this figure.

We can expect therefore to find that beef elements were broken down to a greater extent than pork due to their size but also their weight.

**Quality and Ageing.**

The loin section is a choice piece of any meat animal carcase, and in retail terms along with the rump, is the most expensive. It is difficult however to ascribe the bone with any certainty to a particular grade as even the lower quality barrels include loins but from poorer quality animals. The epiphyses were both only partly fused and Grigson cites an age range of between two and a half to four years for the completion of fusion (Grigson 1982, p.15). This, along with size, suggests that the vertebra derives from an animal over one year and possibly below two and a half years of age. This represents the age at which best quality meat is obtained possibly allowing us to view it as being Mess, Prime Mess or even Prime beef. Unfortunately only Cargo beef is given a precise age range in the legislation, it being from animals three years old and upwards. There remains the likelihood that the vertebra does in fact derive from a Cargo beef barrel for fusion may not be completed even by the age of three years.

The imprecision of ageing on the basis of epiphysial fusion is great and we need also to consider whether taphonomic forces may have induced a weakening or removal of fused epiphyses to create an unrealistic picture.
(2) Left femur midshaft

- Sawn transversely and completely through the proximal end on a line level with the top of the trochanter minor. The sawn face is angled slightly upward medio-laterally. The sawn surface is characterised by regular parallel striations and a flat, planar face.

- Sawn transversely and completely through the distal end on a line bisecting the supra-condyloid fossa.

- No marks were evident on the diaphysis.

Explanation

Such a cutting procedure has not been witnessed in any of the land based assemblages studied in this thesis. Similarly it could not be traced in any Anglo-Australian butchering manuals (Gerrard 1945).

It may represent a strong American influence for it is noted in a number of butchering handbooks that traditionally American practice has favoured sawing off the articular surfaces of long bones as opposed to disarticulating them (Swatland 1984, p.103 and Strother 1975, pp.183-184). The extent to which this was dependent upon the development of power driven band saws has yet to be established.

It is interesting to note that the Euro-American beef cuts cited by Lyman, Schulz and Gust, and Lee Decker all see the distal femur being left attached to the midshaft in the Round, whilst the proximal end is sawn
through and included in the Rump (Lyman 1987, Schulz and Gust 1983 and Lee Decker et. al. 1987). This femur therefore requires explanation and it is suggested that it stems from the necessities of the packing procedure which called for square cut pieces of particular weight. It is unfortunate that at this stage any solid conclusions are limited by small sample size.

Nevertheless we see here a cutting procedure which has produced a distinctive bone residue which as a result may be sought for on land as evidence for the use of packed salted beef. Again however we need to remember that variation may have existed even within the packing methods present on the William Salthouse hence caution must be maintained at this point in time.

Quality and Ageing.

Similar comments apply as for the other beef element. In the absence of a well defined spatial context little can be said about ascribing this femur to a particular grade. The absence of articular surfaces to assist in ageing reinforces this problem.

The meat found on the femur produces the topside, silverside or round cut steaks sawn horizontally to the long axis of the shaft. The first two meat types may be stripped off the bone prior to use. Alternatively the meat can be boiled or roasted on the bone. The round is a middle ranked cut in terms of cost.
THE PORK ELEMENTS.

Split Skulls: three right halves and one left

- these appear to have been chopped cranio-caudally down the medial sagittal plane, division occurring along the line of the suture.

- one skull piece shows an oblique sawing but most probably chopping mark angled across the occipital condyles which indicates the removal of the head from the vertebral column prior to splitting. It is difficult due to weathering of the cut surface to determine whether a saw or cleaver was used to remove the head from the body. Butchering manuals however indicate that a chopping tool is favoured due to the relative softness of the pig skeleton.

- irregular breakage has occurred on the weaker areas of the skull such as the nasals and zygomatic processes of the temporal and malar bones. This most probably derives from post depositional destruction, the surfaces of breakage being ragged and ill defined. A number of isolated and irregularly broken skull pieces were also found and hence confirm this. These included maxilla fragments irregularly broken on their buccal and palatine surfaces.

- no mandibles were recorded as being found in articulation.
Explanation and Ageing

Heads were split prior to packing thereby allowing the conservation of space. The legislation indicates that "the brain, tongue and bloody grizzle" were not packed and neither were the ears or the "snout above the tusk."

Head meat is of a low grade suitable only for broths, soups, and the production of head cheese. This is reflected in the Canadian packing system where heads were not included in the highest grade; Mess Pork. Heads, always referred to as halved, were included in the other three categories but in increasing proportions as one moved down the scale.

The isolated maxilla pieces bearing tooth rows indicated an age range of between 17-19 months.

Mandibles

- both are broken irregularly across the junction of the horizontal and vertical rami just above the level of the tooth row.

- they are both broken irregularly on the anterior end before the symphysis.

Explanation and Ageing.

The disarticulation of the mandible from the skull was necessitated by the fact that tongues were packed separately, their removal being made
possible by the access to the mouth provided by this process. The meat on the jaw is of a relatively low quality.

The tooth rows present in these mandibles showed an age range of between 17-19 months. This agrees with the age at which best quality pork is produced.

**Vertebral Column.**

(1) **Cervical Vertebrae.**

Third, fifth, sixth and seventh cervical vertebrae were definitely distinguished. All appear to have been divided down the sagittal plane although abrasion of the cut surfaces made it impossible to determine whether a saw or chopper had been employed for this purpose.

Epiphyses were absent in all cases and dorsal spines showed irregular breakage near their junction with the neural arch. Articular processes were worn and abraded.

The irregular breakage or complete absence of the upper vertebral body was evidenced in two cases and the presence of an isolated seventh cervical dorsal spine suggests that such breakage occurred after deposition and does not represent butchering practice.

No atlas or axis was present in the sample.
Explanation and Ageing.

The neck region was packed in halved sections. The absence of fused epiphyses made it difficult to determine whether any transverse cuts had further divided the cervical area. Nevertheless this was not evident on either the vertebral bodies or the small number of isolated epiphyses recovered.

The unfused epiphyses suggest the presence of young animals and hence high grade meat. This meat may be roasted as an articulated section or grilled and fried after subdivision into individual steaks.

(2) Thoracic Vertebrae.

These differ from the cervical in the presence of one undivided vertebral body.

The remainder appear to have been divided somewhat irregularly through the left side, removing the transverse and articular processes on a line parallel with the median sagittal plane. Dorsal spines were relatively intact and showed irregular patterns of breakage.

Cut surfaces were flat and planar although heavily abraded.

Epiphyses were either completely absent or only partly fused.
Explanation.

The general pattern suggests division of the thoracic region down the left side of the vertebral column. It remains to be determined whether the absence of division properly down the sagittal plane is the result of

(a) local tradition
(b) poor standards of practice
(c) the necessities of packing

Comparison with land assemblages will be instructive in this respect.

No transverse cuts were distinguished thereby suggesting the packing of articulated half loin sections. The undivided specimen however raises a number of questions for it bespeaks the packing of complete thoracic areas. Interpretation is hampered by the small size of the sample and the absence of a clear provenance. It may well have been that within single carcasses only part of the thoracic area was halved. On the other hand this variation may be representative of different beasts. The use of either method may have been determined by different carcass weights or marketing procedures. The availability of either halved or undivided sections may have satisfied variations in expected demand and consumption and may have differed for example between separate grades.

Metrical observation of individual vertebrae and the ascertainment of their number in the vertebral sequence may help resolve these issues as would a more developed historical and archaeological context.
(3) Lumbar Vertebrae.

Here also we have a combination of divided and undivided examples. Those divided show a straight cut down the median sagittal plane through the centre of the vertebral bodies. One vertebra does however possess an irregularly oriented cut surface which proceeds at an angle cranio-caudally across the median sagittal plane.

Two undivided examples are present and one bears signs of what may be a cut surface extending the full length of the vertebral body below the right transverse process. This is represented by a flat exposure of cancellous bone.

Spines and transverse processes showed an irregular pattern of breakage ranging from absence to near completeness.

Articular processes were generally intact although heavily abraded.

No transverse cuts were detected and epiphyses were either partly fused or absent.

Explanation

Similar comments as used to discuss the thoracic vertebrae apply. In consumption terms lumbar vertebrae represent the loin section of the animal, a high quality piece.
(3) Sacral Vertebrae.

Two halves of a first sacral vertebra were found. The cut surface was oriented down the sagittal plane but, due probably to weathering, was not regular and planar. Abrasion was evident on the wing and auricular surfaces to the point where cancellous bone was exposed. Epiphyses were unfused.

Explanation

The sacral area appears to have been divided down the sagittal plane. These vertebrae appear in the loin and leg sections of pork cuts.

(4) Unidentified.

One vertebra, possibly cervical or thoracic, had been cut dorso-ventrally on an oblique angle as opposed to being divided.

Explanation

The earlier comments on the presence of undivided vertebrae apply. It most probably represents the separation of the butt end from the loin in an undivided or partly divided carcase.
Ribs.

(a) Proximal ends and attached shafts.

The proximal ends are either:

- worn away or heavily abraded with a significant exposure of cancellous bone.
- relatively intact and unweathered.
- possess intact heads but lack tubercles.

The diaphyses show extensive exposure of cancellous bone and a general surface flaking of cortical bone, especially down the lateral and medial borders.

The distal areas are either irregularly broken and heavily abraded or bear a straight cut surface oriented medio-laterally. There is some variation in the length of the shaft pieces left attached to the proximal ends although they all encompass most of the top of the angle and some of the lower diaphysis. Thicker ribs are cut closer to the proximal end.

It is difficult to determine whether any of the proximal ends bear signs of disarticulation from the vertebral column due to the extent of bone weathering.

Explanation

The separation of the loin and the belly involves the passage of a cut along the length of the side, beginning at a point just ventral to the
ilium and ending just ventral to the posterior tip of the upper scapula (Swatland 1984, p.105). This leaves the proximal ribs with short lengths of shaft attached to the vertebral column. The mid and distal ribs were left in the belly section.

The length of the attached shafts will vary between ribs due to the fact that the cut is angled to compensate for the curvature of the rib cage. Ziegler explains that the cut is kept close to the eye or longissimus dorsi muscle so as not to "sacrifice the bacon" (Ziegler 1956, p.335). The cross-sectional width of the eye muscle increases posteriorly and hence we may expect the cut surface to be closer to the proximal end in the anterior part of the series.

The ribs appear to have been packed in articulation with the vertebral column, there being no traceable signs of disarticulation on the rib heads or vertebral articular surfaces. This is the case even after considering the possible removal of these traces by weathering. Again, a larger and well provenanced sample would confirm this interpretation.

(b) Rib midshafts.

These also exhibited extensive general surface flaking and the exposure of cancellous bone. In two cases the proximal and distal ends are too rounded and abraded to be able to distinguish the morphology and orientation of any original cut.
A remaining four examples bear oblique cuts through the shaft at the proximal end. Distal ends are worn and abraded. The nature of the proximal surfaces suggests that a chopping tool was used for we see here the removal of plate like segments of the cortical structure, a phenomenon it may be argued which would not stem from a sawing action. This must needs be tested however before becoming a solid conclusion.

**Explanation**

The rib midshafts represent the belly section of the pork carcase, the proximal cut surfaces being the by-product of separation from the loin. The rounded nature of the distal ends may be the result of the loss after deposition of the cartilaginous areas of the ventral ribs where they join the sternebrae.

Distal chop surfaces may however have been originally present if the belly was further subdivided prior to packing into a mid rib section and a separate brisket, the latter comprising the sternebrae and ventral rib shafts. Such treatment of a pork carcase however is not referred to in the butchering manuals consulted and the 1839 Act refers simply to "rib pieces" (Vic. C.14-15, 1839, p.164). Therefore the belly appears to have been comprised of the ribs below the proximal loin cut. Further subdivision would have been made necessary by the regulation prescribing the packing of pieces weighing no more that six and no more than four pounds. The cutting involved in this procedure would however be likely to leave no butchering marks on the ribs, separation being accomplished by cutting between them through the intervening muscle.
Forelimb.

Scapula.

(1) Glenoid cavity and neck.

The distal ends of two right scapulae were distinguished. Both exhibited general surface flaking and showed no signs of disarticulation on the face of the glenoid.

One shows a cut surface angled acutely up through the mid neck region. At the top of this surface the angle of the cut alters to that of acute down.

The other glenoid shows what may be a sheared surface running dors-ventrally down the posterior neck. Its line of breakage proximally is however irregular.

Explanation

We see here the difficulties created by attempting to delineate between post depositional destruction and butchering marks. It can be argued that we are presented with evidence for the segmentation of the shoulder from the arm joint by a chop or saw line angled down through the neck of the scapula. This left the distal scapula and the humerus articulated and in the arm. Swatland indicates that this remains
contemporary American and Canadian practice and allows the arm or picnic joint to be left as square as possible (Swatland 1984, p.105). This obviously agrees with the regulations of the 1839 Act regarding carcase division and packing. It may well be that the sheared surface evident on the second specimen's neck derives from further squaring of the joint.

(2) The scapula body.

A large piece of a right scapula was present. The infraspinatous fossa was irregularly broken across its length with roughly seventy percent being present overall. The tuber spinae was intact although the supraspinatous fossa was largely absent and broken irregularly down a rough line parallel with the spine below the anterior angle.

General surface flaking was seen. Butchering marks were possibly represented by a sheared dorso-ventral surface down the posterior part of the neck. The distal break mid neck was abraded and difficult to distinguish and no marks were evident on the medial surface of the body.

The remaining scapula piece consisted of a posterior border with a segment of the infraspinatous fossa attached derived from a right shoulder. This was broken irregularly dorso-ventrally, hairline fractures being present on the medial face parallel with the break. The distal end is also irregular and spirally fractured.
Explanation

In the absence of a larger sample our interpretation is limited yet it appears that these scapula pieces have suffered irregular post depositional damage and were originally largely, if not wholly intact, above the distal end. Segmentation of shoulders may have occurred if they weighed over six pounds, presuming that the Act was adhered to. The nature of this process is not distinguishable in this sample.

It is interesting to note that the first piece bears a sheared surface seen in the previous section on the upper neck. This may well emerge as a pattern derived from butchering practice and not simply site taphonomy.

Humerus.

(i) Distal end.

One left and one right distal end were present and both possessed hollow spiral fractures to the midshaft, just above the articular end. The epiphysis was partly fused in one case and absent in the other.

Explanation

Such breakage is not normally the result of primary butchering and is associated rather with deliberate marrow extraction or post depositional destruction. If the humerus was segmented in some fashion then this is not evident here. The nature of the break suggests however that force has been
applied to an intact midshaft after deposition.

Partly fused epiphyses suggest an age range of under one year (Grigson 1982, p.66).

(ii) Proximal end.

One proximal end was found and it also showed an irregular hollow fracture across the diaphysis, just below the articular surface. The epiphysis was partly fused and the lateral tuberosity absent. No signs of disarticulation were present.

Explanation

As for the distal humerus.

Radius.

One radius was distinguished. It was largely intact although the distal epiphysis was unfused. The proximal end was fused and bore a flat surface, possibly derived from butchering, angling upward antero-posteriorly toward the ulna.

The element had suffered extensive general surface flaking and no other marks were evident.
Explanation

The lower fore limb may have been segmented through the proximal radius and ulna. This may have left the proximal ulna in the arm joint. More examples are required to confirm this.

Ulna.

One proximal ulna consisting of an irregularly broken olecranon and semi-lunar notch was present. A hollow fracture was seen on the posterior face of the olecranon. The angle of breakage appears to agree with that seen on the proximal cut surface of the radius although weathering of the break has obscured this and made interpretation difficult.

Hindlimb.

Pelvis.

Present were:

Two isolated and irregularly broken acetabulae. Spiral fracturing has removed the ischium.

Two iliums showing extensive exposure of cancellous bone with hollow spiral fractures across the middle spine.
A right pelvis with ischium, acetabulum and part of the ilium joined but heavily weathered and rounded. A hollow fracture runs across the dorsal area of the pelvis.

**Explanation**

The pelvis region appears to have been divided down the sagittal plane. This agrees with the witnessed division of the sacral vertebrae.

No marks produced by any disarticulation of the femur were found. Disarticulation may nevertheless have been carried out so as to leave no traces, or all may have been erased by weathering on site.

The bones of the pelvis have suffered extensive post depositional damage and weathering.

The loin and the leg were not separated by an oblique dorso-ventral cut just anterior of the acetabulum as found in land assemblages being studied. Rather, the possibility exists that a straight line of division was carried down through the vertebral column just anterior of the ilium, or the ilium was cut dorso-ventrally through the spine.

The first would leave no butchering marks on the pelvis whilst the latter would bring about the separation of the ilium wing. The irregularly broken pelvis fragments do not allow us to distinguish definitely between the two methods. Cut surfaces, if originally present, appear to have been obscured by taphonomic forces.
Femur.

Present were:

Two irregularly broken proximal diaphyses with unfused epiphyses. Breaks consisted of open hollow fractures just below the trochanteric fossa. A number of spiral fractured long bone fragments were also found and give weight to this interpretation.

Explanation

Breakage appears to derive from post depositional action. Little can be learned from these two pieces and we are left with a number of questions. Was the femur chopped through at any point to produce square cut hams? Was the ham packed short or long?

Tibia.

Present were:

One isolated and intact proximal epiphysis, rounded and abraded.

One isolated distal epiphysis in the same condition.

One left diaphysis with no epiphyses and a hollow fracture to the proximal end.

One right diaphysis with unfused proximal epiphysis and partly fused
distal.

One left diaphysis with unfused proximal epiphysis and partly fused distal.

Explanation

The tibia was not segmented in any way. Fusion levels suggest an age range under two years (Bull and Payne 1982, p.12).
Extremities.

Present were:

One fibular tarsal with tuber calcis unfused and no butchering marks.

One intact but heavily abraded patella.

One possible third phalange which would indicate that feet were left on the carcase and packed.

SAMPLE TWO.

THE BEEF ELEMENTS.

VERTEBRAL COLUMN.

(1) Cervical Vertebrae: one cervical vertebrae, possibly a fifth, was distinguished. It was sawn down the sagittal plane. No transverse cuts were seen.

Explanation.

This indicates that the neck area was halved down the centre line. Further transverse division would have occurred if statutory weights were being adhered to. The heavily eroded and broken nature of this vertebra did not allow transverse cut marks to be noted as surely present or absent. It is likely that groups of two or three vertebrae would have been left in articulation, causing some elements to be free of transverse cuts.
(2) Thoracic Vertebrae: all the thoracic vertebrae had been treated in the same fashion as that present in Sample One, being sawn down the sagittal plane or cranio-caudally and parallel to the sagittal plane.

One piece was found to be articulated with the vertebral epiphysis of another. A transverse cut had separated the two vertebrae just posterior to the line of articulation.

Explanation.
As for Sample One.

(3) Lumbar Vertebrae: of the eight identified examples, seven were sawn down the sagittal plane, and one cranio-caudally through the right side. A transverse cut was found and ran through the body just posterior of the spine. Another similar cut ran on a pronounced angle down through the body. Upper bodies were largely absent due to irregular breakage.

Explanation.
The lumbar area was also divided down the sagittal plane. The one example of division cranio-caudally may represent a lack of skill in this process. It is interesting to note that the transverse cuts do not occur close to or through the points of vertebral articulation. This may also indicate rough handling. A larger sample is required to determine the meaning of this procedure.
(4) **Sacral Vertebrae:** one first was found. It had been sawn down the sagittal plane and again transversely just behind the wing across the fusion point with the second sacral vertebra.

Three articulated sacral vertebrae, the second to the fourth had also been sawn down the sagittal plane. A transverse cut was evident across the anterior face of the second vertebra. The angle of this cut did not match that seen on the first sacral vertebra.

**Explanation.**

Clearly the rump and pelvic region was also halved. Transverse division involved separating the first sacral vertebra. The non matching of the cuts seen illustrates the presence within this barrel of meat from at least two animals, as all vertebrae were from the left side of the body.

(5) **Unidentified:** a number of vertebral body pieces were present which could not be definitely ascribed to specific vertebral classes. All had been sawn down the sagittal plane.

**Explanation.**

All portions of the back appear to have been halved prior to packing.

**RIBS.**

(1) **Proximal:** four proximal rib pieces were present. All had been broken irregularly just below the head and across the shaft. No butchering marks were seen in this region.
One piece had been sawn dorso-ventrally to halve the rib head.

**Explanation.**

Ribs do not appear to have been sawn through close to the proximal end above the rib angle. Evidence of disarticulation from the vertebral column was not present. The dorso ventral cut derives from the transverse division of the vertebral column, evidenced by cuts on the vertebrae themselves.

(2) **Proximal and Midshaft:** one first rib was found to be largely intact, although broken near the distal end.

One second or third rib was also found virtually intact, although it had been sawn through distally just above the sternal end on an oblique angle. A further second rib was found to be irregularly broken across the mid shaft.

One piece had been sawn through the mid angle area. The proximal articular surface had been sawn dorso-ventrally as above.

Five ribs were broken irregularly below their angles and bore no butchering marks.

**Explanation.**

Ribs in the anterior part of the series were left relatively intact. Those beyond the third rib appear to have been sawn through close to the proximal end through the angle. The five ribs broken irregularly below their angles, as well as the proximal sections discussed above, could
however refute this and if they had remained unbroken after deposition, have indicated that some ribs in the posterior series were sawn through only distally, if at all.

(3) Midshaft: seven small irregularly broken fragments were present averaging between five to ten centimetres in length. Three small fragments of cortical rib were also found. No butchering marks were evident on these pieces.

Two distal rib pieces had been sawn through on a slight angle just above the sternal end.

Three mid rib sections (25-50% present) had been sawn through both proximally and distally.

A further mid rib section (0-25% present) had been sawn through distally on an oblique angle, whilst the proximal end, and possibly a cut surface, were absent due to irregular breakage.

Finally all sternebrae had been sawn down the sagittal plane.

Explanation.

The rib cage was segmented at a number of points. The oblique angle of the cuts discussed above is produced by the fact that the butcher must take into account the curve of the ribs when attempting to produce square pieces.
The cuts seen here are all standard and appear on terrestrial sites:

- the brisket was produced by cutting through ribs close to the distal end.

- mid rib sections from the middle and rear of the series were produced by proximal and distal cuts across the mid shaft.

**FORELIMB.**

(1) **Humerus:** One proximal end with an intact articular surface was present. This had been sawn through completely on a slight angle, above the deltoid tuberosity. No evidence of disarticulation from the scapula was present.

A midshaft segment had been sawn through proximally above the deltoid tuberosity. This joined with the proximal end. It was spirally fragmented distally ten centimetres below the cut surface.

(2) **Scapula:** One distal end was present. This had been sawn through on an acute angle just below the acromion. The medial face was chipped and irregularly broken. No evidence of disarticulation from the humerus was found on the face of the glenoid cavity.

A segment of a scapula body was found (0-25%). This consisted of a section of the posterior border and the infraspinatous fossa. It had been sawn through distally on an acute angle. This cut did not join that on the above distal end.
Explanation.

The proximal humerus has been treated in the same fashion as the femur in Sample One in that the articular end has been sawn off. In the absence of a distal end we cannot be certain whether both articular ends were dealt with in the same fashion. It is possible that the shorter length of the humerus prevented the need for such segmentation.

Variation in the procedure is indicated by the two midshaft pieces. One bears a cut surface angling acute down, antero-posteriorly, whilst the other has a cut surface which does the opposite.

The extent to which the mid shaft remained intact is impossible to ascertain as the only sections definitely identified are irregularly broken distally.

The proximal humerus and the distal scapula were left articulated and formed a single piece. The body of the scapula served as a separate cut for packing and may have been trimmed in a fashion similar to that observed on the pork shoulders of Sample One.

HINDLIMB.

(1) Pelvis: One worn but intact ilium wing was present. This had been chopped, or possibly broken after deposition, dorso-ventrally through the shaft, just posterior to the wing.

Two irregularly broken fragments of ischium were also found.
(2) Femur: all fragments identified to this element consisted of small spirally fragmented midshaft pieces showing no butchering marks.

Explanation.

The presence of a possible chopping mark is intriguing for it forces us to consider why a saw, which produces a clean cut, was not used. Does this indicate a ragged, poor quality job? In the absence of definite tool marks it is more likely that this represents post depositional damage.

Nothing can be said about the treatment of the femurs in Sample Two because of their fragmentary nature.

THE PORK ELEMENTS.

All as for Sample One.

6.10 CONCLUSION.

The Visibility of Packed Salted Meat Cuts on Terrestrial Sites.

It must be remembered from the outset that we are examining only one example of salted meat cutting. The lines of segmentation used by the Canadian packers may vary significantly from other methods employed during the nineteenth century for both export and home trade.
The cuts from the William Salthouse would be largely undetectable on terrestrial sites due to their close similarity to common wholesale and retail forms. The ribs and vertebrae of both species bear no specific cut types not used by normal retail butchers. Moreover the fact that pig limb bones appear to have been left intact means that mere examination of bone morphology will not aid in detecting the presence of salted provisions. The fragmentary nature of the pig sample may however have obscured significant cut types.

Diagnostic cuts are present on the hind and forelimbs of the cow. The larger size of this animal required that a greater level of segmentation be applied, and the necessities of packing produced square cuts which leave a distinctive bone residue.

The treatment of the femur, proximal humerus and distal scapula may in fact reflect the influence of American cutting procedure which, in general differs from Anglo practice by sawing through limbs to produce a square cut rather than disarticulating them and leaving round edge to joints. This propensity to saw through limbs can however be explained as being a necessity of packing, as already discussed. Excavation of terrestrial sites in Canada has the potential to shed more light on this question.

The transverse sawing marks present on these elements were not witnessed on any of the five terrestrial sites examined in this thesis although it is important to note that Colley discusses a number of cattle hock bones found at First Government House, Sydney, which have been sawn through in an identical fashion (Colley 1987, p.11). Further consideration
of context is required before we can decide whether they represent the consumption of salted meat.

The relative absence of such cuts highlights their distinctive nature, yet at the same time forces us to consider whether salted meat from other sources may have been treated differently and bear different butchering mark types. If the medium sized caprids and porcine animals were capable of being packed with only minor division then we may have to rely upon chemical testing of bones in order to trace remains of salting procedures.

It must also be remembered that salted meat will not always have been destined for packing and transport. Meat may be salted and hung for consumption by those who did the slaughtering. This was a procedure often employed on rural or isolated sites, set apart from normal commercial supply. In this case chemical testing will not necessarily indicate a packing and associated butchering method, but rather a rural subsistence strategy.

Context is everything. If we are to be capable of distinguishing the techniques used by people to acquire and preserve meat we need to assess the relationship between sites and the nature of supply. It may well be that assemblages do contain the remains of salted and packed provisions. If they are not hinted at by an examination of butchering marks they may nevertheless be detected by a consideration of:

- chemical testing for the detection of salt traces.
- site context: was the site supplied by a government store, was it isolated and incapable of having supported stock but linked to lines of supply? An example may be whaling and sealing sites which were occupied for brief periods in remote areas without domestic stock. Their proximity to the sea, and the fact that the men present were brought in by ship, will have meant that they were open to the importation of salted meat.

- the presence and absence of species and skeletal parts. Ratios of elements present may suggest that site inhabitants were consuming meat from barrels in which certain elements were either not packed, or were present in abundance. Consumption of barrels of briskets for example may leave an profundity of distal rib midshafts and sternabrae in relation to other elements. Obviously one would need to distinguish this from a specific pattern of retail consumption of fresh meat. Nevertheless an examination of butchering marks and site context may produce a picture in which salted meat plays a prominent part.

Analysis of other shipboard cargoes will also clarify the situation by revealing the presence or absence of different butchering and packing methods. It would appear to be logical that the variation present in terrestrial butchering practice would be mirrored in the practice of packing. We are dealing with a trade which, despite having a strong self identity, was by nature a collection of individuals possessing varied knowledge and background in the job of providing communities with meat for the table.
Packing Methods.

We can say little about the packing procedure used to secure pork in the barrels. Analysis of butchering mark location and orientation revealed the lines of division along which carcases were broken up. The absence of a meaningful spatial context nevertheless restricts the interpretation.

Sample Two indicates that beef was packed with the ribs lining the inside curve of the barrel. The absence of disarticulation marks on proximal ribs and the vertebrae indicates that they were left in articulation. The vertebral column was halved and then divided further at a number of points transversely. The rib shafts were also divided due to the separation of the brisket.

The larger joints, cut square, were then packed into the central space. The exact nature of their distribution is not apparent due to disturbance of the deposit. We must await the controlled excavation of an intact barrel before such information can come to light.

As far as is assessable the packing and butchering method can be said to follow closely the dictates of the legislation. No waste elements such as lower limbs and feet were recovered which indicates that correct barrel weights were not reached by the packing of elements forbidden by the law. Observed butchering marks reveal that pieces of specific and defined weights were packed, and that cuts were predominately square. Whether the correct ratios of elements were packed cannot be determined from the two excavated samples. Similarly, assessment of the level of honesty in the grading of meat is not possible without a more secure archaeological
context; namely the retrieval of an intact barrel’s contents.

In conclusion the salted meat from the wreck of the William Salthouse clearly illustrates that salted provisions are not necessarily invisible in the archaeological record. Even if most of the butchering residues present indicate that salted and packed meat, at least in this case, will be largely indistinguishable from fresh meat remains on terrestrial sites, the assemblage has revealed a great deal of information about a specific method of butchery and forced us to consider the relationship between carcase division and the use of space in packing. This can only serve to heighten our awareness of the possible meanings of butchering patterns in other assemblages, and may even lead to the detection of salted meat in terrestrial contexts. Our appreciation of past lifestyles and the workings of trade and supply will benefit greatly from such a perspective.
Figure Ten: Diagram illustrating the method of access to the site during strong tidal conditions.
Figure Eleven: Diagram illustrating the 1991 method of excavation of a barrel from the William Salthouse.

Figure Twelve: Location of observed butchering marks on the faunal remains from the William Salthouse.
Figure Thirteen: Beef femur from Sample One of the William Salthouse. The lines of division are quite distinct. Posterior view. Photograph by the author.
Figure Fourteen: Beef lumbar vertebra from Sample One of the William Salthouse. The element has been sawn down the sagittal plane. Posterior view. Photograph by the author.
Figure Fifteen: Pig skull from Sample One chopped down the sagittal plane. Dorsal view. Photograph by the author.
Figure Sixteen: Pig mandible from Sample One chopped across the
border of the vertical and horizontal rami, and
possibly dorso-ventrally anterior of the first molar.
Medial view. Photograph by the author.
CHAPTER SEVEN: REGENTVILLE, NEW SOUTH WALES-A RURAL CASE STUDY.

7.1 Background.

The site of Regentville near Penrith New South Wales was, between 1825 and 1844, the home of Sir John Jamison, surgeon, experimental farmer, philanthropist and wealthy land owner. After his bankruptcy the residence assumed the role of an asylum and then a hotel, until in 1869, the main building was destroyed by fire (Connah 1986).

In a series of excavations commencing in 1977, the Centre for Historical Archaeology at the University of Sydney, has recovered a great deal of information concerning the architecture and form of the site, as well as a vast sample of material culture associated with its occupation.

The 819 bones analysed in this report were excavated in 1985 from Area Two, interpreted as being the kitchen and servants quarters located in the centre of the walled yard running behind the main house. They derive specifically from Unit 151, a midden accumulation which built up under a wooden verandah at the rear of the servants quarters, between the years 1860 to 1869.

The identification of this unit as a midden was based upon the quantification of separate units by artefact types, and was reinforced by the spatial analysis afforded by the method of excavation. The morphology of the deposit indicated an extended period of accumulation as opposed to a single depositional event as there was a build up of material against the southern wall of the structure.
Area Two was uncovered using the open area technique in order to allow the exposure and interpretation of complete functional areas. This produced a fine context for the analysis of individual units and was instrumental in allowing a projected reconstruction of the servant quarters. All of the deposit was dry sieved through a five millimetre mesh and hence the sample recovered is representative of the midden composition.

The faunal material therefore has a direct functional association with the structure in Area Two. Analysis of this material will clarify the behaviour that the midden represents, as well as providing information concerning the diet of site occupants and the butchering techniques employed to create the meat units consumed.

7.2 DIET.

The ratio of the three species, cow, sheep and pig showed a clear preponderance of mutton and pork. Mutton formed the basis of the diet. It is difficult to properly measure the relative importance of mutton and pork due to the fragmentary nature of the sample and the similarity of skeletal morphology between these two species.

On the basis of definitely identified elements mutton is predominate. Nevertheless the pork ratio is not insignificant and may indeed form a large part of the sheep/pig category. Together these two species are present in much larger proportions than beef.
The relative proportions of sheep and pig are therefore difficult to ascertain although mutton does appear to have dominated generally.

We need to clarify the above information by considering whether species ratios have been affected by differential fragmentation. If sheep/pig elements have suffered more comprehensive breakage than the cow elements, then their numbers will reflect this fact. This could cause an inflation of the relative importance of sheep/pig which may not have been present during the occupation of the site.

All species exhibit a breakage pattern in which elements are largely represented by fragments of a size within the 0-25% category. This allows us to compare the samples effectively and illustrates that the dominance of sheep/pig is in fact real. This category does however possess a higher level of fragmentation overall. This may reflect the lower robusticity of these species skeletons, or differential processing treatment. This will be assessed by considering the location and orientation of butchering marks.

<table>
<thead>
<tr>
<th>Species</th>
<th>Proportion</th>
</tr>
</thead>
<tbody>
<tr>
<td>UNIDENTIFIABLE</td>
<td>0.0%</td>
</tr>
<tr>
<td>UNIDENTIFIED</td>
<td>8.5%</td>
</tr>
<tr>
<td>COW</td>
<td>6.2%</td>
</tr>
<tr>
<td>SHEEP/PIG</td>
<td>81.1%</td>
</tr>
<tr>
<td>SHEEP</td>
<td>2.4%</td>
</tr>
<tr>
<td>PIG</td>
<td>1.7%</td>
</tr>
</tbody>
</table>

TABLE TEN

REGENTVILLE 151 SPECIES PROPORTIONS
and breaks. Differences between species and elements will indicate the effects of natural and cultural taphonomic processes.

In general the diet is represented by a marked dominance of ribs. Limbs have only a low frequency whilst waste elements and extremities are present in significant proportions. This pattern is true for all three species.

**TABLE ELEVEN**

**REGENTVILLE 151 BODYPART PROPORTIONS**

<table>
<thead>
<tr>
<th>Bodypart</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>UNIDENTIFIABLE</td>
<td>0.0%</td>
</tr>
<tr>
<td>UNIDENTIFIED</td>
<td>20.7%</td>
</tr>
<tr>
<td>RIB</td>
<td>64.6%</td>
</tr>
<tr>
<td>SKULL</td>
<td>4.3%</td>
</tr>
<tr>
<td>VERTEBRAL COLUMN</td>
<td>3.9%</td>
</tr>
<tr>
<td>TEETH</td>
<td>2.9%</td>
</tr>
<tr>
<td>EXTREMITIES</td>
<td>1.7%</td>
</tr>
<tr>
<td>HIND LIMB</td>
<td>1.1%</td>
</tr>
<tr>
<td>FORELIMB</td>
<td>0.7%</td>
</tr>
</tbody>
</table>

The low percentage of limbs is interesting as it indicates that some of the finest meat from the carcases is not present in the midden. Similarly the gap between ribs and vertebral column numbers is great, suggesting a concentration upon rib roasts rather than steaks or chops. This presents a picture of a low quality diet for although ribs may bear some fine meat, it is generally of a poorer standard than that from the limbs and back.
Moreover there is little to suggest that these ribs were in fact consumed as roasts. Knife marks which would indicate the stripping of roasted meat are present only in small proportions, and the high level of breakage could point to extensive chopping or hand snapping; namely tertiary processing for boiling and stewing.

The high percentage of extremities and waste elements which yield poor quality meat certainly reinforces the impression that the diet was of a low quality. Such elements are good only for incorporation in soups and stews.

The ratio of extremities may indicate also that animals were being butchered on site as commercially these pieces are either removed at the wholesale level or trimmed off retail cuts. This does not mean to say that people in urban settings could not acquire waste elements for use in soups. Nevertheless the percentage frequency of such elements in urban and rural assemblages may indicate through comparison the presence of two separate meat procurement strategies, one of commercial supply and the other of self sufficiency. Analysis of the butchering techniques used at Regentville will further clarify this issue.

The diet therefore incorporated the full range of elements from carcases indicating not only the practice of home slaughtering but also a policy of carcase utilisation which was opposed to the wastage of meat. This reasoning assumes that the did not receive waste elements directly from the slaughtering area, but only after their processing for human consumption. Slaughtering is not likely to have occurred within the courtyard area, but instead took place elsewhere on the estate. Intensive
processing designed to recover every possible amount of protein is witnessed also by the chopping of long bones for marrow, indicated by spiral fragmentation and an absence of carnivore gnawing.

We can acquire a firmer understanding of the diet indicated by the midden if we consider the range and quantity of elements by which individual species were represented.

**TABLE TWELVE**

**REGENCYVILLE 151 PROPORTIONS OF COW ELEMENTS**

**FIFTY-ONE FRAGMENTS**

<table>
<thead>
<tr>
<th>Element</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>UNIDENTIFIABLE</td>
<td>0.0%</td>
</tr>
<tr>
<td>UNIDENTIFIED</td>
<td>17.6%</td>
</tr>
<tr>
<td>RIB</td>
<td>47.1%</td>
</tr>
<tr>
<td>TOOTH</td>
<td>25.5%</td>
</tr>
<tr>
<td>VERTEBRAL COLUMN</td>
<td>3.9%</td>
</tr>
<tr>
<td>FORELIMB</td>
<td>2.0%</td>
</tr>
<tr>
<td>HINDLIMB</td>
<td>2.0%</td>
</tr>
<tr>
<td>EXTREMITIES</td>
<td>2.0%</td>
</tr>
<tr>
<td>SKULL</td>
<td>0.0%</td>
</tr>
</tbody>
</table>
TABLE THIRTEEN
REGENTVILLE 151 PROPORTION OF SHEEP/PIG ELEMENTS
SIX HUNDRED AND SIXTY FOUR FRAGMENTS

<table>
<thead>
<tr>
<th>Category</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>UNIDENTIFIABLE</td>
<td>0.0%</td>
</tr>
<tr>
<td>UNIDENTIFIED</td>
<td>18.1%</td>
</tr>
<tr>
<td>RIB</td>
<td>75.6%</td>
</tr>
<tr>
<td>VERTEBRAL COLUMN</td>
<td>4.4%</td>
</tr>
<tr>
<td>SKULL</td>
<td>0.9%</td>
</tr>
<tr>
<td>TOOTH</td>
<td>0.3%</td>
</tr>
<tr>
<td>HINDLIMB</td>
<td>0.3%</td>
</tr>
<tr>
<td>EXTREMITIES</td>
<td>0.3%</td>
</tr>
<tr>
<td>FORELIMB</td>
<td>0.2%</td>
</tr>
</tbody>
</table>

What factors can have biased this interpretation?

DIFFERENTIAL PRESERVATION.

We need to assess to extent to which our sample has been affected by natural forces of attrition. Has the ratio of species and elements been significantly shaped by non-cultural events such as deterioration in the soil, exfoliation and gnawing by rodents and carnivores? The bone conditions observed generally, and their intensity are presented in the following table. Percentages are ratios of the number of recorded conditions.
TABLE FOURTEEN

REGENCYVILLE 151 GENERAL BONE CONDITION

<table>
<thead>
<tr>
<th>Condition</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Irregular Breakage</td>
<td>60.2%</td>
</tr>
<tr>
<td>Cancellous Bone Exposure</td>
<td>35.2%</td>
</tr>
<tr>
<td>General Surface Flaking</td>
<td>4.7%</td>
</tr>
<tr>
<td>Surface Flaking</td>
<td>0.0%</td>
</tr>
<tr>
<td>Rounding and Abrading</td>
<td>0.0%</td>
</tr>
<tr>
<td>Gnawing</td>
<td>0.0%</td>
</tr>
</tbody>
</table>

The high percentage of cancellous bone exposure and the associated presence of general surface flaking indicate that the deposit was exposed to the forces of aeolic weathering and that it does therefore represent an accumulation of material over time rather than a single depositional event. Discarded material was exposed for possibly lengthy periods prior to burial within the midden and may only have been finally buried by the demolition of the structure between 1870 and 1900.

It is interesting that no gnawing damage was observed as the midden was not protected from the passage of canines or rodents. It may well be that diagnostic marks have been obscured by weathering. Nevertheless the absence of gnawing cannot be so dismissed. It does indeed appear that the midden was not frequented significantly by scavenging animals.

This has a number of implications. Firstly it allows us to argue that bones have not been differentially removed or destroyed by commensals. As such the ratio of elements and species may closely reflect the pattern of material at the time of discard.
Secondly observed breakage cannot have been produced by animals but instead may be the result of human modification. Some fracturing will have occurred as a response to exposure to rain, wind and sun, and the surface flaking recorded in this sample certainly derives from this action. Nevertheless the majority of long bone fracturing has a spiral morphology produced by force having been applied to bone in a fresh state. This stems from human breakage for marrow extraction. Chopping marks found on some fragments clearly suggests such processing behaviour. Absence of tool marks does not destroy this argument as not all fragments will necessarily bear cut marks, but instead will have been broken by the passage of force through the element.

Some breakage may derive from trampling by human and beast as the open nature of the deposit may have led to bone material discarded and broken on the courtyard surface being incorporated into the midden, either accidentally or as a result of sweeping.

Nevertheless the majority of bones appear to have made their way beneath the verandah due to the successive sweeping out of the kitchen and servants' quarters, or due to direct deposition and discard. Therefore observed breakage cannot all have been caused by trampling.

It is important to note that all three species show a comparable proportion of 0-25% breakage, thereby indicating a uniformity of bone condition across elements of different densities and strengths. On the basis of the interpretation of deposit taphonomy this pattern is likely to be linked to a form of human consumption which processed all three species in a very similar fashion.
Examination of burning stages and their distribution across elements within species provides further information concerning dietary behaviour and natural attrition. Only ninety-five incidences of burning were recorded. It therefore has had a very small affect upon the deposit. No natural fire has occurred to induce breakage or the removal of elements for this would be evidenced by a more uniform distribution of burning throughout the deposit as well as a higher incidence of transverse fracturing.

That burning which was observed derives most likely from human action. The general ratio of burning stages was as follows:

<table>
<thead>
<tr>
<th>TABLE FIFTEEN</th>
</tr>
</thead>
<tbody>
<tr>
<td>REGENTVILLE 151 BURNING STAGES</td>
</tr>
</tbody>
</table>

| MOTTLED      | 31.6% |
| STAINED      | 4.2%  |
| CHARRED      | 11.6% |
| CALCINED     | 52.6% |

The only observed burning on cow elements was the presence of three mottled long bone fragments.

Of the twenty identified sheep fragments one fused radius and ulna, one metacarpal, and one astragalus were mottled.

Amongst the 664 sheep/pig fragments calcination was observed on five unidentified and thirteen long bone fragments. Charring occurred on four unidentified and three long bone fragments. Mottling occurred on one lumbar
vertebra, eight rib, eleven long bone, and one carpal fragment. Staining was present on one vertebral epiphysis.

Of the fourteen pig fragments only one, a lower canine, exhibited burning and this was charred.

The meaning of these burning stages was discussed in Chapter Three. Calcination and charring are thought to be good indicators of human modification. Within the midden the distribution of burning across elements and species suggests that much, if not all observed burning may have been the result of accidental association with a hearth, the bones present deriving from the sweeping out of this structure.

Some may also derive from the consumption of roasts which can cause bone in meat cuts to be exposed to fires of high temperature for a significant period of time leading to their charring or calcination. Patterning is present within the sheep/pig sample where calcination occurs predominately on long bone fragments suggesting the consumption of roasted leg joints. The relative scarcity of such fragments indicates that such consumption was limited. Differential destruction of burnt elements in the soil can have had an effect upon the quantity of elements exhibiting exposure to fire. Nevertheless, in a sample of 819 bone fragments deposited in an alkaline context one can argue that if roasts had been consumed in significant numbers the ratio of burnt fragments would have been greater. This reinforces the impression provided by the level of bone breakage and the absence of secondary butchering marks suggestive of roast production, of a diet of predominately boiled meat. The other species are comprised of samples too small to warrant discussion.
DIFFERENTIAL DISPOSAL.

Further thought has to be given to determining whose diet the midden represents. The location of the deposit behind the kitchen and servants' quarters suggests that some of the refuse derives directly from the meals of those who inhabited this structure.

We must however consider the possibility that the midden included material representative of other site occupants such as those in the main house. The midden may have acted as a general collection point for food refuse gathered up from a number of eating areas.

The date range of accumulation covers the period of occupation after Jamison family's residence when the site was used firstly to house an asylum and then a hotel. Examination of the composition of the midden has indicated consumption of low quality meat in soups and stews. It could be argued that such a pattern would satisfy a diet given to the inmates of an asylum, being cheap and easy to produce. One might expect the meat served at a hotel to show more variation and to include some large joints. Given this reasoning it may be that another midden existed on the site during the hotel phase and received waste from the main house. Nevertheless stews could also have formed a staple food offering in public houses.

It is also possible that the midden represents only the diet of the hotel and asylum staff resident in the servant quarters. Interpretation is limited by the absence of a conception of how the midden was composed vertically. Some patterning in the distribution of elements may have been recovered by excavating with a strict vertical control allowing the
isolation of parts of the deposit and their relegation to one of the two phases of occupation. Nevertheless no patterning was found horizontally and hence the deposit must be considered as a whole.

If butchering was indeed occurring on site we are faced with the question of explaining the absence of a more uniform ratio of element types within the midden. We have seen that element ratios cannot be fully the product of natural forces of attrition. The absence of gnawing, and the presence of alkaline soil conditions has meant that the element and species ratios witnessed are closely related to the actual pattern of human processing and discard. The predominance of small, light rib fragments as opposed to denser long bone pieces capable of better withstanding the aeloic weathering that the deposit has undergone indicates that the midden reflects a pattern of human consumption.

7.3 BUTCHERY.

GENERAL.

<table>
<thead>
<tr>
<th>TABLE SIXTEEN</th>
</tr>
</thead>
<tbody>
<tr>
<td>REGENTVILLE 151 PROPORTIONS OF BUTCHERING MARK MORPHOLOGY ACROSS SPECIES</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>COW</th>
<th>SHEEP/PIG</th>
<th>SHEEP</th>
<th>PIG</th>
</tr>
</thead>
<tbody>
<tr>
<td>SAWN</td>
<td>12.5%</td>
<td>2.2%</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>CHOPPED</td>
<td>81.3%</td>
<td>96.7%</td>
<td>100.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>KNIFE</td>
<td>6.3%</td>
<td>1.1%</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
</tbody>
</table>

In general butchering involved the use of saws and chopping blades. The cow sample exhibits the highest proportion of sawing marks and this is
It is interesting to note that the cow elements mostly bear chopping marks. At face value this could be taken to indicate that the use of saws on the beasts consumed at Regentville was limited, indicating possibly a low level of skill and the absence of professional butchery, on site butchery, or isolation from appropriate technology.

Nevertheless in reality this picture has been shaped by the presence and absence of particular elements within the midden. Those elements such as long bones and vertebrae which are more likely to require sawing are poorly represented in the sample and we are left with a predominance of ribs which, being of a weaker structure, can be divided into segments using a chopping tool. Moreover the importance of chopping marks has been inflated by the fact that all the long bones have been fractured for marrow extraction. Significantly all the cow long bone fragments recovered have been sawn nevertheless, thereby indicating the fact that the pattern of element representation is a central force in shaping any interpretation of butchering practice.

The knife marks were found on rib and long bone shafts and represent tertiary processing, namely the stripping of meat from boiled or roasted meat cuts. The higher proportion of knife marks within the relatively small cow sample may be the result of

(a) an emphasis upon roast beef cuts and boiled mutton and pork
(b) a factor of preservation. Knife marks may have been differentially preserved on the bones from the three species. All species are represented predominately by elements which have suffered 0-25% breakage. Nevertheless cow fragments will still be relatively larger and therefore more likely to bear surviving and detectable traces of knife marks.

primary butchering marks on bones from sheep and pig are indicative of chopping. This has occurred on long bone shafts to allow marrow extraction, to divide animals down the sagittal plane, and to break up rib shafts into sections for cooking. Two sawing marks were found, one on a long bone fragment and the other on a rib shaft. This may reflect the presence of on site butchery an issue which is discussed in the next section as well as the concluding paragraph.

**BUTCHERING ON SITE.**

It is postulated in this thesis that the butchering of animals on site for meat consumption will be indicated by:

(a) a high representation of all elements within or across contemporaneous food waste deposits, including a significantly high proportion of waste elements such as feet, lower limbs and skulls.

(b) a pattern of butchery which may be distinct from contemporaneous commercial techniques. This may be indicated by the technology employed, as well as the form of meat cut units.
A number of problems do however arise to make interpretation a complex process:

(a) even isolated rural sites can employ professional butchers using up to date technology.

(b) waste elements indicating use of complete carcases may be discarded at the butchering site away from the area of occupation. They may not find their way into food refuse middens in proportions significantly greater than those present in deposits on urban sites.

(c) excavation may recover deposits which indicate only one form of diet and disposal present on the site. For example this has already been discussed in relation to Unit 151. Differences in the social status of site occupants and the differential disposal of waste in separate areas on site may obscure the full range of variation in diet composition present within the potential assemblage as a whole.

Therefore to detect the presence of on site butchery in isolated rural midden deposits such as Unit 151 in this thesis site comparison was undertaken with an urban assemblage served by commercial butchers. This comparison was based upon:
(a) the relative proportion of waste elements in the deposits

(b) the nature and consistency of butchering techniques represented by mark morphology, location, frequency and orientation.

This thesis has already illustrated that butchering techniques can exhibit great variation over time and space and hence it will be difficult to make an interpretation based solely upon the comparison of butchering mark distribution alone. This does not mean to say that especially distinctive meat cut forms may not be found which suggest home slaughtering using inadequate technology or skill.

A fuller discussion of this problem and the meaning of Unit 151 is presented in the final chapter after analysis of the Footscray assemblages. This enables us to place the problem in a more suitable context.

7.4 CONCLUSION

This analysis of Unit 151 has produced new information concerning the diet of site occupants and nineteenth century butchering techniques not capable of being extrapolated from a mere species and element list.

The importance of considering spatial context, site formation processes and taphonomy is clear as this allowed an assessment of how representative the midden was of a pattern of butchery and human consumption.
In summation we can state the following:

(a) the proportion of species and elements within the midden is linked to a pattern of human consumption. This interpretation was based upon analysis of breakage patterns across and within species, and the detection of natural agents of attrition.

(b) the diet was of a low quality in terms of the meat consumed and the manner of its processing. There is a dominance of rib pieces and a high proportion of waste elements for each species. Consumption of roasts; beef, mutton and pork did occur yet use of soups and stews are likely to have been predominant. Processing was intensive and involved the breakage of elements for marrow extraction.

In conclusion it must be stated that any assessment of diet based upon faunal remains will only present part of the picture. Many food items such as deboned meat cuts, offals and sweetbreads, sausages and smallgoods, may not be represented in the archaeological record.

The information presented here must now be studied in relation to the other material culture recovered from the site and so form part of a broader interpretation of life at Regentville last century.
Figure Seventeen: Plan of the site of Regentville, Penrith, New South Wales showing excavated areas. From Wilson 1988, p.125.
Figure Eighteen: Calcinated long bone fragments from Unit 151 Regentville. Note their chalky appearance and squared fracturing. Photograph by Andrew Wilson.
Figure Nineteen: Spirally fragmented Sheep/Pig long bone fragments from Unit 151, Regentville. Photograph by Andrew Wilson.

Figure Twenty: Cow rib midshaft exhibiting surface weathering and irregular breakage from Unit 151, Regentville. Photograph by Andrew Wilson.
Figure Twenty One: Irregularly chopped cow long bone fragment from Unit 151, Regentville bearing a knife mark on the preserved face running medio-laterally. Photograph by Andrew Wilson.

Figure Twenty Two: Cow scapula sawn as a blade bone steak. The sawing marks are clearly visible as parallel striations on the cut surface. From the Hyde Park Barracks. Photograph by Andrew Wilson.
Figure Twenty1XThree: Butchering on farm and station early last century. From Cannon, M. 1973, page 31.
Figure Twenty Four: The author outside a slab built dressing shed of the period 1850-1870 on the property of Vic Boardman, Camden, New South Wales. This is a fine example of the type of solid structure required to support carcasses of beef, mutton and pork for dressing after slaughtering, skinning and primary butchering. The slaughtering yard was situated twenty metres away up slope. The internal fixtures of the shed are intact. Similar structures probably existed on hundreds of rural properties dependent upon their own stock for meat. See Appendix Two. Photograph by John Burge.
Figure Twenty Five: View of the dressing shed from up slope.
Figure Twenty Six: Vic Boardman and the author inspect a slaughtering yard used during the 1920's and 1930's, also situated on the Boardman property. The yard had a brick lined floor and was set on a gentle slope above a water course which presumably received waste from the slaughtering process. A few fence posts survived to indicate the presence of adjoining handling yards. From here the carcasses were delivered to the retail butchers of Camden who were not allowed to slaughter animals within the town boundary. Photograph by John Burge.
CHAPTER EIGHT: THE CITY LINK EXCAVATIONS, FOOTSCRAY- THE DEVELOPMENT OF AN URBAN ENVIRONMENT.

8.1 BACKGROUND.

The three sites of the Bridge Hotel, Stanley Arms Hotel, and the Pickett Cottages, were excavated in two seasons between January and April, 1989. They are all situated on the bank of the Maribyrnong River, Melbourne in the suburb of Footscray and were set aside for examination by the Victoria Archaeological Survey in response to a plan to develop the area by City Link Properties Pty Limited (Wilson, Mider and Fitzroy 1990, p.15). It was felt that significant archaeological remains relating to the early life and development of Footscray could be traced and that development would destroy these remains completely.

The research design stated that the excavations aimed to:

- locate and reveal significant structures and archaeological deposits.

- recover archaeological remains related to the industrial and domestic occupation of the area.

- increase our understanding of the archaeology and history of the sites themselves, as well as placing them within the context of Footscray and the city of Melbourne (Wilson, Mider and Fitzroy 1990, p.15).

Augering was used to establish site locations and their suitability for excavation. The open area technique was employed as at Regentville,
spatial control being maintained by way of a quadrat system of one metre squares. Details of this process are to be found in the archaeological report (Wilson, Mider and Fitzroy 1990, pp.95-103).

The history of Footscray was one of gradual development in response to the establishment of improved transport and communication systems which ended the area's isolation from the city of Melbourne. Footscray served as a crossing point on the Maribyrnong River and a link with the settlements further west such as Williamstown. A punt was established in 1839 for this purpose and prompted the appearance of numerous public houses such as the Victoria and Bridge Hotels which competed in attracting travellers moving to and fro across the river.

This was followed by limited domestic occupation in the 1860's and 1870's. The prospect of settling in the area was however made unfavourable by the influx into Footscray of the noxious trades such as tanning and slaughtering, which had been moved from the residential sector of Melbourne. The Maribyrnong became highly polluted as a result and the area was increasingly industrialised throughout the nineteenth century. This non-domestic character remains to the present day.

Data was recovered for this thesis from the three sites listed above. Nevertheless due to time constraints only material from the Pickett Cottages is discussed here.
8.1 The Pickett Cottages: Area Two 1872/5-1898.

The Pickett Cottages lie south of the Bridge Hotel on the corner of Wingfield and Maribyrnong Streets, and were built between 1872 and 1875 and demolished in 1898. As such they provide a tightly dated deposit, a fact which greatly increases the scope of any archaeological interpretation.

The cottages were single storey, brick built on stone foundations, and possessed three primary rooms and a service wing at the rear. They were occupied by large working class families of predominately Irish descent. The men tended to be employed in the local industries as slaughtermen, labourers, and as employees in boiling down works. Tenancies were short and this may be related to the unsavoury living conditions caused by the nearby noxious trades and their pollution of the river (Wilson, Mider and Fitzroy 1990, pp.44-46).

No superstructure survived the demolition. The site was covered in fill and then levelled.

One deposit, 2.12, was analysed in this study. It was chosen due to the large sample size that it presented, as well as its demonstrable association with the southern cottage.
8.2 Archaeological Context: Unit 2.12.

This unit yielded 598 bones; a large sample which allows us to gain insight into the condition of those families which occupied the cottages during their short life.

Unit 2.12 was excavated from within the kitchen area of the southern cottage, and represents material which fell into the underfloor space during occupation and demolition. A direct relationship with the kitchen cannot be established as much of the deposit may have derived initially from outside the structure, and found its way into this space through holes in the walls. The fact that over half the artefacts from 2.12 were architectural in nature illustrates also that much of its composition may relate primarily to the process of demolition. This is further heightened by the absence of small items such as pins and coins which may indicate that the room was laid with tongue and groove floor boards, thereby preventing the passage of objects from the kitchen itself into the underfloor area. The artefacts do however have a direct link with the life of the structure and are separate from the later introduced fills (Wilson, Mider and Fitzroy 1990, pp.52-53).
Figure Twenty Seven: Plan showing the location of the Bridge Hotel, Pickett Cottages, and the Stanley Arms Hotel, Footscray, Melbourne. From Wilson, Mider and Fitzroy 1990, p.17.
8.3 DIET.

TABLE SEVENTEEN

2.12 SPECIES PROPORTIONS: 529 FRAGMENTS

<p>| | |</p>
<table>
<thead>
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<tr>
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<tr>
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<td>9.8%</td>
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<tr>
<td>COW</td>
<td>6.2%</td>
</tr>
<tr>
<td>SHEEP/PIG</td>
<td>68.2%</td>
</tr>
<tr>
<td>SHEEP</td>
<td>15.1</td>
</tr>
<tr>
<td>PIG</td>
<td>0.6</td>
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</tbody>
</table>

The species ratios show a clear emphasis upon mutton and pork. As was noted in Chapter Seven it is difficult to measure the relative proportions of sheep and pig, most fragments having to be ascribed to the category of Sheep/Pig.

The number of identified sheep fragments is however significantly greater than pig and this indicates that mutton was probably the meat most consumed. The fact that all three species were represented by a breakage pattern of predominately 0-25% present indicates that the species ratios are not the product of differential fragmentation but instead may be a reflection of the pattern of meat consumption. This is considered again when taphonomy is discussed in detail.
Analysis of general body part proportions indicates a pattern of consumption concentrated upon cuts incorporating the ribs and vertebral column. Limbs are poorly represented by comparison and this suggests a limited consumption of large roasting and boiling joints.

The small proportion of skull and waste elements point to the purchasing of low quality meat for use in soups and stews. Their presence does not necessarily indicate that slaughtering occurred on site as the cottages were situated in an urban environment supplied by commercial butchers. This impression is reinforced by the analysis of butchering mark morphology, frequency and location which indicates the operation of a consistent commercial process. This is discussed in detail in 8.4.

By examining the range of elements by which individual species are represented we can acquire a more detailed understanding of the diet of the cottage inhabitants.
TABLE NINETEEN

2.12 COW ELEMENTS: THIRTY THREE FRAGMENTS

<table>
<thead>
<tr>
<th>Type</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>UNIDENTIFIABLE</td>
<td>0.0%</td>
</tr>
<tr>
<td>UNIDENTIFIED</td>
<td>0.0%</td>
</tr>
<tr>
<td>RIB</td>
<td>93.9%</td>
</tr>
<tr>
<td>TEETH</td>
<td>6.1%</td>
</tr>
<tr>
<td>VERTEBRAL COLUMN</td>
<td>0.0%</td>
</tr>
<tr>
<td>FORELIMB</td>
<td>0.0%</td>
</tr>
<tr>
<td>HINDLIMB</td>
<td>0.0%</td>
</tr>
<tr>
<td>SKULL</td>
<td>0.0%</td>
</tr>
<tr>
<td>EXTREMITIES</td>
<td>0.0%</td>
</tr>
</tbody>
</table>

This indicates consumption of cheap cuts incorporating ribs and skull pieces, the latter being indicated by the presence of teeth which have become differentially deposited or preserved within Unit 2.12 in relation to the other bones from the skull.

Analysis of butchering marks indicates the consumption of boiled meat as there is an absence of knife marks suggestive of roast meat consumption. It is possible that these have been obscured by the surface weathering that all the fragments had undergone. Nevertheless as was the case at Regentville the pattern of breakage could be seen to be indicative of intensive segmentation and fracturing designed to allow bone and meat pieces to be boiled for soups, or put in stews.

A large proportion of observed fracturing; 82.4%, was unassociated with any tool marks. No gnawing apart from eight incidences of rodent
damage was present and hence much of this breakage could indeed be the result of human processing.

However if we consider the context and taphonomy of the deposit it becomes clear that breakage may have been induced by the action of demolition which was an instrumental deposit formation process. Moreover all the elements exhibited signs of having been exposed to aeolic weathering prior to burial and hence breakage could also have been induced by associated weakening of bone structure as well as trampling.

Nevertheless the more robust cow elements have been subjected to a higher degree of fragmentation than those of the other species within the same taphonomic environment which could indicate differential processing of species, with site inhabitants extracting as much protein as was possible from the beef cuts that they purchased by ensuring that all elements were used either primarily or secondarily in soups and broths.

The absence of limbs allows us to state that the amount of beef consumed was small in relation to the other two species. We need to be careful when assessing the dietary importance of animals of different size and meat bearing capacity. Large animals may only be represented by a small number of elements yet these may still indicate a significant amount of meat due to the size of the carcase. The beef represented in this deposit however derives from the rib cage and skull which do not carry much meat in relation to the limbs and back.
The identified sheep fragments reveal consumption of broad range of meat cuts, although this sample can only be understood in relation to the larger Sheep/Pig category.
This sample presents a very different picture as there is a clear emphasis upon the back and rib cage, and an absence of identified limbs. Limb bones were in fact represented by sixty six spirally fragmented pieces which indicates that legs of mutton and pork were consumed either as roasts or boiled meat.

Examination of the distribution of burning stages across elements revealed sixteen charred long bone fragments, nine calcined long bone fragments, one charred and one calcined rib, three unidentified calcined fragments, and one calcined femur fragment.

This was the only burning observed and suggests that some limb pieces were in fact consumed roasted, along with some rib cuts. As at Regentville some of this burning could be due to accidental association with a hearth. There is however a strong enough pattern here to suggest that the burning is a direct reflection of processing and cooking behaviour, given its restriction to ribs and long bones and the temperatures required to cause
charring and calcination, which, in this urban context are best explained by humanly induced fires and hearths. The structure itself suffered no fire during its life, and no other burning stages were present.

The vertebral column is represented by a balanced distribution of vertebra types, most of which have been divided down the sagittal plane indicating their use as chops. This is confirmed by the large number of ribs which have been sawn through just below their angles.

The diet indicated by Unit 2.12 is one in which mutton and pork predominated. It appears that mutton dominated generally. A wide range of meat cuts were consumed from these two species as chops, rib roasts, leg roasts and boiled pieces. By comparison the consumption of beef was limited to rib pieces and head meat.

This presumably reflects the fact that beef cuts from the limbs and back are generally more expensive than mutton from the same areas of the carcase. We know that the occupants of the cottage were of the working class and therefore the dietary pattern can be seen to be related to a low income. A desire to ensure that little was wasted is indicated by the breakage pattern throughout the deposit, as well as chopping marks on long bone fragments which suggests the extraction of marrow from cooked and consumed meat cuts.

Again we need to consider the possibility that the above interpretation of diet and meat processing has not been biased by the differential preservation and breakage of elements, or the fact that the depositional history of Unit 2.12 has caused it to be non-representative of
the cottage's occupation.

The archaeological report argued that 2.12 is linked to the occupation of the cottage. It comprises material which has been moved by a process of demolition, as well as that which was lying about the structure open to weathering and differential removal or destruction by rodents, canines, and trampling.

Interestingly the weathering stages of all bones are not as advanced as those seen in Unit 151, indicating a more rapid burial or protection from the elements. This suggests that much of the material was not altered by agents of natural attrition prior to becoming incorporated within the deposit. Observed breakage may therefore be linked to human modification. Location in a sub structure context obviously ensured that weathering was limited.

We do however have to be aware of the possibility that 2.12 only represents a small fraction of the bone waste which may have accumulated elsewhere on site, and which was not recovered by excavation or which was removed by taphonomic processes.

Nevertheless the large sample size and indisputable association of the deposit with the structure allows us to argue that the discussion of diet presented above does indeed form a representative picture of the dietary and consumer behaviour of the cottage's occupants.
TABLE TWENTY TWO

2.12 DISTRIBUTION OF BUTCHERING MARK MORPHOLOGY ACROSS SPECIES

<table>
<thead>
<tr>
<th></th>
<th>COW</th>
<th>SHEEP/PIG</th>
<th>SHEEP</th>
<th>PIG</th>
</tr>
</thead>
<tbody>
<tr>
<td>SAWN</td>
<td>83.3%</td>
<td>17.3%</td>
<td>24.3%</td>
<td>0.0%</td>
</tr>
<tr>
<td>CHOPPED</td>
<td>16.7%</td>
<td>75.0%</td>
<td>75.7%</td>
<td>0.0%</td>
</tr>
<tr>
<td>KNIFE</td>
<td>0.0%</td>
<td>7.7%</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
</tbody>
</table>

As at Regentville sawing occurs predominately on cow elements, although due to the small sample size of this species 83.3% represents only five sawing marks, all on ribs either just distal of the angle or across the midshaft. This indicates consumption of rib roasts. The chopping marks appear to derive from secondary processing for incorporation in soups and stews.

The sheep/pig category presents the following:

- chopping of all vertebrae types and the pelvis down the sagittal plane (frying chops)

- chopping of ribs for roasts and soups

- chopping of all long bones irregularly across the midshaft for marrow extraction

Sawing occurs on some lumbar and cervical vertebrae (division down sagittal plane), on the scapula in order to produce blade bone chops, and to divide the skull down the sagittal plane.
The presence of both sawing and chopping could indicate supply by two different butchers over the twenty-five year life of the cottage, or rather the production of individual meat cuts by a single butcher who chose to use the saw on occasions, especially when dealing with bones that would splinter if chopped, such as the scapula blade.

8.5 CONCLUSION.

This analysis has indicated that the occupants of the Pickett Cottages consumed a meat diet involving the use of a variety of cuts, predominately mutton, which were boiled, roasted, and in some cases chopped for secondary use in soups and stews.

The beef consumed derived primarily from the rib cage whilst the mutton and possibly pork eaten was drawn from a more uniform distribution of cuts. This reflects purchasing power and consumer taste.
Figure Twenty Eight: Location of the observed butchering marks on the faunal remains from Unit 2.12, Pickett Cottages, Footscray. Tertiary Butchering marks are not shown.
CHAPTER NINE: CONCLUSION—FUTURE RESEARCH AND THE VALUE OF SITE COMPARISON.

9.1 INTRODUCTION.

Analysis of the faunal material from the William Salthouse, Regentville, and the Pickett Cottages has illustrated the manner in which we can use bone remains to partially reconstruct the diet of site occupants on Australian historic sites, as well as the methods of butchery used to segregate carcases for consumption.

Detailed recording of bone weathering, morphology, and the location, frequency and orientation of butchering marks allowed the identification of:

- natural and cultural site formation processes
- meat cuts and the units of consumption
- primary, secondary and tertiary butchering techniques

This information was then discussed in relation to historical context and the status and occupation of those responsible for the food waste. This greatly increased the scope of our understanding of the individual sites.

Site comparison however has the potential to expand even further the meaning of individual assemblages by placing them in a different and wider context. The next section discusses some of the issues of site comparison raised by the analysis of the three sites.
9.2 THE SCOPE OF SITE COMPARISON.

(a) Taphonomy.

The examination of faunal material from well defined archaeological contexts allows us to read meaning from bone condition. This in turn clarifies or alters our initial perception of what it is that a deposit represents in terms of human behaviour.

At Regentville the absence of gnawing and the high proportion of spiral fragmentation enabled some bone, and possibly most bone breakage to be ascribed to human processing behaviour. Within the Pickett Cottages' assemblage the low level of bone weathering indicated fairly rapid accumulation of material after discard beneath the structure. On the William Salthouse the presence of irregular breakage and the surface flaking of bone produced a picture of significant site disturbance.

All this information can be amalgamated to increase our understanding of the response of bone in archaeological contexts to natural and cultural site formation processes generally.

It has already been argued in Chapter Three that immutable taphonomic laws are out of reach, and that we must approach taphonomy initially from a site specific context. Nevertheless through comparison we may notice significant differences or similarities in bone condition which will raise many important interpretative questions concerning the meaning of faunal assemblages; especially where our appreciation of archaeological context is
The examination of burning stages can be used as an example. Charring and calcination it was noted, are thought to be good indicators of humanly produced bone modification due to the high and prolonged temperatures required to produce this effect upon bone.

The Pickett Cottage deposit contained only these two burning stages and had not been subject to any natural fires. This reinforces the theory that charring and calcination are linked to human behaviour.

This influences the interpretation of observed burning on other sites such as Unit 151 which, being in a rural context and on a site which has suffered fire, requires careful analysis in order to distinguish between burning which has been naturally or culturally induced. As such the Pickett Cottage assemblage strengthens the theory that the charring and calcination of bone within the midden was cultural.

Of course this forms only the first line of analysis for we need to test this theory by examining the distribution of burning across elements and species as was done in this thesis.

In conclusion therefore site comparison prompts the development of confidence in taphonomic questioning and interpretation.
(b) Butchering Patterns.

The butchering patterns present on single sites can be defined to enable the detection of the units of meat consumption. As is the case with taphonomic agents, butchering methods can exhibit great variation over time and space for reasons already discussed. This does not however prevent us from comparing butchering patterns within the assemblages from a number of sites, using as our yard stick the structure of the domestic animal carcase and the morphology of butchering marks and bone breakage.

This thesis has already used site comparison as a means of assessing the visibility of salted meat on terrestrial sites, as well as the detection of on site butchery and the use of different technology.

Butchering on site was discussed in Chapter Seven. Comparison of Regentville with Unit 2.12 shows a significant difference in the proportion of waste elements; head, feet, and lower limbs, within their samples (Compare Tables Eleven and Eighteen). The urban assemblage has a lower proportion.

This may indicate the presence of two distinct subsistence strategies; a rural practice of self sufficiency, and an urban reliance upon commercially produced meat.

At this point we need to consider the factors which may bias comparison of the two sites. Both deposits were excavated using the open area technique. Both were dry sieved through ten and five millimetre meshes, and were located in alkaline environments.
As a result we can say that they have been sampled at a level which favours comparison and that both are representative of the diet of site occupants. Therefore it appears likely that Regentville was supplied with meat from animals butchered on site.

Comparison with other sites is required to clarify this issue. It should be noted here that during the course of the year the author gathered information from six assemblages but was unable to carry out a complete analysis due to time constraints and a word limit.

The data collected (see Volume Two) serves as a base for future research and will expand on the issues raised by this thesis concerning the meaning of dietary patterns and butchering practice.

To conclude two major points affecting the interpretation of butchery are set out below:

(a) our impression concerning the butchering techniques exhibited by individual deposits and assemblages will be influenced to a great extent by the proportions of elements present. Unit 151 is a case in point for at face value it would appear that the cow carcases consumed at the site were butchered primarily with chopping tools, and therefore in sharp contrast to the commercial practice of sawing. It was seen however that this picture was produced by the virtual absence of those elements most likely to have been sawn.

Comparison with other sites and the study of the application of butchering technology over time and space must take this biasing factor
(b) assemblages may exhibit significant variation within and between sites in the form and intensity of tertiary butchery involving the fracturing of long bones for marrow extraction, or the breaking down of elements for their incorporation into soups and stews. Analysis of breakage patterns must therefore be very explicit concerning the relegation of breakage to either natural or cultural forces, or their combination.

(c) Diet.

Chapters Four, Seven and Eight illustrate the manner in which faunal analysis can be used to partially reconstruct the diet of the occupants of historical archaeological sites.

Greater understanding of the relationship between diet, social status, consumer behaviour and ethnicity will be provided by comparison with the material from the Hyde Park Barracks, the Bridge and Stanley Arms Hotels, as well as the assemblages from other sites. At this point a number of important observations can be made:

- our ability to understand the linkage between diet and social status is currently hampered by the fact that no high status assemblages have been excavated to allow meaningful comparison across class groups.
price differentiation between meat and cut types allows us to assess the relative cost and quality of meat diets represented on separate sites. Large, well provenanced samples such as those studied by the author are required however for such analysis.

- a contrast between rural and urban dietary patterns was traceable through the comparison of archaeological remains.

- the detection of salted meat on terrestrial sites will involve the use of chemical testing as well as the examination of butchering marks and element ratios.

9.3 CONCLUSION.

This thesis has succeeded in confirming the value of faunal analysis in Australian Historical Archaeology. The insight into dietary and butchering patterns provided by the careful examination of bone context and morphology is unique and deserves closer attention by Australian archaeologists.

The classification system developed here and employed in the analysis of six assemblages has clarified the benefits involved in using computer databases for both the storage and manipulation of information.

The importance of well organised cataloguing and artefact storage techniques must also be emphasised, for without them no worthwhile study of assemblages can take place. The author deliberately chose sites which had
been well excavated and whose artefacts were listed and boxed in an understandable manner.

At least a week was spent during the year attempting to gain an understanding of the context and material excavated in 1989 from the site of Lilyvale in the Rocks. The absence of an archaeological report and an easily accessible artefact list made this task difficult and the site was eventually discarded as being impossible to analyse.

If Australian Historical Archaeology is going to succeed in its aim of providing a cumulative source of information concerning the past lifestyles of people in this country we will need to reconsider the nature of its resource and the methods required to facilitate innovative research designs which move beyond the single site boundary. Excavation is but one part of an involved process of analysis which must be planned from the outset and capable of flexibility.

Faunal analysis has the potential to form an important part of any archaeological interpretation. The redundancy of arriving at mere species lists is clear. Diet forms an immediate and everyday aspect of peoples' lives and reflects their quality of living, social status and ability to maximise the resources available to them. In archaeological terms a food bone is a residue of a central feature of human behaviour; the desire and need to eat. By tracing and explaining variation in this behaviour over time and space the significance of Historical Archaeology in this country will be greatly advanced.


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