ASPECTS OF MAASAI ETHNOARCHAEOLOGY:
IMPLICATIONS FOR ARCHAEOLOGICAL
INTERPRETATION.

By

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A Thesis submitted in part fulfilment
of the requirements of the Degree of
Master of Arts (Archaeology) of the
University of Nairobi.

UNIVERSITY OF NAIROBI MARCH 1986.
I certify that this thesis is my own original work and has not been published or submitted to any other University.

Nubi Bernard Mbae

Supervisor:

Dr. Charles Cable.

University of Nairobi, March, 1986.
This thesis is an ethnoarchaeological study of some aspects of contemporary Maasai patterns of subsistence and settlement which have potential for creating archaeological bone assemblages. It deals specifically with Maasai behaviour in regard to bone modification and refuse disposal and the incidental spatial patterning which is deemed to be visible archaeologically.

The underlying objective is to derive ethnoarchaeological models of bone modification and refuse organisation which, after testing against independent data, can be refuted or supported and/or refined and can thus be used as aids to the interpretation of archaeological pastoralist sites.

The introductory chapter (one) presents the aims of the research, describes the research area and the methodology that was used during fieldwork.

Chapter two examines the theoretical basis of ethnoarchaeology as a sub-discipline of archaeology. It examines how ethnoarchaeology is practised and how it is used in a variety of ways to aid archaeological interpretation.

Chapter three puts the immediate research area into a wider geographical setting. This is done by a brief
examination of various aspects of the physical geography of south-western Kenya. Also available information on the palaeoclimate and palaeoecology of East Africa with special reference to the research area has been summarised.

Chapter four looks briefly at the history of the Maasai. It also examines the present-day Maasai pastoralist economy in the light of historical economic, political and social changes that have affected the supposed 'pure' pastoral adaptation of the Maasai.

Chapter five presents the modern site types extant in the Maasai settlement system, their structure and function. It also examines in detail Maasai behaviour in regard to rubbish disposal patterns.

Ethnographic bone modification is examined in chapter six. Data from the analysis of bones from abandoned sites is also presented to reinforce the observed ethnographic bone modification and discard patterns. Using the ethnographic evidence, bone modification and discard models are formulated and an attempt to test the model is done using the bones from abandoned sites as independent data. In chapter seven, an attempt is made to apply the model to a published bone assemblage. This is to illustrate the interpretive potential of the model in an archaeological context. The rest of chapter seven offers the discussions and conclusions pertinent to the Maasai case study and to implications for future research.
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after this sentence" - while this thesis was written. Also the same goes for my son Gitonga, who in his youthfulness kept on poking fun at my slowness in completing the "homework", thus spurring me to even greater effort.
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CHAPTER ONE

INTRODUCTION

1:1 Research Topic

This thesis is based on an ethnoarchaeological study of the Maasai pastoralists of Kenya. It seeks to examine and document some aspects of contemporary Maasai patterns of subsistence and settlement which have potential for creating archaeological bone accumulations. As Gifford has stressed; "Sites are created through certain kinds of human behaviour which produce material consequences; artifacts, structures, hearths, pits, food debris, footprints and so forth; and which occur together at a particular locus in space and time. They are perceptible in the present due to the interaction of these material manifestations with biologic, geologic and chemical processes in a manner which tended to preserve rather than destroy at least some of these manifestations" (1977:203). And this work chooses to focus on aspects of Maasai behaviour carried on at the various sites that together make up their settlement system. This study concerns in particular, the relations between human behaviour and the production, modification and patterning of faunal remains.

The main reason why I chose this topic is that I hope to find regularities between the patterning of faunal remains and the behaviours that produced them. These regularities can be formulated as hypotheses which, tested
and modified against independent archaeological data, can form the basis for models of prehistoric human behaviour (see fig 1:1). These models are potentially of great importance in the interpretation of some aspects of the East African Pastoral Neolithic (PN), where faunal remains form one of the most abundant constituents of sites.

Ambrose, for instance, has postulated that: "---The ecological context, topographic placement, size, faunal associations and distribution of midden debris at Savanna PN occurrences suggest their settlement strategy may have been similar to that of modern pastoral societies such as the Maasai, Barabaig and Samburu" (1984:230). This study will attempt to evaluate the reliability of some aspects of this generalisation, which is based mainly on the broadly comparable environment and economy of these modern societies and the prehistoric Pastoral Neolithic peoples. The tested hypotheses of models generated in this study are expected to confirm or refute at least part of this and similar generalisations by examining the specific faunal remains patterns which form a subset of the overall economy of both past and present pastoralists.

The most important aspect of this case study is that, together with other similar case studies on different aspects of the Pastoral Neolithic, they can help very much in constructing generalisations that are potentially useful in interpreting prehistoric pastoral adaptations. As
Gifford has stressed, prehistoric sites such as Prolonged Drift, Ngamuriak, etc, "---should not serve as the basis for models of economic transformation but, rather, as the data by which models derived from other sources can be tested" (1984:250). This study thus serves as one of these "other sources".

1:2 Aims of the Research

The main aim of this study is to unravel how human behaviours, or at least some of them, are responsible for patterning of faunal materials in the archaeological record. Through observation of a living society, it is possible to formulate hypotheses of the relationships of physical remains and the human behaviours that are responsible for their modification and patterning. These hypotheses can be tested against independent archaeological data and conclusions or models can be constructed which can be used as 'interpretive tools' of the archaeological record. This procedure is diagramatically illustrated in Figure 1:1.

In order to discuss more fully how human behaviours produce, modify and pattern faunal remains it will be necessary to look at site location and attempt to differentiate the various types of sites within the Maasai settlement system. This will be done to test the assumption that different site types are associated with different behaviour patterns which may generate contrasting and distinctive faunal
Figure 1:1 A Diagramatic Representation of the Basic Aims of this Study.

A: HUMAN BEHAVIOUR

(Relating to: food processing/sharing eating, rubbish disposal and butchery techniques)

B: PHYSICAL REMAINS

C: OBSERVATIONS OF RELATIONSHIPS OF A AND B:

(Relating to: production, modification and patterning regularities of B)

E: ARCHAEOLOGICAL RECORD

(comparison with B and testing of D)

D: FORMULATION OF HYPOTHESES OF B and A relationships using C.


Key to Fig. 1:1

A - represents some of the human behaviours that will be ethnographically investigated and documented.

B - represents discarded physical remains which are modified and spatially patterned as a result of A and form potential archaeological remains in E.

C - represents the observed regularities of A and B.
relationships as concerns production, modification and patterning of B. These regularities are used to formulate hypotheses D which are tested against E.

NB: Between E and D there is a two way relationship. After testing D against E the hypotheses are either supported or refuted, but also as a result of observations of regularities and patterning of physical remains in the archaeological record E, the hypotheses in D can be modified. Thus, it is then possible to move on to step F and construct models that link E and A as aids to archaeological interpretation.
assemblage patterning. This objective entails an examination of site location factors, site structure and function. There are natural and physical, economic, socio-cultural and to some extent political (especially in modern times) limitations that influence the where, how and why of the Maasai settlement system.

The first category of site location factors are those to do with the limitations of the natural environment, the type of economy and their interactions. Under this category it is necessary to investigate the influence of topography and vegetation on the location of sites. Pasture and water availability (both for livestock and domestic use) in the predominantly pastoralist Maasai subsistence system will be important factors in the selection of settlement areas. The pattern of annual exploitation of these resources (i.e. seasonality) will strongly influence the type and function of the various sites. Carr (1977), for example, has shown the importance of pasture and water availability in the entire Dassanetch pastoralist way of life; and Talbot (1964), Western and Dunne (1979) have shown the same for the Pastoral Maasai.

The second category of site location factors are governed by the socio-cultural norms of the Maasai. The division of labour (e.g. between males and females, and the warrior class - Morans) within the entire Maasai social and cultural organisation illustrates this point very well.
Each group has its own cultural requirements and obligations. For instance, Morans, being the 'defence army' of Maasailand, do not live in the main home settlements enkang. They roam the countryside residing in designated rockshelters or clearings in the forest in modern times. However, in the past they resided in a Manyatta which functioned as an 'army barracks'. Mature men, women and children reside in the main home bases (Bomas), while a few elders and boys reside in the seasonal cattle camps during the dry season. This breakdown of the population and their subsequent behaviour and activities, result in the delineation of various site types and their functions. Consequently these divisions will lead to contrasting and distinctive patterning of various material things. This is a result of the fact that each group has its specific tasks and materials (e.g. pottery is a female related item and as such we do not expect to find it in Moran camps or seasonal cattle camps since women, although they visit these camps, neither stay there for long nor carry any pots there. Furthermore the Maasai do not manufacture pots, hence related evidence can not be expected in these camps).

Hivernel (1978) has suggested that we can not talk of 'pure' pastoralists today since they do to some extent practise a form of mixed economy. The Maasai, to a considerable degree today, depend on shopping centres
for their requirements of maize meal, sugar, etc, as attested by discarded paperbags and tins on abandoned sites. These items supplement Maasai food - milk, blood and meat - requirements. Furthermore in modern times there have been political and economic measures enacted by the government for the development of Maasailand. Good examples are the 'Group Ranching Schemes', Health Centres and cattle dips. These amenities, to some extent, have acted as magnets to Maasai settlement locations. However, pasture and water availability may override the advantages of the former. Nonetheless these factors need to be borne in mind in order to assess the explanations of site location factors offered in this work.

On the basis of function, we can recognise five types of sites extant in the Maasai settlement system:

1. Boma
2. Seasonal Cattle Camp
3. Moo Feasting Sites (Il Puli) - NB: Two variations exist; the Family Ol Pul and the Moran Ol Pul
4. Butchery sites
5. The Manyatta.

A detailed description of these sites is given in chapter 5.

Having described the different types of sites in the Maasai socio-economic adaptation, it is my intention to examine in detail how and what activities in individual sites produce, modify and pattern faunal remains. There are many such activities (NB: I refer to them as site specific human behaviour processes) but for the purpose
of this thesis I examine rubbish disposal and other related activities. These include secondary processing of meat in preparation for cooking, its sharing and eating. In addition, I examine butchery techniques of modern Maasai and the related modification of bones through primary processing of the carcass. The underlying objective is to investigate whether there are any systematic patterns in the generation, modification and disposal of faunal remains. I also examine whether there are any inter-and/or intra-site variations of these patterns and the socio-cultural limitations that influence them (e.g. sharing of meat between different sites). This will permit me to draw some hypotheses, which if supported after testing on independent archaeological data, have great potential for archaeological interpretations of prehistoric pastoral adaptations.

In all societies the processing of food, its sharing and actual eating, and the subsequent disposal of the debris are governed by many factors including the socio-cultural norms of the people concerned and the type and function of sites. For example, people will not discard their rubbish in frequently used activity areas such as houses. In modern times when people go for a picnic in the remote countryside, there is a tendency to discard the rubbish at the point of its generation, while in a designated picnic site they throw the rubbish into clearly
specified receptacles or rubbish dumps. These examples, drawn from present-day human behaviour, illustrate my point.

Hodder (1982) has shown that socio-cultural norms influence food processing and sharing among the Nuba of Southern Sudan. In East Africa, Gifford (1980) has shown how eating habits and subsequent bone disposal patterns differ according to site type and function among the Dassanetch of East Lake Turkana in Kenya.

Processing and eating of meat results in special features such as burning of bones, cutmarks and even humanly chewed bones, especially those of young animals. The latter feature has been recorded among the Khoi (Hottentots) by Brain (1981). These processes will be examined among the modern Maasai to show the part they play in bone modification, its disappearance and survival, and its spatial patterning in different sites.

In most societies butchery techniques are governed by accepted culturally specific rules on how a carcass is to be treated. These start with the actual killing of the animal through secondary processing of different cuts to eating of the meat and the final discard of the bones. Thus it is true to say that any faunal sample passes through a kind of a cultural filter and consequently attains a kind of cultural imprint. This cultural imprint
can be detected and observed by examining bone treatment and its distribution in space through ethnographic observation and interview. An examination of the effects of the cultural imprint (e.g., cutmarks, burning and bone fragmentation during marrow extraction) permits us to ask questions about general cultural patterning of faunal remains.

For example, Yellen (in Ingersoll, 1977) has studied !Kung butchering techniques and has shown how !Kung traditional rules of butchering, processing and sharing of meat result in regularities or cultural patterns of faunal remains. This is reflected in bone fragmentation during marrow extraction, cutmarks during primary processing and distribution of the meat among the individuals whom tradition decrees must have a share. Yellen then points out that both natural and cultural factors work together to pattern faunal remains. Thus any cultural inferences drawn from faunal remains need to take both factors into consideration. Yellen has suggested that a simple form of attribute analysis provides the most powerful and reliable analytic tool.

My major objective in this area is to attempt to detect any systematized cultural patterns of bone modification as a result of Maasai primary butchery techniques and the related secondary processing of carcasses. This involves an examination of cutmarks,
cooking procedure, burning of bones, bone breakage during marrow extraction and sharing practices. Inter and/or intra-site variation in any observed patterns and modifications will also be investigated.

Ethnographic information on butchery techniques and the related effects on bones (i.e. form of breakage, burning, cutmarks, etc) will be compared and contrasted with data from the analysis of the bones collected from abandoned Maasai sites. This is expected to throw light on the differential modification and preservation effects of natural and non-human agencies on the faunal remains. In a way this will also act as a test on the ethnographically observed cultural patterns.

In summary, this study is an attempt to form a basis for differentiating through the analysis of faunal remains various types of sites extant in the modern Maasai pastoralist settlement system. It examines how different site functions and socio-economic behaviours influence the patterning of faunal remains. It also looks at the cultural traditions of the Maasai relating to butchery techniques and other related social behaviours (e.g. meat sharing) that affect bone modification and patterning in the framework of the different site types and their function. Bone disposal patterns are investigated with a view to documenting any perceptible variability between the different site types and its underlying causes.
The ultimate aim of this work is to discover and document generalized patterns of faunal remains distribution on modern pastoralist sites which are expected to have archaeological correlates. The last step in this study will be an attempt to frame these generalizations as ultimately testable hypotheses or models, one of which I will attempt to test against actual archaeological data from the East African Pastoral Neolithic. Thus I hope to demonstrate the potential of such models in the interpretation of a specific Pastoral Neolithic occurrence.

Area of Research

The ethnoarchaeological fieldwork on which this study is based was conducted during the months of December 1984 and January 1985 in Lemek Location of Narok District in Kenya (Map 1:1).

The ecological context is characterized by open grassland to wooded savannah at elevations between 1800 metres and 2300 metres above sea level. This area is within the distribution context of what have been called Pastoral Neolithic Industries of East Africa (Bower, et al, 1977).

Recent archaeological work in the central Rift Valley and adjacent highlands of Kenya has resulted in the identification of three supposedly discrete Pastoral Neolithic (PN) Industries (Ambrose, 1980, 1982,
1:1 Lemek: Immediate Research Area

KEY

- AB — Abandoned Boma * Lemek East Boma
- SCC — Abandoned seasonal cattle camp * Kimani seasonal cattle camp
- OP — Ol Pul * Lemek North Ol Pul
- CD* — Cattle Dip
- BS — Butchery site * Thicket
- S Spring * Forest
- \( \equiv \) Contour (V1.40M) * Dots refer to contemporary settlements
1984; Bower, et al, 1977; Nelson, 1980). One has been
called the Elementeitan (Leakey, 1931) Pastoral Neolithic
associated lithic and ceramic technology. The second,
lacking well defined regionally covarying lithic and
 ceramic traditions, has been provisionally called the
"Savannah Pastoral Neolithic Industry" after its ecological
context and adaptation (Ambrose, 1982, 1984). The third
has been called Eburran Phase 5A and 5B (Ambrose op. cit.).

Ambrose has speculated that the Elementeitan
adaptation was similar to modern Maasai and Okiek (who
possess domestic stock) adaptations, and the Savannah PN
as being similar to modern Maasai, Samburu and Rarabaig
(1982, 1984). These correlations are made on the basis
of comparable environmental, climatic and economic
contexts. While the status of the Elementeitan as a
distinct industrial tradition is generally accepted,
Ambrose's Savannah PN is thought (notably by Robertshaw
and Collett, 1983b) to include at least two distinct ceramic
traditions. Thus it does not represent a valid
archaeological grouping. However, since I do not intend
to use this industry for comparison with my
ethnoarchaeological data, this problem of the development
and current status of PN terminologies is beyond the
scope of this thesis.
The main reasons why I chose Lemek for my fieldwork is that currently Dr. Robertshaw of the British Institute is carrying out research in the Lemek Valley. Logistically, this was of great help to me. Secondly the site of Ngamuriak is proving to be one of the most important excavated Elmenteitan sites and offers a suite of data that can be used to test the ethnographic models envisaged in this work. Faunal analysis by Fiona Marshall as regards species composition, age profiles and butchery patterns is almost complete. However, the faunal analysis forms part of an ongoing Ph.D. project by Fiona Marshall and as such it will not be used for the projected comparisons. Instead, Prolonged Drift whose report was published by Gifford, et al, (1980) will be used.

Methodology

Ethnoarchaeological research methods are used in this study. Ethnoarchaeology is a field study that collects original ethnographic information among living societies for use in archaeological interpretation. The fieldwork was designed to investigate the relationships of faunal remains and the human behaviours that result in their production, modification and patterning.

Three basic methods were used. Nearly all the information contained in this thesis was acquired through interview and personal observation. The collection of recent faunal material and mapping of the abandoned sites
Field methods of data collection vary depending on the research problem being investigated. The questionnaire method is the most commonly used for different research problems in the social sciences. Questionnaires are worked out in advance with the help of sociologists and others trained in interviewing techniques. It involves filling forms with yes or no answers. Dangers of incorrect answers are numerous and it requires thorough cross-checking within the questionnaire to counter them. However, in my fieldwork the questionnaire method was not used. Instead, I had a list of pertinent questions on the different aspects I was interested in. These were put to my informants on different occasions throughout my stay in the area. All answers to these independent questions were noted and repetitions were used to arrive at consistencies of informants' responses.

Other methods that have been used are directed and/or undirected discussions of the relevant aspects of the research problem. These are either recorded on a tape recorder or in a field notebook for later analysis. Experimentation with some aspects of behaviour has also been done (e.g. with butchery techniques by Yellen (1977) among the !Kung and Brain (1981) among the Hottentots).
In my research, behaviour relating to the production, modification and patterning of faunal remains was observed as it took place as occasions allowed. Butchery techniques were observed at the different types of sites and resulting bone modifications were recorded. One Boma with two houses was selected for daily observation of rubbish disposal practices. Four other Bomas, three kilometres away were used to cross-check the practices noted in the selected Boma for daily observation.

A cross-section of the people interviewed, including adult males and females and Morans. Each group was interviewed on its specialised activities on the different sites it occupied. Interviews were also carried out on the relationships of one group to the other so as to gather information to show whether it is meaningful to associate any single group with particular material patterning.

In the evenings, after all the livestock were secure in their pens and people were relaxed, both directed and undirected discussions on the topics I was interested in were carried out. My informants, numbering from three to ten, could argue a point during these discussions and in the end arrive at a consensus. This, I felt, was the only way I could be able to reconcile the glaring discrepancies between what was said in the interviews and what I observed, which quite often did not tally. A good example that I examine in more detail in
Chapter 5 is the question of the disposal of bones from the ceremonial cleansing of a habitual miscarriage victim. My informants told me all bones from this ceremony were supposed to be discarded in the middle of the cattle pen but my observations during this ceremony show that no bone discard was done anywhere within the inside Boma perimeter. A small child even went out and discarded a whole humerus outside the Boma. As I will argue in a later section this behaviour is all tied up to the sanctity - for lack of a better word - of the cow in the Maasai way of life. For example Roberts and Collett (1083) have argued that pastoral peoples are best identified by the strong cultural values placed on livestock. This is well illustrated by the Maasai among others.

At this point I will examine in more detail the problem of non-correspondence in what people say they do and what they actually do. This seems to be a major problem that faces ethnoarchaeologists working in a contemporary society. Fodder (1981) has suggested the reason for this non-correspondence is that in dealing with material culture, although we may know what to do, we cannot explain our actions verbally. Fodder has called this discrepancy "non-discursive knowledge" or in other words the hidden meaning of material things which can be used strategically, for example, in the social relations of a particular society. Therefore it requires of us that when we study the cultural and
social framework of material patterning, be it disposal of faunal remains or artifact patterning, we also, of necessity, examine meaningful behaviour which is not verbally expressed by our informants.

Often the problem of disparity between what is said and done is made worse by various attitudes of the informants. Simple and direct lying might arise due to expected financial gain. The researcher might be deemed of an inappropriate age or sex and there is always a fear of divulging any information to foreigners due to a history of maltreatment during colonial times. Also the researcher might not be respected due to the nature of his work (e.g. rubbish disposal) and will be deemed unworthy of any attention.

Problems of comprehension might also lead to misleading answers. The intrusion of the researcher can often result in novel behaviour which can bias his observations (e.g. new ways of sharing and distribution of food may be adopted especially if the researcher shares the food with the group being observed).

All the above problems were faced in differing degrees in my fieldwork. Thus I adopted a procedure whereby I rigorously interviewed my informants, often repeating the same questions in different forms throughout the duration of the research. This, I felt, could allow
me to arrive at some consistent information on the various activities observed and what I was told they were.

The problem of non-coincidence of the spoken and observed information, for whatever reason, has been approached in several ways by ethnoarchaeologists. Gould (1978b, 1980) has suggested a "materialist approach" whereby we need to observe behaviour in totality. Thus we concern ourselves not only with dominant patterns but also with idiosyncracies or minor patterns that otherwise might be thought to be unimportant (see chapter 2). Schiffer (1978:235) has suggested that ethnoarchaeologists should only observe actual behaviour and not study word of mouth reports.

Hodder (1982:43-6) has suggested that we should study and observe actual behaviour as well as examine rigorously what is said, thought and explained by our informants. This approach seems to me the more reasonable and I adopted it in my research. The degree of coincidence between the verbal and non-verbal information certainly varies between different cultures. Therefore we clearly need to be aware of the inherent dangers of our subjectivity. Bearing this in mind, it is possible to construct models that clearly link the material to the non-material world of ideas since both are necessary parts of any single cultural system. Thus these models should be based on
observed behaviour and its by-products as well as through unbiased examination of the ideational realm of the informants and their society.

An aspect of this study that needs to be pointed out was the investigations done on all abandoned sites except the Manyatto and Moram meat feasting sites. For the former the reason was that at present these types of sites are no longer in existence, while those abandoned are devoid of any surface cultural material save for the ring of stones round the outside perimeter (see Figure 5:6). For the latter their location deep in the forest and in rockshelters far away, made them logistically almost impossible to examine. For those abandoned sites that were examined all bones and other cultural features (i.e., houses and hearths) were mapped and the bones were all collected using a grid (see Figure 6:3). Only bones that could be seen on the surface were collected. These bones were treated as archaeological remains and examined for their modification through butchering and secondary processing. As mentioned elsewhere these will be contrasted and compared with the ethnographic information on the relevant subtopics of this research. The former occupants of these abandoned sites were traced and interviewed as to the structure and activities carried out at these sites.

Although taphonomic processes such as water action,
weathering and so forth, are important factors that modify and pattern faunal remains, they are outside the scope and aims of this thesis. However, it is important to bear in mind they will, to some extent, be responsible for some of the patterning and modification of bones from actual archaeological sites. Thus the archaeological data from Prolonged Drift should be used in testing the ethnographic hypotheses with the above in mind.

The methods I used can be summarized as follows: (a) interview (b) personal observation (c) directed and undirected discussions (d) surface collection of bones and (e) mapping of all cultural features on abandoned sites. This last one involves, at a later stage, analysis of the bones using archaeological methods of faunal analysis. These are dealt with in chapter 6.

Having set out the aims and the methodology of my study I offer an overview of "Ethnoarchaeology" as a subdiscipline of archaeology, its use and practice in the following chapter. This will help the whole study since its purpose is to document some aspects of modern human behaviour as regards bone modification and refuse disposal practices.

The chapter defines 'Ethnoarchaeology' and looks at how ethnoarchaeological information is used as an aid in archaeological interpretation. Thus, the following lays the groundwork for the projected task of adducing and
using some aspects of Maasai ethnographic information in aid of archaeological interpretation as discussed in subsequent chapters.

Chapter two also looks at site formation and structure and how refuse is organised. This offers a framework within which to interpret Maasai ethnographic data. Since documenting Maasai bone modification patterns is one of the primary aims of this study, the rest of the chapter concentrates on faunal remains studies with special reference to East Africa.
CHAPTER TWO
ETHNOARCHAEOLOGY: ITS PRACTICE AND USE.

2:1 Theoretical Basis

Ethnoarchaeology is still in the formative stages and as such lacks a generally accepted definition or a developed body of theory and methodology. The basic objective of ethnoarchaeological studies is to gather data on living societies and to use this data as an aid to the interpretation of the archaeological record. There are several sources of ethnoarchaeological data. The most important is when an archaeologist embarks on an actual field study of a group of living people. Secondly he can rely entirely on published and archival ethnographic data without doing any fieldwork. Thirdly he can carry out ethnographic experiments in which behaviour is manipulated in a field setting — e.g. Yellen's 1977 experiments on butchery techniques among the !Kung (Ingersoll et al., 1977).

Most definitions that have been offered restrict the term ethnoarchaeology to the actual field study. For example, Oswalt (1974:3) states that it is "—-the study, from an archaeological perspective, of material culture based on verbal information about artifacts obtained from persons, or their direct descendants, who were involved with the production". Stanislawski (1974:18) offers a more specific and comprehensive definition, that
ethnoarchaeology is: "---The direct observation field study of the form, manufacture, distribution, meaning, and use of artifacts and their institutional setting and social unit correlates among living non-industrial peoples for the purpose of constructing better explanatory models to aid archaeological analogy and inference".

This definition corresponds most accurately with what Gould (1968a, 1974b) has termed "living archaeology". Gould (1974b:29) defines living archaeology as: "---The actual effort made by an archaeologist or ethnographer to do fieldwork in living human societies, with special reference to the 'archaeological' patterning of the behaviour in those societies".

If we accept that ethnoarchaeology (in a general sense) refers to a much broader general framework for comparing ethnographic and archaeological patterning, then the above definitions form the basis of ethnoarchaeological research in the field. Thus generally ethnoarchaeology can be said to be the gathering of data from living or recent societies, and its use as an aid to the interpretation of archaeological data.

In order to appreciate the importance of ethnoarchaeology as an aid to archaeological interpretation, it is necessary to examine briefly the nature of the archaeological record. The archaeological record in
Figure 2:1 Factors involved in the production, modification and patterning of archaeological remains. (Adapted from Stiles, 1977).

6. Perceived Traces of Remains and Patterns

5. Processes of Exposing and Extracting the Remains (e.g. erosion, excavation, etc)

4. Differential Preservation of Remains

3. Burial and/or Destruction of Remains

2. Processes Disturbing Physical Remains (e.g. water, animals, etc)

1A. Physical Remains Patterning (as a result of 1 below)

1. Processes Generating Physical Remains (Human Behaviour - e.g. butchery, food processing, discard of debris etc)
made up of material remains and their spatial arrangements. It is a static phenomenon, existing in the present as the product both of past human behaviour and of various natural processes. Our interest as archaeologists is primarily in that behaviour rather than in the products of it per se, which in themselves tell us very little except as clues to past behaviour. This is illustrated in the flow diagram - Figure 2:1. Emphasis is placed (by archaeologists) on observing the processes which generate physical remains (step 1), through various transformations (steps 2, 3, 4 and 5), to what are the finally perceived remains and their patterning (step 6). The main interest of ethnoarchaeology is in un\textsuperscript{r}avel\textsuperscript{ing} the relationships between step 6 and 1-7A (excluding taphonomic processes).

On the one hand it is possible to describe, enumerate and analyse prehistoric physical remains as observed in the present (step 6). These could be, for example, pottery designs, faunal remains or stoneflaking debris, and intuitive or statistically significant patterns can be demonstrated through such empirical analysis. However, the past human behaviour that was responsible for the observed characteristics in step 6 can only be speculated upon.

To overcome the problem of unconfirmable speculation, we need an approach that goes further than simple empirical analysis of the products of past human behaviour. Binford
has convincingly argued that our understanding of the meaning of the archaeological record is "---Dependent upon a large body of knowledge which links human activities (i.e. dynamics) to the consequences of those activities that may be apparent in material things (i.e. statics)" (1983:19). What this means is that we need theoretical tools that can help us translate our contemporary observations of static material things, such as faunal remains, into statements about the past human behaviour that produced them. The fashioning of these 'theoretical tools' depends upon a type of research that can not be conducted in the archaeological record itself due to the 'static nature' of the latter. Thus the investigation of the relationships between static material things and the dynamics of human behaviour and relevant natural processes which this type of research entails, is only feasible through observation of these aspects simultaneously. This type of work, therefore, can be done successfully only by observing the relationships of human behaviour and material things within a group of people in the modern world. Ethnoarchaeology, by definition, is the only study that examines the human behaviour/material remains linkages directly and thus, used judiciously, it can avail us with important 'theoretical tools' that are necessary for meaningful interpretation of the archaeological record.
It is important to point out that ethnoarchaeology, in one sense, is a subfield of ethnoarchaeology and, while highly relevant to the interpretation of archaeological data, I will only deal with some of its aspects that are specifically relevant to the problem I have set myself in this work (i.e. faunal remains disposal, modification and patterning on both occupied and abandoned Maasai pastoralist sites).

## 2.2 Analogy in Archaeology

The primary data base of archaeological studies is the material remnants of past cultures within their spatial temporal and environmental contexts. However, a cursory examination of archaeological writings reveals the use of many additional data sources. These are used to develop problems and hypotheses and to interpret and explain the primary data base. The potential data sources relate to considerations of present human behaviour and (natural) processes that are thought to reveal the past to us. These data sources include all recorded observations of human behaviour in studies of human history. Within the total range of data available to archaeologists, ethnology and ethnohistory are the two most frequently used. What is of critical concern to us as archaeologists is our ability to transfer the abundant available information from its framework of origin to archaeology (Schiffer 1978:17-18). To do this archaeologists have relied on the concept of analogy.
The use of analogies and models derived from the ethnographic present plays a central role in nearly all archaeological interpretations. As Chang (1977:109) has stated "Archaeology as a whole is analogy, for to claim any knowledge other than the objects themselves is to assume knowledge of patterns in culture and history and to apply these patterns to the facts". Orme (1973:487) has stressed that "In reviewing the overall development of prehistory, it appears that the ethnographic model played an essential part in the emergence of the discipline, and there was no prehistory as we know it until ethnography was incorporated in the discipline". Thus the use of analogies in archaeological interpretation can be traced to the beginning of archaeological studies.

The traditional use of analogies, however, has been very simplistic. Archaeologists examined similarities between artifacts, structures, etc, compared their spatial patterning in the archaeological record and in contemporary living groups of people and concluded that observed formal similarities implied a similar socio-economic adaptation. For many years living hunter-gatherers, for example, were regarded as "fossilized" representatives of palaeolithic lifeways - e.g. the Australian Aborigines' way of life was thought to represent Neanderthal man's adaptation (Sollas, 1924). One specific area that clearly illustrates the nature of these simple analogies is the
interpretation of European stone artifacts as ancient tools. This was based on information about the peoples of the newly discovered lands beginning in the fifteenth and continuing through the eighteenth centuries. As an example, Jussieu (1723:6 quoted in Stiles, 1977), compared prehistoric stone tools found in France with similar forms which were still in use at that time in the New World to explain their use, thus making an explicitly interpretive analogy. This type of analogy was not based on historical and cultural connections, but only on similarities of the tools. No attempt was made to show any known direct connections of the source of the analogy and the archaeological culture in question. Thus the traditional use of analogies was both intuitive in application and general in formulation. This was in keeping with the classical evolutionary viewpoint of human development and adaptation where it was assumed that there was an existing culture representative of each stage of prehistory. Sollas' (1924) Ancient Hunters is a good example of this viewpoint being applied to archaeological material.

The interpretation of archaeological data by the use of simplistic analogies, as discussed above, can be very unreliable. These analogies presuppose that if material things and societies in the present and past are similar in some aspects, they are necessarily similar in others, which is clearly a false assumption. This problem is
compounded by the fact that using simplistic analogies, we can never find out about forms of society and culture that are longer in existence (Dalton, 1981). Thus we only succeed in imposing the present and our conception of it on the past.

Faced with this problem, archaeologists tried to differentiate between the direct historic analogy and the general analogy (e.g. Childe, 1956; Clark, 1953; quoted in Charlton 1981:140). Ascher (1961a), following this trend, differentiated between analogies where cultural historical continuity could be assumed (the direct historic analogy) and analogies where no living or documented relationships could be demonstrated (the general analogy or his "new analogy"). The latter involved revised and restricted evolutionary criteria as opposed to the evolutionary culture stage model of the nineteenth century. Ascher (1961a:319) argued that general analogies should only be sought "--In cultures which manipulate similar environments in similar ways". An example of this more complex ethnographic analogy is Grahame Clark's (1954) reconstruction of life at the Mesolithic site at Star Carr in Yorkshire, England (quoted in Hodder, 1982:12-14). Clark suggests that the evidence of skin-working argues for the presence of women at Star Carr. He further postulates the number of people living at the site and the form of the
sub-division of labour. This interpretation is arrived at through a general analogy with the Eskimo hunters of North America and Greenland, where women prepare the skins. The analogy is drawn on account of the broadly comparable environment, technology and economy of the Star Carr people and the Eskimos. Clark's analogy is not necessarily false, but, as presented, it is an unverifiable hypothesis and only one possible model of social organisation at Star Carr. The general similarities in some spheres in the two cases of the analogy are not sufficient to demonstrate correlations in others.

Unverifiable propositions like the above have led to charges that ethnographic analogies and models are unreliable, unscientific and that they limit our knowledge of the past. This has resulted in the rejection of analogical reasoning in archaeological interpretation by some researchers. For instance, Freeman asserts that "--The most serious failings in present models for interpreting archaeological evidence are directly related to the fact that they incorporate numerous analogies with modern groups" (1968:262). However, few archaeologists would be as extreme as Freeman today, although it is widely agreed that we should use data from the present in a different way. Thus the criticisms are only related to the misuse of ethnographic data.
Every archaeologist is aware that there is no way we can avoid using analogy in archaeological interpretation. The important thing, therefore, is to make our analogies more explicit and testable in order to increase their reliability. In current usage, analogies are regarded as sources of hypotheses which are then tested against independent archaeological data. Analogies are also used to construct analogue models which in turn furnish hypotheses and inferences about the archaeological record. Such models are generally viewed as theory construction tools, but in themselves are neither theory nor proof of archaeological data patterning (Binford, 1967; Stiles, 1977; Atherton, 1983).

Various archaeologists have suggested alternative approaches for the proper use of ethnographic data. The most important examples are Binford (1967, 1972); Gould (1978a, 1980); Yellen (1977) and Hodder (1982).

Binford (1967:1-12) has argued that we can not justifiably employ analogies from ethnographic observations for the "interpretation" of archaeological data unless they are accompanied by a rigorous scientific "testing" procedure. Analogies should be documented and used as a basis for postulates as to the relationship between archaeological forms and their behavioural context in the past. Such postulates or propositions form the foundation of a series of deductively drawn hypotheses which, upon testing, can
refute or tend to confirm the initial propositions. Thus analogies should serve to provoke new questions about order in the archaeological record and should serve to prompt more searching investigations rather than being seen as a means for offering "interpretations" which are used as data for synthesis.

Binford (op. cit.) has demonstrated the application of this "hypothetico-deductive approach" in his interpretation of smudge pits as facilities for hide-smoking. These are small pits or 'caches' of carbonized corn cobs found around the Carlyle Reservoir of south-central Illinois in the United States. Binford offered the proposition that the archaeologically known smudge pits were facilities used for hide-smoking on analogy with the documented ethnographic use of similar pits. This postulate is made on the basis of (a) the convincing correspondence between the formal similarities of smudge pits (in terms of size, contents and the treatment of these contents) known archaeologically, and those used in hide-smoking as known ethnographically; (b) the correspondence between the distribution of archaeological smudge pits in which corn cobs were used as fuel and those documented ethnographically where the same type of fuel was used; and (c) the relatively late archaeological documentation of the use of smudge pits, which makes historical continuity between the archaeological and ethnographic occurrences reasonable to assume.
From the above observations Binford offered pertinent secondary hypotheses to be tested through a "logico-deductive argument" in order to validate the initial postulate. He notes that (a) in all documented ethnographic cases, hide-smoking was women's work, therefore, we would expect stylistic variation in smudge pits to vary directly with other female related tasks such as ceramics; (b) in all ethnographic cases cited, when placed in their time perspective, hide-smoking was conducted in a spring and summer "base camps" after the major hunting season was concluded and before the winter hunts began. Therefore smudge pits should almost exclusively occur in "base camps" occupied during the period of minimum hunting activity; (c) in many cases the ethnographic literature indicated that hide-smoking and the related manufacture of clothing from smoked hides were activities performed more frequently by individuals with recognised skills in these tasks. Therefore the incidence of smudge pits would be expected to vary independently of the number of persons occupying the appropriate site for any given unit of time. Thus they would be expected to vary independently of such direct measures as cooking fires and sleeping facilities.

1. NB: This statement is itself an assumption that needs testing but discussion of this is beyond the scope of this work.
Thus using probabilistic criteria, viz "--The more numerous the similarities between analogs, the greater the probability that inferred properties are similar" (Binford op. cit.:2); a probabilistic conclusion in favour of hide-smoking as the most likely context of use for the archaeologically observed smudge pits is reached. The explanatory value of the initial proposition is increased by testing the above secondary hypotheses which are logically related to the theoretical considerations of the range of variability in form, structure and functioning of cultural systems.

The deductive approach espoused above is supposed to take archaeological interpretation further than the inductive approach. Thus it deals with the interactions of the underlying variables that result in the observed patterns of archaeological phenomena. In short it examines the causes of such patterns which empirical analysis in the inductive approach does not. However, as Yellen (1977) has stated, in a practical sense relatively few archaeological problems have been successfully and conclusively couched within this framework. As a rule it is easier to laud the methodological advantages of this approach than to devise models relevant in concrete archaeological situations. This is a result of the limited and fragmentary nature of the archaeological record and the difficulty of discerning laws applicable to material remains of human culture.
However, insofar as the "hypothetico-deductive approach" tries to test hypotheses formulated from analogies, it gives the necessary 'reliability factor' to conclusions. It serves to strengthen our analogies by evaluating competing alternative ones. In archaeology it is exceedingly hard to prove a relevant analogy. However, it is much easier to disprove such an analogy just by citing a single case where it is not true. Thus there is nothing like the absolute "test or proof".

Yellen (1977) has reiterated the basic problems that face any archaeologist trying to use ethnographic data in the interpretation of the archaeological record, namely
(a) The lifestyles of prehistoric peoples are not necessarily or even likely to be replicated by any recent surviving counterparts; (b) The majority of detailed ethnographic studies deal with human adaptations in deserts, arctic tundra and tropical rainforest environments. These marginal and inhospitable regions where hunting and gathering societies have survived into the twentieth century, require specialized techniques for survival. Thus the available ethnographic sample can not be used as a near approximation to the past. As an example, Yellen (1977:5) states that the evidence from rock paintings in Zimbabwe and South Africa depict some aspects of San (Bushmen) prehistoric culture no longer observed among living San. The rock paintings are located in well-watered, game-rich uplands; whereas the surviving San
populations that retain some aspects of their traditional hunting and gathering economy are found in arid and semi-arid lowlands. Thus any ethnographic information from such peoples should be used with care. (c) Cross-cultural analysis and many kinds of quantitative analysis is greatly restricted by the limited sample of surviving groups deemed to be representative of prehistoric lifestyles, in this case hunter-gatherers. This problem is compounded by the continued assimilation of the few remaining groups.

Yellen has argued that faced with the above seemingly insurmountable difficulties, archaeologists have no alternative but to use "the grab-bag kind of ethnographic analogy" (1977:5). He has demonstrated how such data, although difficult to translate into the past, can be used judiciously to enhance our understanding of past events and processes. He isolates four distinct approaches which he presents as (1) General models (2) Buckshot approach (3) Spéiler technique and (4) The 'Laboratory' technique.

Yellen's (1977:6-7) general models are concepts of broad applicability, which include general analogies, "law-like generalizations" discussed by Sabloff, et al, (1973) and deductive hypotheses discussed by Binford, (1967) and others. This approach involves an underlying faith in some aspects of the law of uniformitarianism
as applied to the functioning of cultural systems, especially their ecological adaptations. As an example, among others, Deetz (1968b) has noted, that northwestern coast Indians of North America exploiting rich and relatively stable maritime resources have more in common with agriculturalists than with tropical hunters and gatherers. Thus one can examine a group's resource base, rate it on the basis of richness, variety and predictability without examining whether the food resources are either gathered, hunted, herded or planted (Yellen 1977:7). A necessary assumption is that particular processes fall within a broader spectrum, portions of which are observable today. General models can be constructed from these observations and can be applied across the entire range of similar adaptations.

An example of a general model in Yellen's terms, is Lee's (1968) cross-cultural approach which suggests that a hunting and gathering lifestyle, both past and present, is less rigorous than has usually been believed. The !Kung, for instance, spend very little time in the procurement of vegetable foods which normally exceed the amount of meat consumed. Gould (1980) has shown the same pattern among the Ngatatjara aborigines of the Western Desert, Australia.

However, while Yellen (op. cit.) agrees that these general models need actual testing, at least to introduce a reliability factor, he argues against the restrictive nature of the scientific testing approach given the
incompleteness of the archaeological data and the difficulty of absolute "proof" of the propositions. Thus the unproven status of such models should be stated and recognized as such and treated accordingly (Yellen, 1977:6).

General models can also be constructed by examining the byproducts of human behaviour that form the archaeological record instead of the actual human activities. For example, through controlled studies of modern rates of bone destruction under differing physical conditions, we can construct general models of a slightly different nature which are directly relevant to our understanding of the past (Yellen, 1977:7).

The major importance of general models as interpretive tools lies in the fact that they attempt to elucidate the underlying regularities in human behaviour. They also try to examine the development of such regularities and processes through time.

Another way of using analogies is what Yellen (1977) calls the "buckshot approach". This is a form of very specific analogy and is usually of limited applicability and is very difficult to substantiate. However, it is one that has been applied most extensively by archaeologists. It is applied to specific problems relevant only to a particular site or technique.

To illustrate this type of analogy, Jarman, Vita-Finzi and Higgs (1972), for example, have estimated that a
person is likely to walk 10 km in a day's gathering trip, on analogy partly with Lee's (1968) !Kung data. While theirs is more of a general model, it should be noted that it is admittedly a subjective guess given weight by the !Kung data. The point to make is that the estimate from the !Kung is as good as any from another source but its limitations must be realized. The issue is when some "buckshot" aspects are given as a general model. Also Yellen (1977:8) gives the example of the correspondence of animal mandible treatment among the !Kung and at some Mousterian sites to remove the marrow, an activity not observed on mandibles from small animals whose marrow content is not worth the effort. A similar pattern of mandible splitting is observed for the Mousterian sites. Thus it is almost unavoidable to interpret the latter on analogy to the former.

The important point is that these probabilistic statements of correspondence between past and present phenomena should be stated as such. They should not be presented as proven facts or couched in the language of general models. The problems of such analogies have been discussed by Chang (1967a, b) and Ascher (1961). They can only be evaluated by a combination of common sense and thorough examination of all the possible alternative explanations. Whenever possible they should be presented as hypotheses that render themselves subject to ultimate testing (Yellen, 1977).
Yellen (op. cit.) presents two additional ways of correct usage of ethnographic data. Both avoid major methodological difficulties and permit the use of data from a single ethnographic source.

The first is the "spoiler approach" which is negative in outlook and acts as a check on archaeological speculation based on unsound or uncertain premises. This approach can best be illustrated with an example: Dart's study of faunal remains from Makapansgat Cave (1957a, b; quoted in Yellen 1977:9) noted that there were obvious discrepancies and irregularities in the proportions of long bones represented in his sample (e.g. 336 distal ends of Antelope humeri were recovered, while only 33 proximal ends of the same bone were found; a ratio of approximately 10:1). Based on these data, Dart postulated that the Australopithecines used bone tools. This explained why bones that made good tools were found in large numbers whereas those less frequently represented were either thrown away from the cave or used as tools elsewhere. Dart made the assumption that only a single factor (i.e. suitability of certain bones as tools) was responsible for observed pattern of long bone representation.

Brain (1967, 1969, 1981) and Yellen (1977) have examined Dart's conclusions in the light of ethnographic data. Brain's controlled study of goat bones collected from the Namib Desert Khoi (Hottentots) camps has shown
that they quite closely duplicated the Makapansgat long bone representation patterns. However, the Khoi never use bone tools, hence Dart's postulate is shown to be unreliable and alternative explanations must be sought. Brain suggested differential preservation of different parts of the bones was responsible for the disproportions observed by Dart.

Another illustration of the application of the spoiler approach has been used by Yellen, (op. cit.) to show that the patterns of shape and treatment of bones do not necessarily imply tool use as was argued by Kitching (1963) and Sadek-Kcoros (1972). To do this Yellen demonstrated that the systematic breaking of animal bones to reach the marrow by the !Kung, resulted in specific shapes in all marrow bearing bones. However, such shaped bones were never used as tools by the !Kung.

Thus through counter-argument within the framework of the initial analogy, one can use ethnographic data to evaluate specific conclusions or studies. Another use of the same data is in the evaluation of the abundant deductive statements and models in the archaeological literature. These "law-like propositions" are presented as underlying principles sometimes explicitly stated and often unconsciously accepted, and applied across all hunting and gathering and other societies as well. Pertinent here is Wilmsen's explicit proposition that a "---band most
effectively exploits stable food resources by dividing into smaller groups each of which is centred among a set of resource locations which it alone exploits. A single location centered in the bands region and from which members co-operatively hunt mobile animals is most effective for this type of resource" (1972; quoted in Yellen 1977:10). Such a statement can be evaluated primarily to determine its usefulness against relevant ethnographic data. Thus the "spoiler approach" serves an essential role especially given the emphasis in recent years on the use of explicit deductive models in archaeological interpretation.

The final method of the use of ethnographic data has been called the "laboratory approach" by Yellen. The ethnographic present offers the archaeologist with a set of controlled or laboratory conditions wherein he can fashion and evaluate analytic techniques. Direct observation of living society permits one to correlate activities, and even patterns of thought and social organisation, with "static" material byproducts of these activities that may be preserved in the archaeological record. This offers a degree of control that is impossible to attain in actual archaeological situations. Thus it is possible to abstract particular techniques that can be applied to real archaeological data.

Gould (1978a) suggested that archaeologists should
In an earlier paper in 1974 Gould suggested two kinds of analogies that can usefully employ ethnographic data. One kind, referred to as "discontinuous analogy", is comparable to Yellen's (1977) general model and what Ascher (1961) called "new analogy", in the way it furnishes models of cultural adaptations in widely separated areas, both in time and/or space. These areas should possess similar ecological and environmental characteristics. A good example of the application of the discontinuous model is the interpretation of a series of sites in the Oenpelli area of Arnhem Land in Australia by White and Peterson (1969; quoted in Gould 1980:34). These sites occur in contrasting habitats - coastal plain and interior plateau - which offer differing resources at different seasons of the year. The archaeological remains reflected different economic activities in the various sites. The seasonal economic model was used, drawn from the ethnographic study of the Wik Munkan Aborigines of Cape York Peninsula of northeastern Australia by Thompson (1939; quoted in Gould 1980:34). They followed a seasonal transhumance, exploiting completely different resources and using a
different technology in each situation. Although Cape York and Arnhem Land are far apart, the occurrence of a dry and wet season is quite similar. Thus environmental similarities were sufficiently close to allow the use of a discontinuous analogy based on Wik Munkan ethnography.

The other kind of analogy was the "continuous". This is quite similar to the direct historic approach well known among archaeologists. In this type of model the prehistoric adaptation under investigation was shown to be linked in a continuous sequence to the present ethnohistoric adaptation in the same general area. The example given was the interpretation of the data from Puntutjarpa Rockshelter in the Western Desert of Australia on analogy to the adaptations of the modern Ngatatjara people of the same region.

Continuous models are thought by many archaeologists as having a greater probability of being accurate approximations of past behavioural realities. However, as Gould (1980:35) has pointed out, general discontinuous and continuous models are all analogies derived from contemporary ethnographic behaviour, as such they still retain all the built-in limitations of these analogies. To overcome these limitations Gould (1978a), suggested what he called the "contrastive approach" which moves beyond analogy. He argued that the analogies could be used as a basis for comparisons with the prehistoric
patterning in the manner of "predicting the past" as proposed by Thomas (1974). What this means is that each model could furnish predictions that could be tested against actual archaeological data. This procedure, however, differs from Binford's (1967) hypothetico-deductive approach in the sense that it stresses that the differences or contrasts arising from the comparisons are more rewarding than the similarities. This is based on the fact that similarities only confirm what we already know from present-day observations whereas contrasts force us to recognize how the past may have been different from present-day analogies.

According to Gould (1980:36), the contrastive approach may overcome some of the uniformitarianist assumptions that have riddled attempts at ethnoarchaeological interpretations in the past. However, this approach like all other ethnoarchaeological approaches can not offer explanations, especially of prehistoric behaviours that do not have any contemporary ethnographic counterparts.

From the foregoing, the idea of ethnographic analogy seems to be shrouded with unreliability and looks like it is no more than the "cautionary tales" so common in ethnoarchaeological literature. According to Gould the use of ethnographic analogy seems to have been "--pushed as far as it will go, with due regard for the empirical accuracy of each ethnographic and archaeological case and its ecological context" (1980:36).
Gould (1980) has dismissed argument by analogy and the unproportional concern by archaeologists to discover laws or law-like generalisations to explain past human behaviour. As an alternative he adopts what he calls the "materialist approach" which has as its foundation two related principles both in the framework of "living archaeology" (1980:138).

The first is the principle of totality of human behaviour. Ethnoarchaeologists or in Gould's term "living archaeologists", are concerned with observing and explaining ALL human behaviour in relation to its material byproducts. This means that they are not only concerned with observing and explaining "---statistically dominant patterns (or behaviour in the aggregate) observable in human residues but also with idiosyncratic or statistically minor patterns that otherwise might be regarded as unimportant exceptions to the more dominant patterning" (1980:138). However, archaeologists have often used the dominant patterns to arrive at law-like generalisations that explain past human behaviour patterning, and have excluded or ignored deviations from the dominant patterns. This type of application of ethnographic data is based on the principle of uniformitarianism without considering the fact that, while some processes of adaptation (e.g. ecological) are subject to this principle, others may not be (e.g. symbolism of material residues).
Gould (1980) has argued that in order to explain human behaviour in totality, we need to establish a basis for uniformitarianist generalisations that cannot be altered or amended by ideational and/or symbolic manipulations by the people under study. He points out ecology as one area that has yielded general principles of a uniformitarianist nature that can be used to explain important aspects of human behaviour. By examining general relations of ecological variables (e.g., resources and tools that exploit them) and particular human adaptive responses in specific societies, we can establish a kind of baseline against which the effects of ideational and symbolic behaviour can be measured. Gould, for example, has used this generalizing approach to show how and to what extent stone technology among the Australian Aborigines can serve as a basis of interpreting similar archaeological adaptations.

The second principle is the "argument by anomaly" which is substituted for argument by analogy. Gould has argued that by examining behaviour in totality, we do discover anomalies that cannot be fitted within the expected regularities or patterns. Argument by anomaly, in Gould's sense, looks for these deviations or anomalies and uses them to discover new relationships that may have no counterpart in any known historic or contemporary society. Although this approach seems similar to the contrastive approach, already discussed, the major
difference is that argument by anomaly goes further to explain the anomalies through interpretive discovery of underlying causes for the anomaly. Gould illustrates the argument by noting the discoveries of Neptune and Pluto. The point is that the general orbital paths of the planets can be explained by physical laws of mass and movement but this is not a most important concern for astronomers. The deviations from the general orbital paths is an area that leads to more research to explain the observed anomalies and thus leads to new discoveries and this is similar to Gould's argument by anomaly (Gould, 1980:138-140).

Gould (1980:36-9) has argued that "living archaeologists" should not always try to discover laws of human behaviour. They should concern themselves with using relationships that have achieved the status of law in other fields as frameworks for making discoveries about human behaviour. These discoveries and similar law-like generalisations derived from living archaeology are not laws unto themselves. Of greatest importance is the testing of propositions drawn from these law-like generalisations against actual archaeological data. This type of testing enables us to discover those things that are most worth knowing about past human behaviour. Herein lies the significance of anomalies. In our attempts to explain them, we either strengthen or refute the law-like generalisations. Consequently we are able to place our
interpretations of the archaeological record on the basis of ethnographic knowledge on a much more convincing footing.

Another method for correct usage of ethnographic data has been suggested by Schiffer (1978). This is the development of "cross-cultural laws" for the explanation of human behaviour. These can be applied across different, wide ranging cultures and environments and are similar to Yellen's (1977) general models and Gould's (1974) discontinuous analogy. Instead of simply investigating and documenting similarities between the source and subject of an analogy, this method requires us to look for and examine ranges of instances in which various characteristics (e.g. resource availability and particular technologies) are associated in wide ranging economies, cultures and environments. This permits us to formulate "cross-cultural laws" that can aid our interpretation of past human behaviour. As an example, Schiffer has described the 'law' taken from Yellen's (1977) detailed ethnographic studies that "the diversity of maintenance activities performed at a settlement varies directly with the length of occupation" (1978:233). Schiffer (p:244) has demonstrated that this observation has been made independently in a wide range of situations. Thus the credibility of the analogy is increased by demonstrating the great range of societies and cultures where the suggested relationships of the variable hold true.
However, this concept of cross-cultural laws has been criticized, especially by Gould (1980). This is because it is presumptuous to call a statement like Schiffer's a "law" when it has not achieved that status as we know it from the natural physical sciences. It is a law-like generalisation which needs intensive testing to make it a law. Nonetheless such statements offer us a framework within which to formulate hypotheses which are testable against our data. In that way we give our conclusions the all important reliability factor.

A cursory look at the abundant ethnoarchaeological literature of "cautionary tales", shows that however much we strengthen our analogies, they will always be shrouded in unreliability. This becomes worse especially if we persist in emphasizing the formal comparisons of the present and past situations. This is a result of the fact that any ethnographic analogy we use is only one among many that can fit the same archaeological data. For example, Ucko (1969) has illustrated in his interpretation of burial remains how different aspects of burial (cremation, presence of rich graves and the body lying in a particular direction) mean different things in different societies. This is a result of the uniqueness of each ethnographic and archaeological context. As a result of this fact many archaeologists and anthropologists have argued that analogies are unreliable and unscientific and that they limit our knowledge of the past.
Hodder (1982), while agreeing that these criticisms are only relevant to the misuse of analogical reasoning, is generally critical of the ethnoarchaeological methods that have been employed by many archaeologists. He has discussed and differentiated between "formal and relational analogies" (1982:16-26) as methods of archaeological inference. The former suggests that if two objects or situations have some common properties, they probably have other similarities. Analogies based on this premise are weak because they are a form of direct inductive inference where the observed associations of characteristics may be fortuitous or accidental. Hodder points out that much archaeological interpretation has been biased towards these types of analogies.

Hodder (op. cit.) has advocated that archaeologists should adopt relational analogies in order to stem these criticisms and make their interpretations more meaningful and convincing. Relational analogies examine the interdependent natural or cultural links between the various aspects of the analogy. For instance, a people's technology will determine the mode of exploitation of resources and likewise, the available resources will have a bearing on the technology used for their exploitation. The cultural traditions will also have an effect on the choice of appropriate technology and what resources are
exploited. Thus a meaningful investigation of all these variables can only be done in the framework of a clearly defined and explained overall cultural context.

Hodder (op. cit.) has differentiated between the functional and ideational or symbolic context, although there does not seem to be a clearcut dividing line between the two. The former refers to the actual utility of material things and various aspects of the environment, and the latter refers to the meanings, ideas and other personal strategies applied to material things. Each cultural context, although unique, is built up from general principles of meaning and symbolism, and functional attributes of material things. A good example, to clarify this, can be drawn from Gould's (1980: 141-159) study of exotic stone tools among the Aborigines of Western Desert of Australia. These "exotic" stones occur at Puntutjarpa Rockshelter continuously for at least the last 10,000 years. They also occur among the modern Ngatadjara living in the same area. These exotic rocks were imported long distances and interestingly they are of inferior quality when made into implements for working hardwood. Better quality stone with superior edge-holding qualities was available much closer to the site but as noted there is a persistence of the exotic stones through the archaeological sequence at Puntutjarpa. Thus a functional and utilitarian explanation of these stones
is not convincing. Ethnographically similar stones have a widespread distribution and have sacred associations. Gould (1980:158) has suggested that the presence of these stones depend more on the ideational and symbolic aspects of human behaviour. This demonstrates the Aborigine behaviour of creating widely distributed social networks, through the medium of these stones, as a risk-minimizing strategy in an area where resources are unreliable and unpredicatable.

In order to generalize about symbolism of material things, we need to examine its links with other variables and the conditions under which a particular symbolism can be used. In Gould's example noted above there is an examination of the qualities of the exotic stones in relation to their utilitarian aspects (i.e. edge-holding and/or efficiency) which shows a utilitarian argument can not explain their presence. Consequently Gould has examined the links of the exotic stones with resource availability, reliability and predictability in the Western Desert of Australia. This has been done within the framework of an ecological risk-minimizing desert adaptation of the Aborigines.

However, as Hodder (1982) laments archaeologists have more often concentrated on the functional and utilitarian aspects of the variables being studied to an almost complete exclusion of the ideational and symbolic
ones. To use one example, Schiffer (1976) has suggested that there are cross-cultural relationships between the size of a site and the intensity of occupation. While there are many instances when this proposition holds true, an examination from my fieldwork of the Maasai Manyatta and the Boma seems to contrast it. The ceremonial Manyatta is generally occupied for a short period of time to allow the passing out of Morans into elderhood but normally occupies a larger area than the Boma since Morans from several sections are involved. The Boma is occupied more intensively and for longer periods. The utility of the Manyatta is more symbolic, whose size can only be explained in terms of its function within the overall ceremonial organization of the Maasai.

Hodder (1982) has argued that relational analogies are primarily concerned with causal relationships rather than simple associations of one variable to the other. In our assessment of cause and relevance of the different variables in our analogies (e.g., discard behaviour and site type in the Maasai case or technology and resource availability and exploitation), there is always a danger of our cultural and personal preconceptions influencing our conclusions about the observed material patterning. Thus the notion of a relevant context takes on real importance. We need to explain and understand the different variables in the framework of their total context - i.e. both functional and ideological. Thus we
need to know a lot about the various interdependent links between material culture and its functional and symbolic context. In that way it becomes possible for us to interpret past human behaviour and unique arrangements of cultural material beyond our present-day experiences.

Hodder (1982:22) has argued that "— the whole process of inference is one of building up an edifice of hypotheses, adding one to another and moving beyond the data in order to explain them". This use of ethnographic analogy does not establish it as a criterion of truth. As Hodder has gone on to point out, "we can not prove or disprove partly because our predictions and expectations (the test) may themselves be incorrectly construed, but also because there are no independent data, and a great deal of subjectivity is involved" (p. 22). However, in all the approaches offered for proper use of ethnographic data by Binford (1967, 1978), Yellen (1977), Gould (1978, 1980) and Hodder (1982), ethnographic analogy is put forward as a means of exploration, extrapolation and discovery beyond the points observed as data or facts. This has been done through the continued use of both general and direct historic analogy, the generation and testing of hypotheses, laws and models as well as the empirical evaluation of these general principles.

In concluding this section, I wish to reiterate what many ethnoarchaeologists have stated either implicitly
or explicitly: that the role of analogical reasoning in archaeological interpretation is an important one. We need to develop analogy as interpretive discovery where we establish and clarify its limits, productiveness and its logical structure. This permits us to demonstrate the relevance, generality and goodness of fit of the analogies we apply in archaeological interpretation.

2:3 Site Formation, Structure and Spatial Patterning of Debris.

23a Introduction

During the last few years there has been a surge of interest in the relationships between ethnographic observations of living societies and the materials studied by archaeologists. On the one hand, there have been books such as Ethnoarchaeology edited by Donnan and Clewlow (1974), and Explorations in Ethnoarchaeology edited by Gould (1978), in which a variety of approaches have been advanced by a number of scholars. It is possible to infer a degree of unanimity in their theoretical basis regarding the field of ethnoarchaeology. Their very diversity of geographical and topical subjects make the current status of ethnoarchaeology very clear indeed.

On the other hand, there have been some ethnoarchaeological studies that describe and analyse particular contemporary societies at a level of detail never before attained. The most important of these are
Archaeological Approaches to the Present by Yellen (1977) and Binford's (1978) Nunamiut Ethnoarchaeology. The former deals with the !Kung San of the Kalahari Desert, and the latter with the Nunamiut Eskimos of Alaska. Each is a detailed case study emphasizing particular aspects of hunter-gatherer ethnography in relation to its archaeological material correlates. Yellen's work examines !Kung residential patterns in relation to various activities and the consequent material remains, while Binford's study examines the Nunamiut hunting and butchering of game and relates the findings to the larger body of literature on faunal remains analyses in archaeology.

Although the works by Binford, Yellen and Gould have dealt specifically with hunter-gatherer ethnography, in terms of its archaeological material correlates, they have a lot to offer investigations of pastoralist ethnography and its archaeological imprint regarding site formation and refuse disposal patterns. I will attempt briefly to show how this is possible below.

Binford (1983) has noted that archaeological sites, which form the basic units of archaeological reconstructions, are discrete, isolated points in the landscape, which represent past human behaviour that may have been very mobile—especially for hunter-gatherers. We may assume that mobility also held true to some degree for pastoralists (see Hodder, 1982:104-6).
Each site, therefore, would represent a range of activities depending upon its unique position within a regional system of behaviour. Thus the archaeological records represented by these sites portray particular aspects of the socio-economic adaptations of the people under study, in a regional scale. This has been illustrated very well by Binford's (1978) ethnoarchaeological research among the Nunamiut Eskimos; where he noted that the Eskimos conceive of all their sites as parts of a larger adaptive subsistence system. For example, the residential locations and the enormous variety of special purpose areas (e.g. lovers' camps, hunting blinds, butchery sites etc) are merely parts of an overall socio-economic strategy of making a living in the inhospitable Arctic environment. All the individual parts fit together to form site complexes with all activities geared to a similar goal. These site complexes can be grouped together within the territory exploited by one group of people. Finally several such territories, that will be utilized sequentially during a single person's lifespan, can be grouped into a kind of tribal territory.

Yellen (1977) has shown how residential patterns (how !Kung camps are arranged) and the nature and spatial ordering of social units within the camp and within the overall territory, is an environmental adaptation for subsistence purposes.
Figure 2:2 is an oversimplified representation of the salient features of hunter-gatherer land use patterns and the resultant material patterning based on Binford's and Yellen's researches noted above. However, without the benefit of relevant ethnographic information on a people's economic and social adaptation, and due to the high mobility of such a people, a palimpsest of spatial distribution of sites and material patterning would result from an archaeological perspective. The variable functions of the different sites and features (e.g. houses, hearths, tool clusters etc) might lead an archaeologist to attribute the different sites to different social groups. As Thompson (1939) has stated "--It will be apparent that an onlooker, seeing these people at different seasons of the year, would find them engaged in occupations so diverse, and weapons and utensils differing so much in character, that if he were unaware of the seasonal influence on food supply, and consequently upon occupation, he would be led to conclude that they were different groups" (quoted in Cable, 1984:198).

To overcome this problem of interpretation, both Binford (1978) and Yellen (1977) recognize the need to establish a kind of uniformitarianist baseline to explain the spatial dispersion of different sites and material patterns in their respective studies. Without belabouring the issue further, both the Arctic and the Kalahari Desert are extremely inhospitable environments and as such
Fig. 2: An Oversimplified Representation of the Nunaniut Eskimos and I-Kung San Land Use Patterns and Resultant Material Remains Patterning. (Adapted from Binford 1983 and Yellen 1977).

1. SETTLEMENT LOCATIONS:
Site Structure: - made up of components such as houses, artifact distributions, activity areas and other features. (see Binford 1983)

2. SPECIAL PURPOSE LOCATIONS:
Site Function: - Such as temporary hunting camps made up of tent rings, hunting stands, facilities (i.e. deadfall traps, soldier rocks), processing sites, etc.

1 and 2 form groups of regional site complexes which are parts of an overall pattern of territorial subsistence. (see Binford 1983)

1. RESIDENTIAL SITES:
Site Structure: - huts of individual families groups in a circle (see Yellen, 1977:125-31)
Empty space in the middle of huts circle is used communally by all in the group.

2. SPECIAL PURPOSE LOCATIONS:
Site Function: - special purpose tasks are conducted in scattered areas on the periphery of the ring of huts (see Yellen 1977:126 Fig. 12).

1 and 2 form the basic units of I-Kung Band Model and I-Kung Individual Model, both of which form parts of an overall pattern of territorial subsistence (Yellen, 1977:36-46).

The functions of 1 and 2 in both cases will result in settlement and material patterning.
ecological parameters are used to interpret the observed patterns. As Gould (1980) stressed, ecological parameters render themselves easily as uniformitarian principles, and once we have established them, we are in a better position to evaluate the effects of symbolic and ideational behaviour on adaptive strategies and consequently material patterning. To illustrate the above point we can take the example of the "Righteous rocks and the Western Desert Aborigines" in Gould (1980:141-158). Through "argument by anomaly" Gould has shown how the "righteous rocks" are symbolically used to reinforce the Ngatatjara adaptive strategy in a precarious environment in terms of resource availability.

From the above discussion we can discern some relevant aspects that can be applied to pastoralist land use patterns and the resultant material patterning from an archaeological perspective. The settlement pattern of hunter-gatherers may be seen as organized on a series of levels. The first is the territory occupied by a large group of people (tribe). In a pastoralist settlement pattern a single tribal territory (e.g. in the Maasai
of "facilities" (see Section 2.3b) such as houses, hearths and debris on individual single sites (Fig. 2:3).

Fig. 2:3. Diagrammatic representation of Maasai land use patterns and resultant material remains patterning.

1. MAIN MAASAI SETTLEMENT LOCATION

Boma - made up of roughly circular outer perimeter fence, houses and internal hearths, and house related refuse dumps.

2. SPECIAL PURPOSE SITES

Butchery sites, meat-feasting sites (Il Pulii), ceremonial Manyattas, Seasonal cattle camps, and areas outside but associated with a Boma - (e.g. W. and M in Fig. 5:2a)

3. 1 and 2 form a site complex within any single Maasai 'locality'.

4. Site complexes in all different Maasai localities constitute the Maasai 'tribal territory' and reflect different aspects of adaptation of the Maasai settlement system.

5. Human behaviours associated with 1 and 2 result in material patterning.
It should be pointed out that the three level hierarchy of 'tribal territory', locality and site complex, and the site structure of facilities is somewhat similar to the hierarchical division proposed by Vita-Finzi and Higgs (1970) where they use annual, seasonal and site territories. The use of this framework in the Maasai case study has several implications bearing the major objectives of this work in mind.

First, within this framework we expect to find in a tribal territory a series of site complexes equivalent to the 'localities'. These will be made up of the different site types identified in chapter 5:2 as making up the Maasai settlement system. Second, it is possible to abstract and ask questions pertinent to the kind of material patterning within single sites composing the site complex and how this might be detected. Third, the occurrence of the various sites within the site complex is determined by social, economic and ecological factors. For example, the Manyatta is tied to the Maasai social/political organisation, butchery sites and Il-Puli are tied mainly to the economic status of families, and seasonal cattle camps are determined by pasture and water availability in any one place. Accordingly the structure and function of the different site types will ultimately result in more or less distinct patterning of material things and facilities. For as Higgs and Vita-Finzi have
noted, "Where a mobile group occupies over the year a number of sites within its annual territory, it is not to be expected that different functions will be carried out in similar proportions at different sites, and indeed such differences may be expected to reflect in the proportions of the different artifacts present" (1972:30).

Thus, inter- and intra-site material patterns permit the placement of individual sites within the overall settlement system. This has important implications for interpretation of pastoralist archaeological sites. Archaeologically, the great majority of the Maasai site types will have been lost through time although a single group may have occupied several sites at any one time. Thus, in order to make meaningful interpretations of whatever remains of the sites we need to place them within the overall settlement system. This can be indicated by differences in distribution, location and the intra-site material patterning in the different types of sites.

This brief introduction to land use patterns and the consequent material remains patterning sets the stage to look more specifically at individual sites, their formation and structure. Both are directly responsible for the material patterning on sites in terms of their associated behavioural processes. This is examined in the following sections.
Site Formation:

From the outset, it should be emphasized that ethnographic material observations comprise a single class within a broader realm of observable phenomena of site formation processes that also include observations of natural processes in the environment (e.g., weathering, deposition, etc.). These are where both cause and effect can be directly determined and should be considered theoretically in the same light as replicative studies of stone tool production and function (e.g., Keeley 1980).

On similar lines, studies using controlled ethnographic experiments to examine deposition, dispersal, modification and differential preservation of faunal remains, though different in formulation and execution, are most relevant and fruitful to the investigation of the aims of this thesis.

Studies by Gifford (1977, 1980) and Gifford and Behrensmeyer (1977) have shown the influence of the human factor in the creation of sites as well as the natural processes that affect cultural materials. They include both ethnographic observations and controlled experiments to examine deposition, dispersal and differential preservation of faunal remains. These studies are based on individual sites of specific groups; in this case the Dassanetch of East Lake Turkana, who practise a mixed economy dominated by pastoralism. Similarly Yellen's (1977b) study among the 'Kung and Brain's (1981) work among the Khoi of the
Namib Desert are activity oriented. The former concerns itself with !Kung butchery techniques with an underlying aim of explicating and explaining cultural patterning of faunal remains. The latter examines Khoi treatment of bones on much the same lines, with an underlying objective of documenting differential preservation and perceived patterning of faunal remains as an aid to the interpretation of bone assemblages in the South African early hominid sites.

These studies are very important, bearing the aims of my work in mind; but before I examine in more detail what they have to say about the production, dispersal and modification and patterning of faunal remains, I wish to look at the concept of the site oriented investigation. As mentioned elsewhere sites are the basic units of archaeological reconstruction of past human behaviour. Thus we might begin with some definitions of sites.

Sites are made up of patterned arrangements of facilities around which all activities are performed in any living cultural system; and if we extrapolate backwards in time, the same held true for prehistoric cultural systems. Wagner, and I concur with him, has defined facilities as follows:--

"---containers like baskets, and pottery, vessels, boxes, buildings, --- bases like roads and platforms ---and barriers like fences, dams, walls ---."
Facilities represent a rearrangement of features of the environment, or the addition of features to the environment —- they control or prevent the movement of solid, liquid or gaseous material and animate beings" (1960:91).

From an archaeological perspective one can see facilities as features (i.e. houses, hearths, scatters of artifacts, faunal debris, etc). Through the medium of human and non-human manipulation, we can expect a rearrangement, modification and patterning of facilities. Thus as Binford has postulated: "Fundamental clues to the character of activities, the labour organization employed in their execution, and the anticipated use of a location in terms of the overall subsistence-settlement system, are coded in the organization of the site structure" (1983:145-6). We therefore need to know the factors that may explain how people establish, plan and use a site, and how they maintain it. This involves an examination of the activities and behaviours that affect the distribution and patterning of materials in terms of the site structure and associated facilities.

To illustrate, we can take examples from Gifford's (1977) work among the Dassanetch. Using Binford's (197?) concept of "curation behaviour", she has concluded that these people are a high curation society. Artifacts like gourds, pottery and metal vessels, beads, and metal implements which must be acquired through trade, and the
relative isolation of the Dassannetch from other groups, have meant that these items are highly prized and are carried away with every migration from a given locale. The point here is that if discarded after their usefulness is over, these items would be poor archaeological indicators of, for example, their relationships with resource type exploitation. Another example is the Dassannetch maintenance of settlement sites. The long term settlements are cleaned daily and rubbish tossed over the nearest inner fence while dung inside the cattle kraal is swept into heaps and burnt everyday.

Another example can be taken from my work among the pastoral Maasai. In a typical Maasai Boma, the characteristic site framework is composed of several houses on the inside perimeter of an outer enclosing fence of thorn branches, each with a gate to the outside of the enclosure (see Fig. 5:1 and plate 1). Within the Boma there are cattle tether posts, small stock pens and a household refuse dump on the nearest fence to the house door. Outside the enclosure, 3 to 5 metres from the enclosure door, is the small stock dung dump. On a small clear area near the exit door, women carry out the initial food processing (e.g. chopping meat into smaller pieces for boiling) with a children's playground around this same area. Some distance from the Boma (about 10-15 metres) there is usually a shade tree, often with a hearth and a
stake windbreak. On the periphery of the Roma are found the butchery sites, always with an open hearth. Some of these are not facilities per se, but are activity areas where particular functions relevant to the life of the social unit are carried out (see chapter 5).

Given the outline above, archaeologically not all the facilities would be visible, but we might see archaeological clues to their functions in the form of the spatial arrangements of items, tools, dung heaps and other debris, which had been incidentally produced at the area or placed there intentionally. A descriptive and analytical procedure which defines the site framework in terms of the features (facilities) and which is followed by an examination of the relationships between the skeletal framework (outlined above) and the dispersion of items, seems the most appropriate approach for site structure arrangement (Binford, 1983).

This simple procedure of site structure interpretation, however, is not easily applicable without a great deal of unfounded subjectivity in the world of archaeological reality. This is due to the eternal problem of differential preservation hence lack of archaeological visibility of ALL facilities in a site.

Leroi-Gourhan and Bre'zillon (1972:361-4 quoted in Binford 1983) have advanced a model of site structure which attempts to infer a former house from the patterning in the
dispersion of items on a site. However, they assume the presence of a house in the first place before choosing the cluster of items, thus as Binford (op. cit.) says, making their inference highly suspect. To take an example from my work with the Maasai, a hearth may be clearly recognized but considering the ephemeral nature of Maasai houses, and in the absence of postmolds, it would be difficult to infer the presence and position of a former house - particularly since not all Maasai hearths are inside houses. One important observation emanating from my research is that if a way can be found of documenting consistent recognizable properties of the small stock dung heaps always located outside the enclosure, 3 to 5 metres from the door; and the rubbish dump of assorted items on the inner fence nearest the house, it may be possible to predict where to look for the former house. This idea will be pursued further in more detail in chapter 7:1.

From a spatial viewpoint it seems that areas within sites can be very complex; some might be multi-purpose locations and others, places of individual activities or specific tasks all combining to make up a single site (see chapter 7:2). Thus from an archaeological perspective we can never assume an exact correspondence between the location of items and a single activity. In the Maasai case, for example, an individual might begin making a rungu (club) in the Ol Pul and in the evening carry the unfinished rungu to the Boma where he may continue working.
on it inside the house as he awaits the evening meal. Next morning the same person may carry the rungu and finish it under the shade tree outside, near the hearth. Thus the resultant manufacturing debris will be located in three distinct and different areas in terms of their function; but the debris are all parts of the single activity of manufacturing a rungu. However, before I am labelled defeatist, let me reiterate what Binford has said: that this challenge of interpreting site structure and the associated debris is no different from the general challenge of archaeology. That is, how do we give accurate meaning to the static and contemporary patterns we observe, which may have been created many millennia ago.

Recently archaeologists have begun to search for appropriate methods by studying patterns of site formation and structure in the present to meet the above archaeological challenge.

One very interesting and potentially most productive approach has been advanced by Binford (1983). He has posed an important question that needs concerted examination; whether the physical size and structure of the human body - elements that are common for the inhabitants of all the sites at least as far back as our ancestors had basically the same type of body as ours - can serve as an 'interpretive key' of site structure. This requires the adoption of
pattern recognition studies that focus on the spatial facilities which influence the position of person and layout of the activities and associations of items. The relationship between the human body and the consequent spatial patterns would act as "archaeological signatures" to use Gould's term, of material patterning of different sites. To illustrate the above with examples, Binford (1983) has used his own Nunamiut data and data from the Alyawara Aborigines of Australia, and Yellen's (1977) !Kung data to demonstrate the distinct patterning of debris in different activity areas and the structure of the sites within the framework of the position of the human body and the facility. These are: (a) working around a hearth (b) working around hearths inside and outside of houses (c) sleeping areas (d) what he calls breakfast in bed, and (e) extensive activity areas. These basic elements result in distinctive patterns and can be combined into general spatial models relating to particular activities (e.g. seated worker arrangements, group seating arrangements, sleeping areas, extensive standing-up work places, etc). Such spatial models together comprise a complete site and by investigating how they fit together in the structure of a site as parts of a unified entity, we can begin to give meaning to at least some of the spatial patterns we observe in the archaeological record (for details see Binford 1983 pp. 149-172).
One point that archaeologists are aware of is the constraints on space use that limit spatial organization of site structure. Binford (1973, 1983) has shown how heat and light act as constraints to the use of space within a site, especially inside a house. Among the Nunamiut Eskimos, the position of heat within the house was symmetrical while light was distributed asymmetrically relative to the house design. Thus, those activities that require both light and heat (e.g., some crafts and food preparation) were localized in the lighted section of the house, thus within an area of intensive use. Other activities requiring only heat and minimal light (e.g., eating and sleeping) were concentrated on areas poorly illuminated by outside light. In this case, however, the importance of heat as a variable is related to the cold Eskimo environment. The point to make here is that the house is an intensive activity area. As Binford has suggested, this general spatial organization should be viewed against the role differentiation between the sexes and age. For instance, men's activities like tool manufacture required relatively large amounts of space and sometimes a long time to complete. Thus specific use areas, often outside, would be set up to avoid disrupting the daily cycle of domestic activities within the house.

Limitations on space use have also been illustrated by Yellen's (1977) observations that the !Kung move around
during the day, but depending on the shifting distribution of shade, carry out essentially the same activities in a variety of different places. For example, the same activities that are carried out around the nuclear family hearth (like head roasting and manufacturing of tools) are also carried out for briefer periods of time in shady spots outside the hut circle.

The above points can also be illustrated by my Maasai data. A Maasai house is an intensive activity area. Thus tasks like mending and manufacture of tools are carried out under the shade tree outside the enclosure. The houses are poorly lit and have a high capacity for heat retention hence a more open area is required to store large quantities of meat which would otherwise go bad if stored in the house. This fact together with the Maasai custom which forbids young men to be seen by women eating any fatty foods, has led to the tradition of locating an Ol Pul some distance away from the Boma and in the open (see chapter 5 for details).

The above examples suggest that the more particular tasks require specific settings for their performance, the more intense will be the concentration of activities in places which meet those requirements. Whatever the environmental conditions, individual tasks differ in their demand for extensive use of space (e.g. domestic tasks like cooking, tool manufacture, etc). For instance, a
variety of tasks which can be done by a single seated
person might all be conducted in the same place so long
as they do not overlap in time. On the other hand,
activities that require vastly different amounts of
space for their performance tend to be independently
distributed. In chapter five I look in more detail at how
these points apply in some of the Maasai sites.

2:3c Rubbish Disposal.

Material patterning on sites is determined by the
different activities that are conducted around the site
facilities discussed in the previous section. One of the
most important of these activities is rubbish disposal
practices, which result in many of the material debris
patterns that we observe archaeologically. These could
be in the form of middens, or clusters of artifacts,
food debris, etc. that make up a large part of the
observed structure of many archaeological sites.
Schiffer (1972) has stressed that the most important
factors that condition this structure, as far as human
behaviour is concerned, are site maintenance activities.
He has defined two useful categories of refuse: debris
that is produced, discarded and remains at its location
of use is "primary refuse"; refuse discarded away from
its location of use is "secondary refuse".

According to Binford (1983) site maintenance involves
two kinds of strategies: (1) preventive maintenance, and
(2) *post hoc* maintenance. The former refers to the cleaning up of debris away from intensively used areas (e.g. tossing of bones away from sitting areas in a Maasai *Ol Pul* - chapter 5). The latter refers to the actual cleaning up of areas and the transport of the debris collected to special dumping areas (e.g. the nucleated rubbish dump on the nearest inner fence of a house inside the Boma, and the dump of small stock dung and other items next to the Boma exit, 3 to 5 metres from the outside perimeter fence in the Maasai case (see chapter 5 Figure 5:7).

Using Schiffer's terms, the nucleated bone scatter around the hearth in a Maasai butchery site and *Ol Pul*, for example, would be primary refuse. This is because in the case of activities occurring outside a structure, preventive maintenance takes the form of throwing away the waste on the edges of the area of immediate action but within the immediate spatial context of the activity (cf Binford's 1978, 1983 "toss zone"). According to Schiffer (op. cit.) both the distinct dumps created through preventive maintenance of a Maasai house, for example, would be correctly classified as secondary refuse (i.e. redeposited waste). However, this rubbish type may contain the same things, as far as faunal remains are concerned, as the toss zones around a hearth which Schiffer would certainly recognize as primary refuse. This discrepancy highlights the problem of differentiation of primary and secondary
refuse; a problem I examine below. The important point to note is the difference in scale of the area being intensively maintained between the two situations. In the nucleated bone scatter around a hearth, the restricted sitting area relative to the peripheral toss zone - Figure 5:10 - is the one being maintained, while in the secondary refuse dumps it is the entire interior of the house including the areas for sleeping and other important domestic activities.

As Gifford (1977, 1980) has said, it is relatively easy to differentiate primary from secondary refuse in the ethnographic present, but when we are dealing with an actual archaeological situation it becomes extremely difficult and complex. We should ask ourselves whether prehistoric societies followed our "common sense" rules of rubbish disposal in our interpretation of archaeological rubbish disposal patterns. In open sites, for instance, do the small nucleated scatters of bone and other debitage represent primary or secondary refuse? Both types of rubbish disposal reflect past human behaviour, but the former directly reflects the actual activities that affected the items associated with secondary refuse disposal. Examples of secondary refuse (e.g. shell middens) have been recognized for a long time now. However, in relatively recent activity oriented studies, it has been assumed that nearly all clusters of artifacts and debris on occupation floors are primary refuse (e.g. Binford,
1964, Hill, 1968, Longacre, 1970 quoted in Gifford 1980). This might be true for some cases but more recent ethnarchaeological observations in widely differing contexts have shown that secondary refuse is extremely common on human sites (e.g. Binford, 1978; Yellen 1977 and Gifford, 1977, 1980).

As Gifford surmises, in the light of the above discussion, can we "defensively speak of activity areas, or must we be content with only generalities about activities inferred to have occurred somewhere in the general area?" (1980:101). She suggests we should, therefore, investigate ethnarchaeologically whether these two types of refuse have any properties that can differentiate them in real archaeological situations.

One spatial aspect of faunal debris patterning that can provide a reliable index of refuse type is the proximity of bones to hearths. Gifford (op. cit.) has illustrated this among the contemporary Dassannetch sites. Here short-term hearths are surrounded by primary refuse from food consumption. This spatial relationship depends on the habitual use of an open fire for food preparation. The hearth also acts as a 'magnet' for bone disposal. Due to these factors bones in these sites display evidence of scorching and burning. Similar evidence is presented in chapter five for the bone patterns in Maasai Il Puli and butchery sites. Thus the important point is that properties of scorching and burning of bones and their spatial
relationships with the hearths, are potentially useful variables which might be able to help resolve our problem of differentiating the two refuse types. However, this hypothesis needs intensive testing to evolve consistent criteria that can be applied in other archaeological interpretations. In my work, in order to be able to test fully the hypothesis, the rubbish dumps representing primary and secondary refuse needed to be excavated. This exercise, however, was not carried out during my fieldwork due to limitations of time and logistics.

Various scholars have suggested other hypotheses concerning features that may distinguish secondary refuse. Schiffer (1976) has postulated that clusters of debris containing byproducts of two spatially isolated stages of the same activity are secondary refuse. This suggestion is on the basis of what he calls "behavioural chain analysis" of the historical Pueblo Indian corn processing activities, whose different steps are carried out in separate areas of the pueblo. This approach can be tested in other ethnographic situations. However, it remains to be seen whether similar behavioural chains can be reconstructed in other areas without the benefit of direct historic analogies.

Gifford (1980) has shown that Schiffer's hypothesis may hold true among the modern Dassannethch. Skin, bones and ash, for example, are often observed together in Dassannethch home camp refuse heaps. Animals are slaughtered
and skinned away from the immediate vicinity of the houses, close to the stock pens. The meat is either cooked by boiling or roasting inside the family dwelling from which the bones and excess ash are removed and dumped in the rubbish heaps. Thus the presence of skin, ash and bones on the same heap is a case of bringing together of debris from at least two locales through rubbish disposal practices. An exactly similar case applies in my Maasai data presented in chapter five.

Schiffer (1978), on the basis of observations of contemporary American discard behaviour, has postulated that the size of an item is a major determinant of whether it becomes primary or secondary refuse. The same has been hypothesized by Gifford when she argued: "If small size turns out to be a consistent feature of both primary refuse and elements migrating into an unconsolidated substrate, regardless of whether the elements are stone, bone or any other artifactual material, a consistent method of defining primary refuse areas will have been found" (1980:102). This hypothesis is supported by Gifford's (1977) research which showed that smaller bones were buried through human trampling. This was clearly illustrated by the original figure of two hundred bone elements that were mapped in 1973 as compared with 1,954 bone elements recovered after excavation in 1974 of the original site. She concluded that the additional bones were a result of both trampling and breakage especially of the fragile
catfish crania (Gifford and Behrensmeyer 1977; Gifford 1980). Yellen (1977) and Brain (1981) noted similar trampling phenomena on !Kung and Khoi settlements respectively.

A direct relationship between the duration of time that a site is occupied and the proportion of primary to secondary refuse has been recognized by various scholars, for example Schiffer (1972); Yellen (1977); and Binford (1978, 1983).

On the basis of research in the American Southwest, Schiffer has proposed that "---with increasing site population (or perhaps site size) and increasing intensity of occupation, there will be a decreasing correspondence between the use and discard locations for all elements used in activities and discarded at a site" (1972:162). This "intensity of occupation" involves the interplay of the rate at which debris is produced and the time over which it is produced. Thus as Gifford has argued "---Given constant debris producing activities and constant rates of such activities, time is the major determinant of proportions of primary and secondary refuse on a site" (1980:98).

Gifford (1977, 1980) has shown that among the Dassannetch of East Lake Turkana, refuse patterns alter according to duration of site occupation. For example, refuse in short-term single occupation camps is nearly always primary refuse, having been dropped and left at its
point of generation - either at locations of initial butchering or in and around the hearth. Long term home settlements display a high proportion of secondary refuse since Dassannetch women sweep their houses every day and throw the rubbish into a heap over the fences of the innermost stock pens. These patterns are also borne out by Maasai rubbish disposal patterns (see chapter five).

Binford (1978, 1983) has noted that there exists a direct correlation between the degree of maintenance and the intensity of use (or occupation) of a site. Areas that are used intensively (e.g. houses) are thoroughly maintained and will therefore be associated with specialized disposal areas. The degree of this relationship is also a direct function of the length of time that such intensive use and consequently maintenance lasts. Thus we can expect a strong set of relationships between the two (i.e. intensity of occupation and effort expended in maintenance). Moreover, the longer the occupation, the more diverse the activities that are likely to be conducted at the site (see Schiffer 1978:233). Therefore there should be a strong correlation between duration of occupation and the numbers of special purpose activity areas and/or the quantity of carefully maintained, large scale areas on the periphery of the major activity area. This is borne out by Yellen's (1977) observations among the !Kung and Binford's (1978) work among the Nunamiut Eskimo residential sites. The Maasai data also supports this contention as will be seen in chapter five.
The interrelationships between faunal remains and human activity form an important area in the study and explanation of cultural process in prehistory. Once natural processes of bone accumulation (e.g., running water, scavenging by animals and so on) have been excluded, we can conclude that all bones found in sealed contexts were deposited there by man, most often as food waste. Thus, due to the fact that human behaviour has affected such bones, we can assume that they have passed through a kind of cultural filter. In addition through human behaviour these bones may acquire distinct features such as burning through cooking and cutmarks through butchering and processing the meat for sharing and consumption. Thus we can further assume that such bones have acquired a form of cultural imprint. Therefore, by examining properties of this cultural imprint, it is possible to infer some aspects of the cultural process. This means that by examining the spatial distribution of different bone parts and the form of their treatment, and the proportions of different anatomical parts for different species of animals, it is possible to discuss questions relating to, for example, hunting and butchery techniques, trade (e.g., Chaplin, 1969, 1971), sharing and more general cultural patterning.

For instance, a number of workers (Frisor, 1971;
Kehoe, 1967; Kehoe and Kehoe, 1960; Wheat 1967, 1972) have been able to reconstruct in some detail the final stages of the bison drive and the following butchering procedure in the series of excellently preserved and excavated bison kill sites in the Western United States. Perkins and Daly (1968; Daly, 1969) feel they can reconstruct both hunting patterns and the subsequent butchering processes through the analysis of the relative frequency of forelimb bones from a number of species of animals at Überde, a Neolithic site in Turkey. Using a similar technique, Chaplin (1971), in his study of sheep remains from Roman sites in England, has noted a significantly low number of pelvae and femora and has suggested the meat from these choice parts may have been traded or shared away.

Guilday, Parmalee and Tanner (1962) have adopted a different approach and have studied cutmarks on bone and from them inferred butchering techniques. The most sophisticated studies in terms of conceptualization if not methodology, are those of White (1952, 1953, 1954, 1955). Working with faunal remains from a number of sites located in the Western United States, White tried to interpret observed distributions of faunal remains in terms of hunting and butchering techniques, taking such factors as the size of a species into consideration. He also took a larger view and considered assemblages in the light of overall patterns. He used observed patterns in such assemblages to determine site similarities, just as one might use stone tools or
pottery for the same purpose; and tested his conclusions against these more standard measures.

Gifford et al. (1980), using faunal remains from Prolonged Drift, a Pastoral Neolithic site in Kenya, have attempted to model the prehistoric subsistence patterns of the site's creators in the light of relevant ecologic and ethnographic information. Using neonate and juvenile dentitions of wild species with restricted birth seasons, and the overall structure of the wild species represented in the Prolonged Drift assemblage, Gifford has tentatively suggested the seasonality and predation patterns of the site's inhabitants. Gifford (on. cit.) also noted a predominance of the domestic cow as the single most common species in terms of the Minimum Number of Individuals in an assemblage where domesticates (i.e. cattle, sheep and goats) constitute only a fraction of the total assemblage. In addition well-worn dentitions were more frequent among Bos than among wild herbivores reflecting the pattern of retaining animals past their prime, a typical practice in traditional bovine husbandry in East Africa. However, there was a large proportion of teeth of large sub-adults and non-aged adults. This reflected the entry into the assemblage of animals of an age class that one might not expect to be willingly culled by true pastoralists - breeding age adults.

In as much as the above reflects a unique butchery pattern in the light of ethnographic information, Gifford
(op. cit.) has also hypothesized the possibility that the pattern results from trade or theft of mature stock from neighbouring peoples. A similar proportion of Bos and dentitions is also reported for Crescent Island by Onyango-Abúje (1977a:328, 1977b). However, this unique butchery pattern and the possible explanations for the observed proportions can only be established through careful analysis of fauna from more Pastoral Neolithic sites and in the light of greater and more detailed ethnographic information.

It is hoped that the present work may provide a contribution to the corpus of ethnographic data necessary to improve our understanding of such problems. As Gifford has emphasized, the faunal remains analysed for Prolonged Drift apparently represent the remains of a subsistence system no longer extant in East Africa (1980, 1984). Gifford further warns that "--This might be expected of a diachronic sequence representing the evolution of subsistence system in a region; however, it presents real problems to those who try to interpret the data through improper use of modern ethnographic analogies" (1984:249). To overcome these problems Gifford has suggested that studies of cultural and economic successions using stratified sites "--should be replaced by more behaviourally and taphonomically defensible analyses of deposits". In that way the ensuing data, which should not be used as a basis of models of economic transformation, can serve "--as data by which models derived from other sources can be tested" (1984:250).
Bower (1980) has suggested the way for future research on a similar line. Thus it is felt that the ethnographic models based on modern Maasai behaviour in relation to faunal remains contained in this work, throw light on some of the problems of interpretation of archaeological bone assemblages in the Pastoral Neolithic of East Africa.

Archaeological faunal material, by its nature, comes in bits and pieces which can (with varying amounts of difficulty) be fitted into predetermined categories of species and then anatomical portion. Generally three stages can be recognized in all such faunal studies. The first is classification, then manipulation of the numerical results to determine the patterns or irregularities, and finally the attempt to explain the observed results most often in cultural terms. A good example is Dart’s (1957) study of faunal remains from Makapansgat Cave already noted (see chapter 2:2). Another example is Perkins and Daly (1963), where they use a similar approach to that used by Dart in their analysis of the remains from Cuberde. They note that for the ox (Bos primigenius), foot bones occur more frequently than the upper leg bones. They then argue that the upper leg bones were discarded away from the camp while the foot bones were left attached to the skin when the latter was carried home. Just as in Dart’s
conclusions, the assumption is that a single cause for most, if not all, observed variations can be isolated. Duly, who is aware of this problem, discusses other possible natural causes and states that "---In the archaeological context, however, we are not dealing with natural survival, but with the results of man's activity and the differences in survival pattern become of great importance" (1979:149).

However, it should be pointed out that there is very little about butchering practices and secondary processing in the ethnographic literature on East Africa which can serve as examples to buttress or attack assumptions of the type noted above. From a wider world perspective, however, there are notable examples to draw from - e.g. Binford (1978, 1981); Yellen (1977a & b) and Brain (1969, 1981). The respective studies of these scholars throw considerable doubt on the notion that the observed distributions and patterns of faunal remains can be explained in terms of a single cultural factor.

Bone modification and differential preservation is a result of the treatment it undergoes through human processing, animal predation and scavenging, and taphonomic processes - e.g. weathering, attrition in running water, etc. Binford's (1978) and Yellen's (1977) ethnoarchaeological research provide information on general butchery practices and descriptions of animal carcass processing - e.g. sharing, storing, marrow extraction, etc.
These studies were such that the life histories of bones and their accumulation of properties in relation to human behaviour were empirically illustrated.

Yellen's (1977a) work among the !Kung provided an important account of bone breakage by the !Kung but lacked detailed descriptive information regarding the morphology of the derivative bone fragments. There does not seem to be any attention given to discriminating fragments produced during different processing phases of !Kung bone use.

Binford's (1978) work among the Nunamiat Eskimos provided some descriptions of marrow bone breakage but suffered, just as Yellen's work, from a lack of information on the morphological properties of bone fragments resulting from the different phases of bone use among the Nunamiat.

The point I am attempting to make above is that the morphological properties of broken bone are important clues to specific behaviours—both human and animal. This important aspect of faunal studies has been dealt with in great detail by Binford (1981): Bones: Ancient Men and Modern Myths. The reader is referred to this important work, especially chapters three, four and five. It examines in great detail the morphological properties of bone fragments resulting from both human and animal use of bones and offers criteria for differentiating and attributing various bone modification patterns to the two agents.

Needless to say both human and animal behaviour, in terms
of their treatment of bones, are the most important factor in bone modification and to some extent in its differential preservation. It should, however, be emphasized that other factors intervene to affect the survival of different skeletal elements. Brain (1981), for example, has suggested that differential preservation of goat bones in the sites of some Khoi groups of the Namib Desert is related to the variations in the structural features of individual bones and the relative times at which longbone epiphyses fuse.

This thesis concerns Maasai behaviour in relation to the modification, preservation and patterning of faunal remains. Thus the emphasis is on culturally determined modifications through the different stages of Maasai bone treatment. This involves an examination of primary butchery techniques and the secondary processing of bones. As Binford (1984) has argued, it is the final phases of processing, eating and subsequent discard that plays the biggest role in bone patterning. This fact is very well illustrated by the Maasai data (see chapter 5:3). However, it is important to bear in mind that other non-human factors impinge on the observed bone modification and preservation patterns.

Although this work is on modern Maasai Pastoralists, Yellen's (In Ingersoll, 1977) study of the butchery techniques of the !Kung San hunter-gatherers, is highly
relevant. He has shown how !Kung traditional rules of butchering, processing and sharing of meat result in regularities or cultural patterns of faunal remains. This is reflected in bone fragmentation during marrow extraction, cutmarks during primary and secondary processing and distribution of meat cuts among the individuals whom tradition decrees must have a share. Binford (1978) has also shown much the same general principles of carcass treatment and the resultant bone modification among the Nunamiut Eskimos.

In the Maasai case traditional butchery practices, secondary processing and the general treatment of bones results in cultural patterns in the different types of sites (see chapter five). One example will suffice here: the primary butchering results in very few cutmarks, all cutmarks observed on Maasai bones are inflicted when the meat is being carved from the bones in readiness for consumption - this is the case for meat that is roasted. However, meat that is boiled has to be chopped into convenient pieces depending on the size of the pot and will thus display more cutmarks and fragmentation. Boiling of meat is more common in the Boma and the meat feasting sites (Il Puli) while roasting is more common in the butchery sites. Therefore the intensity of occurrence of cutmarks, the degree of fragmentation and burning of bone will tend to vary according to the different site types. This, however is an hypothesis that needs further testing (see chapter six).
Gifford, et al. (1980), for instance, noted a set of distinctive patterns of burning, cutmarks and fracture of bones with regard to certain anatomical regions of the animals processed at Prolonged Drift. From these she inferred a number of points regarding the butchery and culinary practices of the site's creators drawing from her ethnographic experience from the pastoral Maasai and the Dassannetch. The bone damage attributes indicated that a considerable amount of cooking, marrow extraction and discard went on at the site. In addition the assemblage included a wide variety of debris such as an abundance of geometric microliths, various scraper forms, a ground stone axe, ground stone vessels, pottery and beads. Thus a wide range of subsistence and processing activities were implied both by artifacts and food refuse. Using this information Gifford was able to support the hypothesis that Prolonged Drift was a type of "residential base camp". Thus the point to draw from the above is that by examining butchery and culinary practices, and the consequent bone damage, it is possible to infer the type and function of a site. In addition ethnographic information on bone damage in different site types can be of great value in explaining its archaeological counterparts. This has been illustrated by Henry Bunn (1982) in the interpretation of the Plio-Pleistocene bone assemblages from Olduvai Gorge and Koobi Fora.

Bunn has suggested that "---research on modern bones subjected to known taphonomic factors make it possible to
develop diagnostic criteria for identifying events in the taphonomic histories of ancient bone assemblages". (1982: 208). By using bone fragmentation and surface modification such as cutmarks, chopping marks, rodent gnawing, etc, of relatively well controlled sets of data on modern bone-related processes (Leopard, hyena and rodent scavenging and gnawing, and the treatment of bones by Khwee San hunter-gatherers of Botswana), Bunn was able to adduce "circumstantial evidence for the transport by mechanisms other than water, of parts of animal carcasses, to the sites (Olduvai Gorge and Koobi Fora) where they were ultimately buried together with stone artifacts" (1982:204). Of more relevance to this thesis, however, is that Bunn (op. cit.) was able to attribute the occurrence of stone artifact induced cutmarks as unambiguous evidence for hominid involvement in the modification of the full range of skeletal parts in the FLK Zinjanthropus site at Olduvai Gorge. He also showed that bone fragmentation, especially limbs, at Koobi Fora strongly resembled the limb fragments from the hunter-gatherer camps. This led to the conclusion that fragmentation in the former was most likely due to hominid marrow processing activities. Bunn (op. cit), however, notes that other mechanisms of limb fragmentation ought to be considered. These include bone crushing by the weight of overlying sediments during fossilization, trampling before complete burial and carnivore damage prior to burial. These factors have also been noted by Gifford (1977, 1980),
and Behrensmeyer and Dechant-Boaz (1980).

In concluding this section we can point out that, although it is extremely difficult to attribute archaeological bone breakage to specific causal agents on the basis of fracture morphology only, studies of modern bone fracture induced by various agents seem to offer a solution. Bone fragmentation and surface modification patterns are critically important in understanding and recognizing the complex processes responsible for the formation of a bone assemblage. The interactions of these processes are best studied in modern ethnographic situations where all the causal agents of modification can be actually monitored. Having done this, it is possible to interpret archaeological bone assemblages in cultural terms.

In the following chapter I look at the geographical setting of the study. This involves a brief examination of the physiography, climate, soils, vegetation, fauna and overview of the palaeoenvironmental changes in East Africa in general. This description puts the Maasai of Lemek, who are the subjects of this thesis, into their wider environmental perspective. This is very relevant since as will be shown in a subsequent chapter environmental factors - i.e. climate, pasture and water play an important role in the Maasai settlement and subsistence system.
CHAPTER THREE

GEOGRAPHICAL SETTING

3.1 Physiography

The area of this study is centred on Lemek Location of Narok District and is part of what is often referred to as Maasailand, inhabited mostly by Maasai pastoralists. This review confines itself to Kenya Maasailand (Map 3:1) but it should be noted that Maasailand traverses the national boundaries of Kenya and Tanzania.

In Kenya, the Rift Valley divides Maasailand into two, with Kajiado District to the East and Narok District on the plateau to the West. There is considerable variety in the physical environment in these areas, but usually they are regarded as a unit because of the distinctive land use and cultural features associated with their inhabitants.

The plateau occupied by the Maasai west of the Nguruman escarpment in the Rift Valley is contained within Narok District. The plateau level consists of the sub-Miocene peneplain sloping gently to the southwest. Much of it has been covered with Tertiary lavas and ashes which form a particularly level surface. The Loita Plains lie at 1,500 to 1,800 metres (5,000 to 6,000 feet) but large residual hill masses rise above this surface, including the partially forested Loita Hills reaching altitudes of over 2,400 metres (8,000 feet).
Map 3.1 Maasailand (KENYA) Physiography.

Source: Sanford (1919)
On the far west of this area the peneplain has been upfaulted by 270 metres (900 feet) in the striking Sīrin escarpment. To the north volcanic cones rise into the great swell of the Mau escarpment, eventually reaching heights of over 3,000 metres (10,000 feet) in the Mau Ranges.

East of the Nguruman escarpment, overall altitudes are lower. The floor of the Rift Valley within Kajiado district declines in elevation from 1,500 metres (5,000 feet) in the north to 600 metres (2,000 feet) on the edge of Lake Natron. Block faulting has created numerous basins which have been infilled with alluvium (e.g. Olorgesailie) and may hold temporary lakes or swamps in the rainy season (e.g. Amboseli - see Map 3:1). The best example is the series of interconnecting basins that form Lake Magadi (Morgan 1973; Foley 1981).

3:2 Climate

Altitude, proximity to large water bodies and other orographic factors are the important determinants of the total amounts of rainfall that can be expected annually. For instance, Narok District, being higher in elevation and closer to Lake Victoria, receives higher amounts of rainfall per year than Kajiado District - e.g. Narok Town averages 733mm (28.9"), whilst Kajiado Town averages 508mm (20") per year (Morgan 1973).
Map 3.2 Probability of annual rainfall in South West Kenya showing the amount in inches likely to be exceeded in four years out of five. (Morgan 1967)

KEY

- Under 20 inches
- 20 - 30 inches
- 30 - 50 inches
- Over 50 inches
Most of Narok has been characterized as having a "dry season Savannah climate". In this type of climate the maxima of rainfall coalesce into a long rainy season of about seven months, from November to March or April. The average totals for this rainy season range from 500 to 1,000mm (20 to 40") - see Map 3:2. The other months of the year are characterized by a severe and often prolonged dry season (Morgan, 1973).

3:3 Soils

As Carr (1977) and others have stated, the soils of the East African rangelands defy any clearly defined classification into soil zones. They range from very light sands to extremely dense clays, and from rapidly draining soils to heavily impeded ones. Map 3:3 is an oversimplified classification of the soils found in the study area and adjacent regions, both in Kenya and Tanzania, that comprise Maasailand.

Juvenile or young soils are found in landscapes where both the landforms and parent materials date from the late Quaternary or more recent eras in the central and southern Rift Valley in Kenya and northern Tanzania (Morgan, 1973). These soils are thin with little development of horizons. They are in the process of formation from the alkaline lavas or ashes associated with the Rift volcanicity.

The soils of Narok have been characterized as "Poorly Drained Soils of dark greyish brown to very dark brown loams"
(Scott, 1973: Soil Map). Those of the immediate study area, centred on a five kilometre radius around Ngamuriak archaeological site, have been characterized as Red brown friable sandy clay loam with boulders, Brown sandy loam and Red brown friable sandy loam (Robertshaw and Collett, 1983:70-71). The first is a thin soil, the second is liable to waterlogging and the third is similar to the first. This complexity is a result of the soil/topography association noted by Milne (1935).

The dryland soils are found in areas with a pronounced dry season and are shallow in nature. They are typified by light red brown sandy loams (Scott, 1969). The soils of the Loita Plains and Hills are examples of this type.

The notorious "black cotton soils", cracking in the dry season, and heaving in the rainy season are found in the flat lying Rift Valley lavas in the Athi and Mara Plains. They occur in poorly drained depressions in nearly all areas of the study region.

In summary, soil types in Maasailand occur in great variety and are frequently intricately patterned. It is important to note that the sequences of soils are always associated with recurring landforms. Therefore Map 3:3 should not be taken as representing homogenous soil zones but as a generalized classification of soil types to be found within Maasailand.
Map 3: Soils of Maasailand (after De' Hoore in Morgan, 1973: 81)

NB These are greatly simplified soil zones of Maasailand and adjacent regions.

KEY

Zones
- Juvenile soils
- Ferruginous soils - dryland soils
- Vertisols
- Highland soils
- Ferralic soils - plateau catenas

Scale

NB The soils of the study area are represented by zones one to three.
Vegetation zone 1

Mainly forests and derived grasslands and bushlands with or without natural glades.

The economic potential for this zone is forestry and intensive agriculture. The natural grasslands, under intensive management for optimum livestock production, support one stock unit per 1-1 1/2 hectares, depending on grassland type.

The climate is equatorial - humid to dry sub-humid with a moisture index of not less than -10.

**Zone Key**

1. **Forest**
2. **Woodland/Savanna Mosaic (Moist)**
3. **Bushland/Grassland**
4. **Wooded grassland/Bushed grassland (less moist) with abundant acacia and commiphora.**

Scale 1:3,000,000
Zone 2

Land carrying a variable vegetation cover from moist woodland through bushland to savannah. The trees are characteristically broad leaved (e.g. *Combretum* spp.) and larger shrubs are mostly evergreen.

The potential is for livestock production. Areas under range use are still extensive and under close management stock carrying capacity is high; one stock unit per less than 2 hectares.

The climate is dry sub-humid to semi-arid with a moisture index of -10 to -30.

Zone 3

The natural vegetation is dry forms of woodland and savannah (often an *Acacia-Themeda* association) or derived semi-evergreen or deciduous bushland.

This is a marginal land for arable agriculture, but it is potentially the most productive rangeland. The stock carrying capacity is one stock unit per less than 4 hectares, mainly limited by the encroachment of woody species. The more open country has a high density of wildlife, valuable as a tourist asset.

The climate is semi-arid with a moisture index of -30 to -40.
Zone 4

This consists of woody vegetation dominated by Commiphora, Acacia and allied genera, mostly of shrubby habit. Perennial grasses such as Cenchrus ciliaris and Chloris roxburghiana can dominate but succumb readily to harsh management.

This land is only very locally suited to agriculture. One stock unit requires more than 4 hectares of land. Wildlife is most important in this land, particularly where dry thorn bushland predominates. Burning requires great caution, but it can be highly effective in bush control.

The climate is more or less similar to that of zone 3, but tends to be more arid with a moisture index of -40 to -50.

For detailed definitions of vegetation types and vegetational indicator species the reader is referred to National Atlas of Kenya, 1970.

3:5 Fauna

Broadly speaking, the different vegetation types noted support characteristic assemblages of wildlife. It is important to note that all the different animal species are adapted to their specific immediate environment or niches (e.g. riverine forest, swamp, rock outcrop, grassland or woodland) and this is more important to them than that vegetation type typical for the wider region.
Consequently we may only very broadly list the animals most characteristic of the vegetation types identified above in Fig. 3:1. It must be emphasized that this is to suggest the fauna which is particularly common in the named ecological zone and it does not imply an exclusive limitation of that fauna to that zone only.

**Figure 3:1 Game animals characteristic of the major vegetation zones in Masailand.** *(adapted from Morgan, 1973:71)*.

<table>
<thead>
<tr>
<th>Vegetation Type</th>
<th>Common Animals</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Montane Forest</strong></td>
<td>Elephant, Buffalo, Bongo, Bushbuck, Giant Forest Hog, Monkeys and Leopard.</td>
</tr>
<tr>
<td><strong>Woodland</strong></td>
<td>Sable Antelope, Roan Antelope, Greater Kudu, Lichtenstein’s Hartebeest.</td>
</tr>
<tr>
<td><strong>Wooded Grassland</strong></td>
<td>Elephant, White Rhinoceros, Buffalo, Giraffe, Topi, Impala, Kob and Lion</td>
</tr>
<tr>
<td><strong>Bushland</strong></td>
<td>Elephant, Black Rhinoceros, Giraffe, Lesser Kudu, Dikdik, Lion and Striped Hyena.</td>
</tr>
<tr>
<td><strong>Grassland</strong></td>
<td>Wildebeest, Hartebeest, Zebra, Topi (including more Thomson’s/Grant’s Gazelle, Lion, open wooded grassland) Cheetah and Hunting Dog.</td>
</tr>
<tr>
<td><strong>Semi-desert</strong></td>
<td>Reticulated Giraffe, Grevy’s Zebra, Ostrich, Gerenuk and Oryx.</td>
</tr>
<tr>
<td><strong>Swamps</strong></td>
<td>Hippopotamus, Sitatunga Antelope</td>
</tr>
</tbody>
</table>
Fig. 3: 2 Ecological separation among the principal game animals (after Lamprey 1963).

<table>
<thead>
<tr>
<th>Grassland</th>
<th>Open Woodland</th>
<th>Dense Woodland</th>
</tr>
</thead>
<tbody>
<tr>
<td>G/T. Gazelle</td>
<td>Wildebeest</td>
<td>Zebra</td>
</tr>
<tr>
<td>Hartebeest</td>
<td>Eland</td>
<td>Buffalo</td>
</tr>
<tr>
<td>Giraffe</td>
<td>Impala</td>
<td>Waterbuck</td>
</tr>
<tr>
<td>Warthog</td>
<td>Rhino</td>
<td>Dikdik</td>
</tr>
<tr>
<td>Elephant</td>
<td></td>
<td>Lesser Kudu</td>
</tr>
<tr>
<td>Cheetah</td>
<td>Hunting dog</td>
<td>Lion</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Leopard</td>
</tr>
</tbody>
</table>

G – Grants
T – Thompsons
The occurrence of a dry season, with the resultant dwindling of pasture, results in seasonal movement of both ungulates and their predators to better endowed areas in terms of pasture and water. This migratory pattern is greatly influenced by where rain happens to fall and seasonal rivers begin to flow, an occurrence that is instinctively known by the animals. Dietary preferences of different animals also are a factor determining what animals migrate and when and where their migrations take place. For details of wildlife migration in East Africa see Bell, 1971.

During the seasonal migrations there is always an ecological separation well favoured by different species. This ecological basis of environmental exploitation by wildlife has been well documented by Lamprey (1963) in the Tarangire Game Reserve in north Tanzania (Fig. 3:2).

3:6 Palaeoclimates and Palaeoecology of East Africa with special reference to Maasailand

In the last two decades evidence has been accumulated which shows substantial changes in the East African climate during the Holocene. This involved temperature and/or precipitation changes with consequent changes in the biosphere.

Changes such as these may play an important role in initiating, ending and determining the nature of population movements and economic adaptations. These movements can
assume the form of seasonal transhumance or a more permanent move to better endowed areas in terms of resource availability. In addition they can impinge on populations not directly affected by the climatic changes. Finally the presence or absence of climatically determined features in the landscape such as deserts, forests, grasslands, lakes, rivers and so on may hinder or facilitate the movement of groups.

Although this study is primarily concerned with material patterning on modern pastoralist sites, a review of the Holocene climate is important in that, especially during the late Holocene, it can be expected to have impinged upon pastoral adaptations. In addition one of the aims of this study is to derive ethnographic models which are of use in the interpretation of the Pastoral Neolithic generally. Although the Pastoral Neolithic falls within the late Holocene, a review of the late Pleistocene, early and middle Holocene climate is relevant in order to put the late Holocene climate into perspective. As MacEachern (1984) has argued, cultural systems of the early Holocene, directly affected by climate, offered some of driving forces during the Neolithic of East Africa.

The late Pleistocene environment in East Africa was characterized by a hyper-arid climate. Pollen spectra from upland and lacustrine areas show a lowering of vegetation zones relative to those of the present indicating
a drier and colder climate (Hamilton, 1982:192); with temperatures lower than the present - estimates range from 5 to 14 degrees centigrade (Messerli, Winiger and Rognon, 1980; Hamilton, 1982; Street and Grove, 1976).

These drastic changes show a reduction of precipitation entering the groundwater reservoir. The ultimate results of these events were probably a reduction of tropical rainforest and it is likely that desert and semi-desert conditions would have been more extensive than at present. The environments, therefore, would have been likely to be very open, possibly carrying high densities of wild ungulates, although their distribution would have been limited by the surface water and pasture availability (Foley, 1981).

The early Holocene climatic optimum was considerably warmer and wetter than the preceding period. For instance data from Lake Naivasha indicate that a 65-80 per cent moisture increase was needed to maintain it at the overflow level, with a 2-3°C temperature increase indicated by sections of the pollen spectra. Also a more seasonal regime of rainfall may be indicated but is as yet unconfirmed (Richardson and Richardson, 1972). The significance of a single rainfall maxima is important both for plants and herbivore carrying capacity.

Maximum rainfall was reached by about 10,000 b.p, and lakes and rivers reached their Holocene maxima between
9,000 and 8,000 b.p. At this time presently seasonal lakes and rivers would have been permanent (e.g. Chalbi, Yangi Yangi Swamp near Lokori, Amboseli - Phillipson 1977; Foley 1981). Thus the availability of water and the potential distribution of lacustrine and terrestrial biota in terms of resource availability and productivity, would have been greatly increased.

The middle and late Holocene climatic record, however, shows less overall unity. Approximately between 6,000 and 4,800 b.p. there was a brief drop in lake levels followed by a lesser transgression. For instance Lake Nakuru shows a regression at about 7,000-6,500 b.p. (Butzer et al, 1972) followed by a return to higher levels terminating in the fourth millennium b.p. Lakes Naivasha, Victoria, and less certainly Baringo, Bogoria and Magadi have, however, yielded data which show an early Holocene highstand lasting to 6,500 - 5,000 b.p.; followed by gradual and irregular decline to the lower levels associated with the later Holocene (Butzer et al, 1972; Kendall, 1969; Degens and Hecky, 1974; Owen et al, 1982). This is broadly supported by palynological data in Hamilton (1974) and van Zinderen Bakker, et al, (1971). The various East African pollen spectra show no pronounced mid - Holocene regression, but rather, a slow, gradual change from a warm wet regime during the early Holocene toward the present day conditions which are, to varying degrees, cooler and drier (MacEachern, 1984).
During the final phase of the Holocene, between 4000 b.p. and the present, the environmental changes are extremely complex and dating of the climatic changes is bedevilled by uncertainties. A temperature and rainfall optimum characterized the early Holocene and probably the same climatic factors characterized the mid-Holocene. Such homogeneity, however, is not evident in the late Holocene.

Lake level data indicate that by about 5,000 – 4,000 b.p. most of the lakes studied had begun the decline to present levels; although they were subject to oscillations of varying amplitudes. There are different degrees of co-occurrence between these oscillations. There was a contemporary rise in the levels of Lakes Chad, Turkana, Bogoria and, perhaps, Naivasha (see above) about 3,000 b.p. (Butzer 1980b; Owen et al.; Richardson and Richardson 1972) and this may be related to the fluctuations farther to the west (Street and Grove, 1976). It is interesting to note that the Ethiopian Rift lakes show a regression at this time (Gasse and Street, 1978) as does the level of the Nile floods (Butzer, 1980a). Another oscillation occurred at about 2,000 b.p. in some of the lakes of the Chad basin and in the Ethiopian Rift and the Afar (Gasse and Street 1978; see also Street and Grove 1976). Dating of these events becomes a problem here since these rises may be contemporary with the rises of Lakes Turkana and Gamari at 1,500 – 1,200 b.p. (Owen et al., 1982). However, it should be pointed out
that the dates of many of the events are poorly known and
the inherent uncertainties of many radiocarbon dates
(see Robertshaw and Collet 1983) could affect the interpreta-
and significance of the climatic events.

The pollen record for the late Holocene is even less
informative than the stratigraphic/geochemical/microfossil
record of lake levels. Species identification and their
response time to climatic change, human intervention in
the Holocene environment, and in addition the usual problems
of dating, become significant factors in late Holocene
climatic reconstruction.

The pollen spectra from Lake Victoria, Lake Muhoma,
the Muhoya Swamp and other locations (Hamilton 1974;
Kendall 1969) show only a gradual shift from the early
Holocene climatic optimum towards the drier and probably
slightly cooler climate of the present day.

In spite of the uncertainty of the dating and
insufficiency of data, a general conclusion can be made
for the late Holocene climate. It was marked by gradually
increasing aridity interspaced with wet oscillations of
decreasing amplitude, length and frequency. The most
significant occurred between 3,500-3,000 b.p.; 2,100-1,500
b.p.; and 1,200-1,000 b.p. (Foley 1981). Small scale wet
oscillations are historically documented between 1870-1895
and 1950-1965 (Beadle 1974). It is probable that the
recognized drought cycles in Kenya (e.g. 1960, 1973 and 1984) are a continuation of these oscillations.

It should be noted, however, that within this pattern regional variations exist. It seems that the more southerly regions of East Africa did not experience the wetter oscillations of the more recent period (see Figure 3:3). There is the possibility that the more northerly regions of the Rift Valley may have experienced considerable tectonic activity during the Holocene which may have affected the level of the lakes (Bishop 1972).

To summarize, it is possible that by 10,500 b.p. the basic interglacial environmental pattern of East Africa had been established following the prolonged late Pleistocene aridity. The distribution of montane and lowland forest, and surface water availability and related aquatic resources, would have been altered by subsequent environmental changes. However, the woodland/grassland mosaic, typical of most of the study area, would have remained unchanged but for human intervention. Pollen spectra show a decrease of grass pollen in some pollen diagrams from relatively dry areas and this has been attributed to domestic stock grazing and more intense burning (Hamilton 1982:190).

The obvious question to ask now is how the foregoing superficial overview of the Holocene climate is relevant to the study of faunal remains patterning in modern pastoralist
sites. In terms of physiography, climate, soils and vegetation (see preceding sections) Maasailand is so diverse that the documented climatic changes would have caused expansion and/or contraction of the different climatic zones. It would require, perhaps, gross climatic changes indeed (such as those of the late Pleistocene) to eliminate a large number of these zones altogether. Certainly this could not have happened during the Holocene. Thus we can expect only localized deterioration of the environment during the gradual dessication in the late Holocene. As was discussed in chapter two, ethnographic analogies can be greatly strengthened when it can be shown that environmental factors were similar in the prehistoric and modern cases.

The central and southern Rift Valley offers wide variations in the amount and season of rainfall, and temperature, over a relatively restricted area. Temperature is primarily determined by altitude whereas rainfall is determined by altitude and other orographic factors. The closely contiguous temperature/rainfall/ecological regime has historically allowed the coexistence of different economic adaptations but more so has allowed single groups, especially pastoralists, to exploit different environments at different times or simultaneously. The transhumance pattern discussed in chapter four illustrate this very well.

The transhumant pattern involves the relocation of
Regional palaeoenvironmental change in East Africa, 20,000 BP to the present.

<table>
<thead>
<tr>
<th>YEARS BP (x 10)</th>
<th>RH (°)</th>
<th>Temp. &amp; Wet.</th>
<th>Cold Oscillation, Becoming warmer, warmer &amp; humid</th>
<th>Warmer &amp; Wet</th>
<th>Some cold oscillation</th>
<th>Arid &amp; Cold</th>
<th>Dry &amp; Cold</th>
<th>Dry</th>
<th>Minimum biological productivity (65% rainfall)</th>
</tr>
</thead>
<tbody>
<tr>
<td>120</td>
<td>Low</td>
<td>Low</td>
<td>Reduction in forest cover</td>
<td>Cooler</td>
<td>?</td>
<td>Slightly cooler &amp; (humid)</td>
<td>Cooler</td>
<td>Relative ARIDITY</td>
<td>Increasing ARIDITY</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Low</td>
<td>Semi-deciduous forest (sparsely) or more seasonal, high lake</td>
<td>Slightly more dry &amp; humid</td>
<td>Slightly more dry</td>
<td>Warm &amp; Wet</td>
<td>Some cold oscillation</td>
<td>Arid &amp; Cold</td>
<td>Dry &amp; Cold</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Low</td>
<td>Evergreen forest</td>
<td>Cold Oscillation</td>
<td>Warmer &amp; Wet</td>
<td>Slightly warmer</td>
<td>Slightly less than present</td>
<td>Dry</td>
<td>Arid &amp; Cold</td>
</tr>
<tr>
<td></td>
<td>High</td>
<td>Int</td>
<td>Lowlake</td>
<td>Moderately wet</td>
<td>Becoming warmer</td>
<td>Becoming moist</td>
<td>Dry</td>
<td>High ARIDITY</td>
<td>Low</td>
</tr>
</tbody>
</table>

This figure is adapted from Foley 1981 fig. 5:1

pastoralist sites depending on resource availability at different times of the year. Climatic factors determine resource availability and hence they have always been taken into consideration in locating sites. Certainly this affects the spatial distribution of sites and consequently the patterning of debris on these sites. Thus past and present climatic regimes are highly relevant to the understanding and comparison of past and modern distributions and material patterning of pastoralist sites.

Chapter four gives an outline of Maasai history. It begins with a brief presentation of linguistic and archaeological evidence as regards the peopling of East Africa in general and Maasailand in particular. However, it should be noted that there is no attempt to especially correlate archaeological evidence with a particular people or tribe. The rest of the chapter outlines the history of the Maasai as a tribe, their social organisation and land use patterns - i.e. pastoralism from the earliest to the present time.

The purpose of this chapter is to put Maasai pastoralism into historical perspective. This is essential in that modern settlement and subsistence behaviour of the Maasai has been influenced by age-old historical traditions. These have a strong bearing on how they set up and organise their settlement sites.
CHAPTER FOUR

PASTORALISM IN MAASAILAND

4:1 Brief History of the Maasai

In a discussion of Maasai history it is highly relevant to examine the antiquity of pastoralism in East Africa. The best way to do this is to look at the linguistic and archaeological attestation of pastoral adaptations in the East African Rift Valley and adjacent highlands which form the home of the Maasai today. However, I wish to point out that no attempt will be made to correlate linguistic and archaeological evidence as they relate to the actual peoples of East African grasslands, since these correlations are as complex as they are difficult to confirm. Although attempts have been made to correlate the linguistic and the archaeological record (e.g. Ambrose 1982) these are by no means universally accepted, and no attempt is made here to evaluate such correlations.

The earliest inhabitants of East Africa, and sub-Saharan Africa in general, are widely assumed by linguists to have been of a "Bushmanoid type", speaking a Khoisan language characterized by clicks (Murdock, 1959:9). In East Africa today, they are represented by Sandawe and Hadza in northern and central Tanzania, Dahaloan (Sanye or Ariangulo) near the coast of Kenya in the Tana river area and the Yaaku of the Mt. Kenya area (Ehret, 1974). These remote and isolated groups imply that Khoi-San was once spoken.
by hunter-gatherers over the most of the region between the Kenya/Somalia border and central Tanzania (Ambrose, 1982).

Southern Cushitic speakers are thought to be the first immigrants into the hunter-gatherers' territory in East Africa. They are reputed to be the first pastoralists in East Africa. They are represented today by the Dahalo of eastern Kenya, and in Tanzania by many isolated groups - e.g. Asa, Aramanik, Iraqw, Gorowa, Alagwa, Burungi (Ehret, 1974). As Ambrose (1982) has stated, it is important to note that Southern Cushitic loan words are abundant in almost every language of their successors between Lake Victoria and the Indian Ocean, which implies prolonged and often intimate contacts with Southern Nilotes, Eastern Cushites, Eastern Bantu and Eastern Nilotes. These groups displaced or absorbed the Southern Cushites in many areas of Kenya and Tanzania.

The second series of immigrants, documented linguistically, was the expansion of Eastern Cushitic speakers into northeastern Uganda, northern and eastern Kenya as far south as Mt. Kenya. Today they are represented by the Rendille and Somali camel pastoralists, and the Boran and Galla who represent later sets of movements (Fleming, 1964). They must have displaced or absorbed the Southern Cushites who controlled the Turkana basin (Ambrose, 1982).

The next group of immigrants originated from the
Uganda/Sudan/Ethiopia border region and moved south through eastern Uganda and the western Kenya highlands, eventually as far south as the Mt. Hanang and the Lake Eyasi area of northern Tanzania. These were the Southern Nilotes whose modern representatives are the Tatog or Barabaig pastoralists in Tanzania, who are separated from their nearest relations - the Kalenjin speakers - by a wedge of Maasai in the Serengeti and Mara plains. Their influence seems to have been weak in areas east of the Rift Valley (Ambrose, op. cit.). The Southern Nilotes probably displaced or absorbed most of the Southern Cushites in western Kenya, the Rift Valley and northern Tanzania as they moved southwards. There remain, however, pockets of Southern Cushitic speakers (Asa and Aramanic hunters of the Usambara hills) who occupy areas formerly settled by Southern Nilotic speakers and whose contacts with the Southern Nilotes prior to the expansion of Maa speakers is well attested by loan words in their languages (Fleming, 1969).

Although the Asa and Aramanik original language may have been completely replaced by the Southern Cushitic tongue, the presence of Southern Nilotic and Maa loan words in it reflect their past and present contacts with dominant food producing groups. As Ehret (1971:56) and Fleming (1969) have pointed out, the Asa and Aramanik are the best examples of the role hunter-gatherers play in recording (in their language) the presence of groups who have been displaced from their former lands. These people speak a
Southern Cushitic language attesting the prolonged and intensive interactions with the ancestors of the early Rift Southern Cushites. The presence of Southern Nilotic loan words rather than complete replacement by this language, attests to a less intense and prolonged interaction of the two. The presence of Maasai loan words suggests more recent interactions of these hunters and Maa speaking pastoralists (Fleming, 1969; Ambrose, 1982).

Soon after the movement of the earliest Eastern Cushites* and Southern Nilotic speakers, Bantu expansion began. The Bantu moved from the Lake Victoria Basin south to central Tanzania and beyond, with a branch moving east and then north around the high plains between the Indian Ocean and the Rift Valley as far north as the Somalia border. However, domestic cattle play a far less significant role in their economic and social systems than those of the Nilotes and Cushites (Ambrose, 1982).

The final major movements, which are of more importance as far as this thesis is concerned, are those of the Eastern Nilotes who were the ancestors of the Maasai pastoralists. The first movement of these peoples from their homeland in the Uganda/Sudan border region was represented by the divergence of the Teso/Turkana cluster from the Ongamo-Maa cluster which appears to have occurred

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* - These occupied the northeastern Kenya region and no attempt is made to document their movement which is deemed as not strictly relevant to this study.
in the first millennium A.D. The proto-Ongamo Maa division moved south into Kenya and northern Tanzania. The split into Ongamo and Maa seems to have taken place in the highlands between the Nyandarua Mountains of Kenya and Mt. Kilimanjaro sometime in the middle of the first millennium A.D., as is suggested by the degree of difference between the two languages taken in conjunction with their present distribution (Ehret, 1971:53; Vossen, 1978). During this movement from the nuclear area, these people would have displaced or absorbed both the Southern Nilotes and Southern Cushites.

The most recent Eastern Nilotic expansion is today represented by modern Maa speakers - the Maasai and Samburu pastoralists - who occupy the Rift Valley and adjacent highlands from Lake Turkana to the Pare hills in eastern Tanzania, and the Njemps with a mixed economy in the Baringo basin of Kenya. The modern Arusha farmers and Baraguyu herders of northern Tanzania represent the Ongamo division (Ambrose, 1982).

The picture that emerges from this brief summary of linguistic-evidence of the migrations into East Africa is a complex one. The occurrence of successive and sometimes contemporaneous movements of different peoples led to displacements of some and assimilation of others through continued social and economic interactions. These interactions must have been a two way affair, each
influencing the other. Whatever the causes of these migrations, the results for East Africa is the present complex mosaic of languages, cultures and economies.

I have avoided quoting dates of the movements due to the unreliability of dates derived from linguistic reconstructions, especially when compared with archaeologically derived ones. Recent archaeological evidence attests livestock domestication in various parts of Maasailand beginning as early as the first millennium B.C. The East African Neolithic Era (i.e. predominantly pastoral food producing communities) has consistently been dated between 3300 and 1300 b.p. in the central Rift Valley and southern Kenya. There were at least three contemporaneous industries: the final phases of the Eburran (Phase 5A) dated at Maasai Gorge Rockshelter to before 2865 b.p. (Ambrose, 1984); Ambrose's Highland Savannah Pastoral Neolithic - a cultural complex that included domestic stock, stone bowls, and several pottery wares, with sites distributed throughout the entire highlands at elevations between 4800 and 7000 feet, as far south as the Serengeti Plains in northern Tanzania - dating between 3300 and 1250 b.p. (1982); and the Elmenteitan culture dating from about 2500 b.p. if we exclude the date of 3000 b.p. from Njoro River Cave (Merrick and Monaghan, 1984). All these Pastoral Neolithic Industries contain domestic stock in varying combinations, sometimes low as in Eburran Phase 5A at Naiyaga Railway Rockshelter.
(Onyango-Abuje, 1977b) or high as at Narosura (Odner, 1972). Thus it can be concluded that the domestication of cattle in Maasailand is of great antiquity with dates of 3300 B.P. onwards.

It is not clear when precisely the pastoral Maasai emerged as a distinct people. Both Greek sources (quoted in Huntingford, 1966:60-70) and Chinese records (Duyendak, 1949:12, quoted in Jacobs, 1975) refer to purely milk-drinking pastoralists in the interior of East Africa as early as 130 B.C. and 838 A.D. of whom the Maasai may be modern descendants. The medical research of Kang-Jey, quoted in Jacobs, 1975, et al, (1971:392), although the genetic conclusions are still unproven hypotheses, suggest that the preponderant milk diet of the Maasai is likely to be of considerable antiquity. The pastoral Maasai have unusually low serum cholesterol levels and a paucity of coronary heart disease. They also have a high incidence of immunoglobulin - IgA - that allows the absorption of the high cholesterol content of their animal fat diet. This trait is presumed to be genetically acquired and is identified as being directly related to Maasai subsistence on unpasteurized cow's milk. This dietary practice needs to have existed for over a millennium in order for the trait to be genetically fixed among so vast a population. In contrast, the Samburu, Rendille and Turkana have significantly high serum cholesterol levels which suggest that the purely pastoral component of their diets is of a shorter historical duration or has a
distinctly lower milk-drinking content.

The pastoral Maasai appear to have diverged from the Samburu as early as a thousand years ago purely on linguistic evidence (Heine, 1972; quoted in Jacobs, 1975). Oral traditions and linguistic evidence suggest that the Maasai originated in the area west of Lake Turkana.

They slowly moved southwards into the central Rift Valley, probably not much before A.D. 1400 and very likely because of dessication and environmental deterioration in the Lake Turkana region (Jacobs, 1965b, 1968, 1975).

By the beginning of the seventeenth century the Maasai had occupied the Ngorongoro Crater and the Serengeti Plains in northern Tanzania, chasing away or assimilating a former semi-pastoral people known to them as "Iltatua" (Jacobs, 1972a). However, one thing is certain, that from linguistic and of course archaeological evidence, all the areas into which the Maasai settled were previously occupied by earlier pastoral and semi-pastoral peoples (Ehret, 1971, 1974), whose economic activities would have helped to domesticate the landscape in the form of wells and other man-made water supplies and prepared the grasslands for the purely pastoral adaptation that the Maasai were to bring to them (Jacobs, 1975).

The Pastoral Maasai occupied the richer grasslands of the central Rift Valley, while other Maa speaking groups
mainly occupied adjacent areas both on the eastern and western fringes. These latter areas, though suitable for agriculture, were of less potential for pastoralism because of poor grasses, incidence of livestock diseases and other factors. Jacobs (1965b) has argued that during much of the eighteenth and nineteenth centuries the economic history of the Maasai consisted of semi-pastoral groups attempting to expand into the richer grassland plains occupied by Pastoral Maasai through raiding and warfare. However, many of these semi-pastoral groups such as the Loogolala, Losekelai and Laikipiak were subsequently defeated and no longer exist today as distinct tribal groups. The survivors were either dispersed or absorbed into the Pastoral Maasai. These events occurred just at the time of the early European penetration into the interior of East Africa. The misconception of the Pastoral Maasai as ruthless and war mongers was a result of these events (Jacobs, 1965b, 1968).

The impact of European control and settlement is a sad story. European settlement was preceded by the great rinderpest epidemic of 1890 and the subsequent smallpox epidemic that played havoc with the Maasai as well as their livestock. Previously, between about 1860 and 1890, the Maasai were a prosperous tribe and probably reached their maximum land holdings and livestock numbers. The results of these multiple disasters led to the emptying of large areas formerly occupied by the Maasai; they lost most of
their cattle, many people died from smallpox and famine and many others were scattered (Talbot, 1964).

During this time Mbatian, the Maasai leader, died and his two sons Lenana and Sendeyo vied for leadership. This resulted in open civil war in 1896; Sendeyo was backed by the Loita section and Lenana was supported by the Purko in Kenya. It was only after the Purko joined hands with the Kisongo section of Tanzania, that Sendeyo's forces were defeated. By 1902 the civil war was for all intents and purposes over. The Maasai were extremely weakened and had very few remaining herds.

Such was the stage on which European settlement and systematic encroachment by agricultural neighbours onto Maasai lands was set. The Pastoral Maasai progressively lost large areas of their richest and most vital dry season grazing areas to European land alienation. This culminated, in 1904, in the first Maasai Agreement under which the colonial government created two Maasai reserves, a northern one of some 4500 square miles in the Laikipia area and a southern one of some 4350 square miles in south western Kenya (Talbot, 1964).

The two reserves were joined by a corridor of land but Lenana found it difficult to administer due to the large distances involved. In addition the Europeans were bent on alienating the northern reserve for their own use.
Thus in 1911, Lenana had no option but to sign the second Maasai Agreement. The Pastoral Maasai of Kenya were now contained in a much reduced southern reserve composed roughly of the modern districts of Kajiado and Narok.

All along the Maasai who survived the catastrophes of the early twentieth century slowly started rebuilding their herds through stealing or buying with money from working for the Europeans - e.g. Germans in Tanzania employed Maasai in their attempts to subdue other tribes - (Talbot, 1964). By the mid 1920s the Maasai had relatively recovered and their numbers were estimated at about 50,000 (Joelson, 1928) and the 1948 census put the total population at 107,309 people (Fosbrooke, 1948).

The Maasai in Tanzania did not fare any better. The Germans gazetted most of the Serengeti Plains as a National Park where the Maasai were not permitted to graze their cattle. In Kenya, after the second world war, the triangular area bounded by the Mara River, Siria escarpment and the Tanzania border was made a Game Reserve. This did not immediately affect the Maasai, but in 1961 an agreement was made between the Narok African District Council and the colonial Government of Kenya to establish the Maasai Mara Game Reserve. This covered about 700 square miles and adjoined the Serengeti National Park. The Maasai were prohibited from grazing in these game sanctuaries, a prohibition that is effective to this day.
Thus the economic history of the twentieth century Pastoral Masai can be summarized as continued adaptation to changed circumstances in terms of economy, environment and social organization. Faced with reduced grazing areas, declining herd sizes and quality, but increased population pressures, many pastoral Maasai were forced to abandon traditional systems of herd management in favour of alternative methods that are often detrimental to the balance of the physical environment (Jacobs, 1975).

4:2 Maasai Economic Organisation

4:2a Economy and Dietary Habits

Ownership of livestock - cattle, sheep, goats and to some extent donkeys - form the central mainstay of the Maasai economy. Cattle are most important and are heavily value laden. The short horned Zebu is the most common breed.

Cattle are only very rarely slaughtered, except when sick, and steers are raised mainly for communal feasts (e.g. initiation ceremonies) and other socially significant rituals where their meat is liberally consumed. Herd size varies considerably among individual families and estimates of total cattle populations are both variable and notoriously inaccurate from year to year. However, it would appear that for the last quarter century pastoral Maasai possessed on the average 14 head of cattle per capita, thus making them the wealthiest cattle owners in Africa. On the average a typical family of 8 to 10
individuals owns 125-140 head of cattle, of which 57-60 per cent are milking cows on which the family subsists (Jacobs, 1975).

The Pastoral Maasai also keep large flocks of sheep and goats, and a smaller number of donkeys, all of which play a vital role in sustaining their cattle based economy. Sheep and goats are milked and such milk only consumed by children. Men never partake of this milk. This is a new development as Jacobs (1972a, 1975) states categorically that small stock are never milked. They were exclusively kept for meat supply or for trading to acquire cattle to improve herd structure. Donkeys are solely used as pack animals, not only to move household goods from one settlement or grazing area to another, but also, more importantly, to carry drinking water for immature, sick or aged animals and human consumption. This increases greatly the size of grazing areas into which whole families can move with their livestock as a single interdependent subsistence unit.

Though sheep and goat ownership varies greatly, a typical family of 8 to 10 persons on the average owns 150-200 sheep and goats, and at least five to six donkeys.

The diet of the Pastoral Maasai is mainly fresh or curdled cow's milk, occasionally supplemented with steer's blood. This constitutes about 80 per cent of their annual diet. However, it should be pointed out that in modern times...
the percentage is certainly less since they depend more and more on agricultural foods acquired through trade and even from their small incipient farms. Occasionally meat from small stock is also eaten. On the whole, however, the Maasai have retained their extreme commitment to a purely pastoral diet, circumstances permitting. It is possible that agricultural and traded foods might have played a considerable part in Pastoral Neolithic diet. For example Robertshaw and Collett (1983:67-74) have suggested this on the basis of the agricultural potential of the areas near Pastoral Neolithic sites, the evidence from polished and ground stone artifacts, and on the ethnographic evidence among East African pastoralists. In addition historical linguistic reconstructions indicate PN peoples were familiar with sorghum and various types of millets (Ehret, 1974).

Preoccupation with a purely pastoral dietary system was made possible by the relatively rich and extensive grassland traditionally occupied by the Maasai, enabling them to maintain large subsistence herds. Also Jacobs (1975) has noted that their lack of centralized political institutions may have hindered exploitation of alternative foods, and the historical absence of large-scale trading networks in their area that might have impinged upon and influenced their otherwise self-sustaining economic practices meant that they were left alone to pursue their pastoral diet with great unrestricted zeal.
Interestingly, Kang Jey's, et al, (1971) medical research already alluded to, although not conclusive, suggests that the milk diet among the Maasai is of great antiquity.

Unfortunately, as noted elsewhere, my fieldwork was undertaken during a dry spell and the Maasai of Lemek were 'in a famine situation. Thus the dietary habits cited below can not be taken as standard. For the duration of the fieldwork, the target family (one man, his wife and their five children, and his brother's wife with six children) ate 'ugali' (maize meal) with milk or potatoes and cabbage with occasional meat (two times only) purchased from the nearby shopping centre. Children were either given some milk or tea with a sprinkling of milk. The family had to do with one meal and some beverage - dinner and breakfast - per day instead of the preferred three. However, from interviews I concluded that under normal circumstances they drank milk everyday and had meat at least twice a week - either bought or from their herds of sheep or goats. Therefore it seems that in order to document present-day 'standard' dietary habits of the Maasai research ought to be conducted during a period when there is plenty of food resources; when there are many alternative foods.

4.2b Patterns of Land Use

Jacobs, writing in 1975, reports that there are 164,000
Pastoral Maasai in Kenya, occupying an area of 16,000 square miles; and about 62,000 in Tanzania occupying 24,000 square miles. Roughly this works out to a pastoralist density (both people and livestock) of ten persons and 190 livestock units (i.e. five sheep and goats equal to one adult cow, and one adult donkey equal to two cows) per square mile for Kenya and three persons and 65 livestock units per square mile for Tanzania, though densities tend to be higher in localized areas. When we compare this with modern estimates of ideal range management practices (that vary from eight to twenty acres per livestock unit depending on local environments), much of Maasailand is overstocked as well as overpopulated in terms of traditional subsistence practices* (Jacobs, 1975:408).

Pastoral Maasai were never organized as a single tribe under a centralized political system. They were divided into a number of named sub-tribes or sections (Olosho), each with its individual territory and an autonomous political structure based on the age-set system (Jacobs, 1965b). The two largest sections are the Kisongo living in Tanzania and the Purko who live in Kenya. The two smallest are the Damat and Delalekutuk with the Loitai

* - NB. These figures are simply estimates based on inadequate human and livestock census data, and they exclude non-pastoral Maasai living in Maasailand. Nevertheless they reflect a serious overpeopling and overstocking of the available rangeland.
Modern "sections" of the Maasai of Kenya and Tanzania. Major "sections" are in capital letters and "sub-sections" in small letters.

Map adapted from Saitoti and Beckwith, 1980.
occupying a middle position in terms of numbers and area, found both in Kenya and northern Tanzania (Jacobs, 1975; also see Map 4:1).

Age sets were organized for and by each section separately. Individual family male heads secured rights for communal grazing and water sources within their tribal boundaries through initiation into a specific age-set. Families of other Maasai tribes were prohibited from using such facilities without the tribal owner's approval. However, in times of drought or famine there was an institutionalized sharing of each other's resources, and occasionally some changing of tribal affiliations. Otherwise, families generally grazed solely within their tribal territory and defended it by force if and when necessary.

The tribe was further divided into a number of named localities (enkutoto), each with its own dry season grazing area with permanent water supplies and well defined boundaries for wet season pasture areas. Thus individual families in each locality practised essentially a transhumant mode of pastoralism. Politically each locality had its own 'council of elders' under the leadership of its own local age-set "Spokesmen" (Jacobs, 1975). In theory a locality never owned land in the same sense as a tribe (that is, it could not prevent other families from another locality from grazing within their territory) but in practice, the fact that each locality was a self-contained ecological and
socio-political entity enabled its leaders to manage its resources and public affairs as if it owned the land (Jacobs, op. cit.).

Lower down the scale of land ownership and utilization was the individual Boma or 'enkang' backyard grazing area. My fieldwork reveals that a single family or families in a single Boma often stake a claim on land adjoining their settlement as a kind of "backyard grazing area" for their calves, old and sick animals. Livestock from other adjacent Bomas are not allowed into this area without the owner's consent. Often it is staked all round with thorn branches to emphasize its exclusiveness and ownership. It may be as large as 50 acres.

Individual families acquired rights to communal resources only by common residence within the same locality over long periods of time, and by regular participation in all specific obligations of the local age-set activities. Thus families could not move frequently from one locality to another lest they forfeit their rights in the old locality and would begin building them all over again in their newly adopted locality since they were not transferable. Although localities vary greatly in size and population, depending on the local environment and other factors, on the average they consist of about 300 square miles with about 1000 persons (or roughly 125 families) owning about 19,000 livestock units (Jacobs, 1977).
The imposition of colonial rule and administration led traditional tribal boundaries in Maasailand to become slightly blurred. In independent Tanzania, the Ujamaa policies of national ownership of all land did away with tribal boundaries altogether. However, the importance of localities as a focus of community organization has remained relatively intact. In Kenya, the national policy of establishing freehold titles to all land has revived the importance of tribal boundaries, with some squabbling and scrambling between the various Maasai to re-establish former tribal boundaries. This has tended to strengthen the locality concept as the basic unit of ecological, socio-political and economic organization in Kenya Maasailand today (Jacobs, 1965b, 1975).

Having looked at how the Maasai organise their territory, I now examine the more specific pasture and livestock management practices. The principal unit of livestock management within each locality is the Boma or what Jacobs calls "kraal camp or enkang" (1975). This consists of several independent families who have joined together, mainly on the basis of mutual friendship and common interest or kin relationships, in the economic exploitation of their surrounding area. Also, often a Boma may consist of a single but wealthy individual with all or some of his male offspring and their wives and children. The Bomas also form the basic units of settlement and main centres of domestic life as we shall see in a later chapter.
Ownership and control of livestock is solely an individual family's business. However, a Boma's entire herds are pastured and watered together as a single herd, and at night are corralled together in the open centre of the Boma for protection against predators. This is a result of the common interest and congenial co-operation that characterize Boma organization. Elders meet every morning to decide that day's movements of the herds and to decide whose young sons would look after the cattle, and which elders will supervise the herdsboys. Although personal disputes or differences of opinion over herd management do cause families to break away and join another Boma (generally in the same locality), most camps maintain a core of congenial members over many years. These work co-operatively both among themselves and other Bomas in their locality to ensure the most efficient and fruitful use of their common resources.

The modern Pastoral Maasai herding systems are of great diversity and complexity which are to a large extent a result of environmental and historical circumstances. Prior to European colonisation and land alienation, the herding patterns of the Maasai livestock were based on a transhumant model solely determined by pasture and water availability. The transhumant pattern was closely similar to that of migratory wild ungulates already noted (Talbot, 1964:140). The 'migratory' movement of the Maasai and
their herds, however, was not an unoriented wandering, but a regular seasonal movement from one designated area to another, and back, solely determined by the availability of the two most important resources - pasture and water.

As noted earlier each locality had a dry season pasture reserve with a permanent water supply based on a river, well or spring. In the wet season, when there was plenty of water, they could graze over a wide area within their locality. Part of the members of a locality took the livestock away to take advantage of the now abundant grass and water in other areas. In the dry season they retreated back to the permanent water sources to use the dry season pasture reserves. The fact that there were well defined areas belonging and controlled by different localities, meant that the wet season movements were relatively circumscribed. Nevertheless carefully planned, crude but efficient pasture management techniques permitted the maintenance of large herds, but in balance with the local environment. These techniques included: (a) Elaborate grazing sequences that involved reconnaissance of and movement to wet season grazing areas in order to hold standing pasture as a dry season reserve; (b) Regular use of donkeys to transport water, both to expand the grazing area and to allow seasonal camps to stay away for as long as was possible from the dry season reserves; (c) Moderate burning of grass during good rainfall years both to kill ticks and other livestock disease carriers, and to promote
growth of more nutritious grass species; (d) Careful management of sheep and goats to avoid damage to grass during its critical growth periods; (e) Literally 'family planning' sheep and goat herds so that they gave birth only when there was plentiful grass through well calculated periods of fertilization; (f) Regular social rebuke or ostracization of families or Bomas that failed to adhere to these management principles. It appears that in this traditional herding system, the absolute livestock numbers that a single family owned were primarily determined by pasture and water availability, disease and to some extent predation and raiding by other tribes (Talbot, 1964).

Jacobs (1975) gives us the best example of this herding system as represented by the Maasai 'Steppe' area of Tanzania and various local areas in and to the west of the Loita Hills of Kenya. Although this system is thought to be relatively unproductive and uneconomic in terms of its contribution to the national economy (Raikes, 1981), it has offered its adherents a high standard of subsistence and health, and surplus stock which, when sold, allowed their owners to purchase moderate amounts of consumer goods over many years.

The loss of former high potential dry season reserves to European settlement, and in independent Kenya and Tanzania to National Parks and agricultural development (e.g. wheat production, individual or company ranches, etc) meant that the Maasai had to establish permanent camps in
the low potential, formerly wet season grazing areas. The Sinya, Ngare Nanyuki and Longido plains which were tied to the dry season reserves in the Kilimanjaro and Mt. Meru highlands in Tanzania, and many of the Rift Valley plains in Kajiado and Narok districts which were tied to the Nyandarua highlands in Kenya, represent the "new" herding systems in Maasailand (Jacobs, 1975).

Although not literally new, this type of herding system has come to be characterized by disastrous effects on the traditional pasture management practices, the social life and the local environment. The low potential areas are provided with permanent boreholes to water stock, but offer limited scope for improvement or expansion of pasture resources because of low or erratic rainfall. The traditional grazing mobility is curtailed and the areas around boreholes become centres of overgrazing, ultimately resulting in roughly concentric rings of soil devoid of any grass cover. As Jacobs points out "...Faced with deteriorating pastures, lack of grazing mobility and often high livestock losses, many families drifted into apathy and careless herding practices due to the hopeless struggle against impossible conditions which they saw as having occurred as a result of the alienation of their former, high potential dry season reserves" (1975:418). Thus faced with dwindling supplies of the favoured pastoral diet, many families today have turned to cultivated foods (mainly maize meal) to supplement their little livestock food. It has also become common for some
to become livestock traders, occasional wage labourers as watchmen in towns, while others have simply taken to drink thus increasing apathy.

The Maasai today consist of those whose situation and standard of herding fall between the above two extremes. I would characterize the Maasai of Lemek among whom I did my fieldwork, in this medium group. These pastoral Maasai continue to fight with a combination of the old traditional and new herding management practices such as cattle dips, innoculation programmes and changes in dietary habits in the face of increasing livestock pressures on their lands as well as population increases. Many of their relatively higher potential reserves are being used for alternative economic activities, such as wheat production and wildlife tourist attractions. While these developments are significant for the national economy, they have not addressed the long term problem related to the most efficient and beneficial use of and development of the low potential areas into which the Maasai have progressively been pushed.

To conclude this section, it is worthwhile to point out that the Maasai pasture and livestock management patterns as observed today, are but necessary adaptations to a drastically changed environment in terms of size and potential. These new adaptations, as we have seen, have encroached on the social fabric of Maasai society (e.g. dietary habits, wage labour, etc.). Thus any ethnoarchaeological study
based on the present Maasai society, needs to take into consideration the above points. This is an aspect of this study that ought to be borne in mind while reading the following chapter, which is about site types, their function and refuse discard patterns among the Maasai.

The chapter begins with a brief examination of the various site location factors which the Maasai consider in establishing their settlements. This serves to show that Maasai settlements are not haphazardly located. More importantly it sets the stage for identification of the different site types and their functions within the Maasai settlement system which together with bone discard patterns, form the subject of the rest of the chapter.
5:1 Site Location

The distribution patterns of Maasai settlements in Lemek reflect various physical and biological characteristics of the surrounding landscape. Four basic factors are taken into consideration in choosing site locations. These are:

(a) Elevation in terms of hillslope gradient, distance downslope and the actual slope length. The Maasai avoid steep slopes and always locate their settlements near the tops of ridges (see Map 1:1). Western and Dunne (1979), for example, have shown that Amboseli Maasai avoid hillslope gradients exceeding .08. A similar pattern occurs for the Maasai of Lemek. In terms of distance downslope they avoid the lower sections of long hillsides, which often receive large amounts of runoff during the rainy season. The total length of a hillslope is always considered and an optimum location is selected that will minimize the hazards, production losses and general discomfort for both humans and livestock in terms of energy expended in moving to and from the settlement daily. For example, Western and Dunne (op cit) have shown that longer slopes greater than 1500 metres had significantly fewer and smaller settlements than
the shorter slopes ($P < 0.05$). These site location factors are especially important in the location of Bomas, which tend to be more permanent compared to other site types (see section 5:2).

(b) Vegetation cover is an important influence in choosing a site. In the selection of a Boma site the variables that are of utmost importance, according to the Maasai, are the availability of wood for building and firewood, balanced with an openness of the vegetation canopy cover to otherwise ward off predators that might hide in dense vegetation canopies. For instance, the hills to the north (see Map 1:1) and the Lemek river valley are forested and hence are avoided. Western and Dunne (op cit) have quantified the vegetation variables and have given the optimum vegetation canopy cover for settlement location among the Amboseli Maasai ranging from 2 to 8 per cent.

However, this variable does not apply to the special purpose sites such as butchery sites, *Ji Puli* and to some extent seasonal cattle camps (see Figure 5:2, section 5:2). For the latter, availability of pasture and water in the surrounding area is more important.

(c) The soil type as related to its drainage potential is also an important consideration. The Maasai generally avoid soils that are prone to waterlogging. For example, the brown sandy loams of the Lemek river valley are avoided because according to the Maasai they are cold at
night, which brings considerable stress and consequently reduced milk yields from their livestock. In addition the river valley is a meeting ground for all kinds of animals at night which would not be safe both for people and their animals. Also these soils are liable to waterlogging (see Map 1:1 and also Robertshaw and Collett, 1983:70). The red brown friable sandy clay loams with boulders are also avoided. These are found on the ridges and any settlement would require extensive boulder clearance (see Robertshaw and Collett, op cit).

(d) The availability of water both for domestic and livestock use is a most important factor in the location of all the different site types. The optimum location is one with a permanent water supply about 3 kilometres away. Closely allied to this is pasture availability. These two factors are weighed against those already discussed and a series of compromises are made, to enable the most efficient use of the basic resources.

(e) Lastly a site might be selected for some specific attraction such as its scenic beauty or important traditional values (e.g. the Ol Doinyo OleNabala hills - Map 1:1 - are named after the Nabala family of Lemek, members of whom have always located their settlements on the lower slopes of these hills for the last one hundred years or so up to the present day).
The strategy of Maasai settlement location involves a process of choice in which the various positive and negative environmental parameters that affect both human and livestock welfare are weighed. These parameters have been briefly discussed above and they include various hydrologic, geomorphic, edaphic and vegetation features. On the whole the tradeoff of any major requirements is considered in the framework of livestock productivity. As was intimated elsewhere livestock, especially cattle, occupy a central place in Maasai socio-economic organization. The herds literally play the role of a 'bank' and 'granary' among the Maasai. In this connection the shopping centres, amenities such as cattle dips and health centres do not seem to influence site location. All of my informants, given a choice between being near these recently introduced amenities in an area without pasture on the one hand, and being far from them but in a well watered and pastured area on the other, always preferred the latter choice. To them it was better to walk to these amenities than to drive their cattle from areas near these amenities to pasture and water a long distance away.
5:2 Site Structure and Function

On the basis of function we can recognize five major types of sites that are found within the Maasai settlement system. These are:

(a) Boma (enkang)
(b) Butchery Sites
(c) Seasonal Cattle Camp
(d) Meat Feasting Sites (Il Puli)
(e) Manyatta

and are examined in turn below.

The Boma (enkang)

The word 'enkang' refers to the main home settlement in the Maa language. However, Boma is a more commonly used word with the same meaning; thus it is used with this meaning throughout this study.

The Boma is occupied all year round by part of a single family or families. The actual number of occupants is not fixed at any one time and depends, firstly and most importantly, on the economic status of the owners, and secondly on the requirements of manpower for herding, especially during dry conditions when a seasonal cattle camp (see below) is established away from the main home base. Sometimes two or more families with modest herds may come together and build a single Boma for their livestock, with individual houses for each wife and her offspring as single nuclear family units. The size of any one Boma is primarily determined by the number of families and
the size of the combined herds of livestock, and can range from 30 by 20 metres in single family Bomas with not very large herds, to 80 by 60 metres in several families' Bomas with huge herds. The Boma acts as the 'nerve centre' for all activities undertaken within the Maasai social and economic system.

The typical plan of a Maasai Boma consists of a post and thorn brush fence that entirely encloses a roughly circular area (see Figure 5:1 and plate 1). Houses of the various wives are aligned along the internal perimeter of the enclosure with external gates on the outer fence leading to the outside. The number of these gates reflect the social relations of the inhabitants. For example, when a man marries his first wife, she builds her house on the right hand side of the Boma entrance. When the second wife is married she builds her house on the left hand side of the same Boma entrance. Any subsequent wives will build their houses either on the left or right along the internal perimeter of the outer Boma fence. Any other male occupants of the same Boma will have their wives build houses in a similar pattern thus making additional gates on the outer perimeter fence. Usually some houses have smaller internal hedges, often only a line of posts to protect them from the cattle.

The sizes of the houses average 6 by 3 by 1.5 metres and they are made of sticks and daub. The postholes average
Fig. 5:1 Diagrammatic illustration of a Maasai Boma (enkang)

- Cattle Sleeping Area
- Small stock pen
- Hearth
- Guard room
- Open hearth
- Wind break (constructed with tree branches)
- Shade tree
- Exit
about 7 to 9 centimetres in diameter at their widest near the ground surface and are of a 30 to 35 centimetres average depth. These figures were arrived at by measuring the sizes of ten houses and calculating the average size, and the thickness of the pointed wooden stick that every woman uses in house construction. The depth of the postholes can clearly be extrapolated by examining the extent that the stick point entered the ground which is clearly visible since such a stick is not cleaned after use. The walls are plastered with cow dung only and the roof with cow dung mixed with some soil and ashes to make it waterproof.

A Boma may be abandoned and reoccupied several times, although not necessarily by the same family. Factors that initiate abandonment are varied. Sometimes the accumulated dung becomes unmanageable, or a member of the family dies in the settlement or the frequent death of livestock on the site or purely disagreements of the members, may lead to new Bomas being built in a different area. However, in the case of unmanageable dung, my informants told me they build a new Boma attached to the old one and moved livestock into it to allow the dung to become dry and compacted, meanwhile continuing to occupy their old houses.

One common feature outside the Boma, 10 to 15 meters away, is a shade tree near which there is always an open hearth. Often on the windward side is built a stake windbreak. This spot is used as an informal committee room where decisions of herd management and other social matters are deliberated.
Fig. 5:2 A Diagrammatic illustration of a Maasai seasonal cattle camp.

A Four family - A , B , C , D - seasonal cattle camp as seen at Kimani, December, 1984 (see Map 1:1)

NB The inside dividing fences are roughly built - branches are just dropped on the ground - and are more temporary than the outside fence which is stronger but weaker than that of a boma.
The Seasonal Cattle Camp

The occurrence of a wet and dry season results in seasonal movement in search of fresh pasture. The Maasai establish transient and ephemeral seasonal cattle camps during the dry season in areas where there is still some pasture for their herds. These camps may range from 10 to as much as 35 kilometres from the Boma depending on the distribution and intensity of the dry conditions.

Two or more families come together and build a temporary enclosure divided into smaller pens (see Figure 5:2 and plates 2 to 3). Each pen contains a house and an open area for the individual’s livestock. The typical plan of the overall camp resembles that of the Boma. However, the houses are smaller measuring about 4 by 3 by 1.5 metres. Only junior elders and young boys occupy these camps - a single elder with two or three boys from each family unit depending on the number of families in the camp. However, women build the houses and then go back to the Boma to look after the rest of the family.

Meat Feasting Sites (Il Puli)

As the name implies these are meat and soup feasting sites and two variations can be recognized.
One type is the meat and soup feasting enclosure used by all members of a family whose head has slaughtered a steer, goat or sheep for this purpose. The use of this site is not restricted to the family that constructed it and is normally used by other families from other Bomas around it, with the distance between the Boma and the site being the only determinant of who uses it at any one time.

An Ol Pul of this type is often located half to one kilometre from the nearest Bomas. It is often located in a clearing surrounded by thick bush and trees, always near water supplies. It consists of two compartments each with an open hearth (see Figure 5:3.). The bigger of the two is roughly circular measuring between 7 and 10 metres, and the smaller between 3 and 5 metres in diameter. The bigger compartment is used during the day for cooking and eating while the smaller one is used to store the meat and as a sleeping area for two or three young men to guard the meat at night.

One interesting point is that all the meat from a single animal is consumed here, except the neck which tradition demands be taken to the mother of the owner of the animal back in the Boma or his wife if the mother is deceased. The viscera, excluding the intestines which are used to make soup together with the head and other meat cuts, are also taken to the women of the Boma.
Sometimes the bigger compartment might be fenced but natural trees and shrubs might demarcate the position of the fence. The animal is slaughtered on the more open side just inside or outside the fence position. The smaller compartment is always carefully constructed to prevent entry of even the small scavengers. The entrance is blocked at night with tightly fitting thorn branches.
Fig. 5:4  Rockshelter Ol Pul : Leshuta Ol Pul adapted from Gramly (1975)

Scale

- 5 Metres

KEY

B — Bed constructed with Leleshwa leaves
H — Hearth
F — Firewood
M — Meat rack
I — Thornbrush semi-circle inside of which meat is cooked and eaten
The other variation of an Ol Pul is the one exclusively used by Morans. It is often located far away in rockshelters, or where these are absent, in an open enclosure built deep in the forest. The design of the forest Ol Pul accurately duplicates the family Ol Pul discussed above. The reasons for choosing these inaccessible locations include a desire for protection from wind, weather and animals, as well as seclusion from women who traditionally must not see Morans eating meat.

A typical rockshelter Ol Pul consists of a semi-circular thornbrush fence at the point of the rockshelter's greatest overhang. Inside are found the hearth, the bed made of Leleshwa leaves, firewood stack and meat storage rack (see Figure 5:4 and plates 4 and 5).

The Morans use these sites as sleeping areas as well as for meat feasting which takes place more frequently than in the other variation of Ol Pul. Two or more boys always stay with the Morans and act as their servants. The Morans may number anything from 5 to 20 or more individuals.

Butchery Sites

Butchering in Maasai traditions is done by young men and not within the confines of the Boma, except in very special culturally significant ceremonies. An example is the cow slaughtered to cleanse a woman who has habitual
Fig. 5: Diagram of a Maasai butchery site as seen at Morijo near Kimani seasonal cattle camp.

Path to the boma - 150 m away.

Slaughtering or carcass dismembering area

Hearth

Firewood

Bushes hiding the site

KEY

Arrows denote the possible areas of new hearth extension from the original central hearth.
miscarriages. These traditions, however, exclude stock that die inside the Boma which can sometimes be skinned by women—the meat is either eaten (depending on whether they judge it to be fit for consumption) or the carcass is thrown away outside the Boma for scavengers to dispose of it.

Otherwise all butchering is carried out in several designated places, well hidden by bushes and where possible under a tree. This is a result of the tradition that requires young men not to be seen eating meat by women. These sites may be located from 30 to 150 metres on the periphery of the Boma. A butchery site consists of two areas; where the skinning and dismemberment of the carcass is done, and where the hearth is located. Traditionally the liver, ribs and a limb are roasted and eaten here and the rest of the meat is taken back to the women in the Boma, since they are traditionally not allowed in the butchery sites. The two areas of a butchery site may cover an area of about 5 to 15 square metres with a single hearth often extended to cover about one or two metres. This happens when the original hearth has been used for a long time and ash has accumulated which inhibits the fire. In such a case a new hearth is made by the side of the original hearth, which after abandonment will look like a single hearth (see Figure 5: 5 and plate 6).
The Manyatta

Many people have used the names Manyatta and Boma interchangeably when referring to the more permanent Maasai settlements. However, the two differ both in function and size, although not so much in the actual design and location. A Manyatta is an exclusive settlement built purposely for initiation ceremonies of newly circumcised young men into warriorhood and later into elderhood.

A relatively level area with a plentiful supply of water was chosen for the construction of a Manyatta. It was normally inhabited by the warriors, each with his mother, their lovers, a few boys to run errands and several elders to act as advisers to the warriors. Only cattle and donkeys were allowed into the Manyatta — small stock were excluded. All butchering and eating meat by the Morans was done in a wooded area away from the Manyatta enclosure. However, some specific meat cuts were traditionally sent back to the Manyatta for the elders, women and the young people.

The Manyatta design was like that of a Boma, but often covered a larger area depending on the number of initiates. The houses were built on the inside perimeter of the enclosing fence but without the smaller internal hedges as is common in Bomas. A ring of quartz stones, preferrably of a white hue, was constructed round the circumference of the Manyatta and supposed to keep at bay any bewitching by ill-wishers (see Figure 5: 6).
Fig. 5:6 Diagrammatic illustration of a Maasai Manyatta

- Entrance
- Quartz stones
- Cattle Area
- 12 m
It should be pointed out that Manyatta are very rare these days especially now that the government has banned the tradition of Moranism which was the principle premise on which Manyatta construction was predicated. During the old days the Manyatta served as the barracks for the warriors during peace time. Their numbers could be anything from 20 to 300 men.

5:3 Refuse Disposal Behaviour

This section describes in detail site specific human behaviour - i.e. Maasai behavioural processes that take place in the different types of sites - as regards the generation and discard of debris either as a conscious maintenance strategy or incidentally to other behaviours. Such behaviours, needless to say, have the greatest potential for creating destroying and patterning faunal remains from an archaeological perspective.

The preceding section described the layout of facilities (see chapter 5:2 and also 2:3b) in the different types of sites in the Maasai settlement system. The discussion now examines the facilities (e.g. houses, hearths, and so on) as activity areas - areas around which various activities are carried out. This involves an examination of the nature and spatial ordering of social units within the different sites and the factors that determine where specific kinds of activities will take place. These activities will generate and pattern debris within the sites. Thus the procedure
followed requires a definition of the site framework in terms of facilities (e.g. houses, hearths, etc.) and associated activities, followed by a study of the relationships between this skeletal framework and the dispersion and patterning of debris.

The different types of sites are examined one by one below. The discussion looks at the activity areas - e.g. hearths, houses -; activities - e.g. cooking, eating, repair of artifacts, etc. - and finally at the dispersion of items in relation to the above two variables (i.e. activity areas and activities).

1. Boma

As was noted earlier this site type contains a variable number of houses, depending on the wealth and size of the social unit occupying it. Also it acts as the nerve centre of all activities undertaken in the Maasai subsistence system. It forms the residential quarters of the majority of its owners at any one time throughout the year. More specifically, individual family domestic activities are carried out inside the house and/or the immediate area outside the main fence of the Boma, generally directly opposite the house. For the purpose of this study only one house will be examined in detail but it should be borne in mind that the observations are typical of the other houses.
Fig. 5: Inside a Maasai house showing the lay out of activity areas and the area near the external fence of the Boma. (Based on Morombi Ole Taruru's Boma)

LEGEND

F Stack of spare firewood
FP Fireplace platform
CH Central hearth
CP Cooking pots
B1 Master bed exclusively for the husband
B2 Smaller bed exclusively for the wife and her smaller children
CB Cupboard for smaller utensils
C/MG Calves and milk goats room
S/GK Sheep and goat kids rooms
//SA Sitting area - NB the beds are also used as sitting area by respective owners and friends.
WC Water storing vessel
WPS Wife's private shelves.

NB The breadth and width of the house has been doubled for clarity of internal divisions.
The plan of the inside of a single Maasai house and the immediate area outside the main perimeter fence is illustrated in Figure 5:

There are several important points to note about Figure 5:

- The central hearth (CH) is the centre around which nearly all domestic chores (e.g., food preparation, distribution, eating, etc.) are organized and carried out. Thus it acts as a focus of organized activities inside the house.
- The division of labour among Maasai males and females dictate that artifacts associated with food preparation must be kept within the area occupied by the wife. The woman carries out food preparation while seated on her bed (B2) hence the hearth is always nearer her bed than that of the husband (B1). In this connection we should also note the positioning of the water pot (WO), small utensils shelves (CB), cooking pots (CP), water containers (WC) and the wife's personal shelves (WPS) where she keeps her personal effects such as earrings, necklaces and a cache of unused beads for making new ornaments.

- The fireplace platform (FP) is used as a working bench both in food preparation and distribution. The designation (SA) refers to the sitting area of the family and all friends and visitors. All eating of food, under normal circumstances, is done inside the house and in the area marked (SA). Food debris such as bones are either dropped in front of the eater or tossed near the hearth BUT never
into the fire on account of the badly smelling smoke from burning bones. On three occasions I observed the man of the house working on an unfinished *rungu* (club) while seated on his bed waiting for the evening meal. The debris from this manufacturing process was subsequently left where it fell near the husband's bed. This area was not the final resting place for this refuse as we shall see below.

The area around the hearth as well as the entire inside of the house is an intensive use area where delicate activities and social acts are conducted. Thus it is consciously kept clean by daily sweeping of all the rubbish from all previous activities. The ashes from the hearth are periodically removed to prevent their accumulation which can often choke the fire and increase the amount of smoke inside the house.

The disposal patterns of refuse emanating from activities conducted inside the house should be examined in more detail since these are the key to understanding material patterning in modern Maasai Bomas. After the interior of the house has been swept, all rubbish is carried out of the house and dumped on a spot on the inside of the outer perimeter fence. The area between this section of the fence and the house is also swept and the rubbish added to the dump on the arc of the fence. The rubbish so discarded might be any undesired items such as bones from the previous meal, wood shavings from club manufacture, potsherds, old tin cans,
pieces of leather, wornout pieces of clothing, old paperbags and so on. Ashes that do not contain live embers - to avoid setting the fence on fire - are also dumped here. As more and more rubbish is repeatedly dumped here, it forms a rough arc demarcated by the external perimeter fence. This refuse dump is marked (X) in Figure 5:7.

According to my informants and my personal observations, the Maasai women never throw their rubbish anyhow over the fence. Each wife - and this means a single house - has a second rubbish dump located outside the Boma at an average distance of some 3 to 5 metres from the entrance door of the Boma. The excess dung from the calves' and milk goats room (C/MG in Figure 5:7), always located inside the house, is thrown into this rubbish dump. Ashes that contain live embers are also thrown here. Sometimes, but only very rarely, other rubbish from the house interior will also be thrown here. However, this is the exception rather than the rule. This rubbish dump is labelled (Y) in Figure 5:7.

It should be pointed out that these rubbish dumps remain as two distinct features since the distance separating them - rubbish dumps X and Y - is about 8 to 10 metres thus minimizing any chances of the two coalescing into one dump. In addition, especially for Y rubbish dump, the tendency is to extend outwards away from the Boma, for example, towards the south and southwest in Figure 5:7. Rubbish dump X
builds up vertically rather than horizontally, thus offering no chance to join with dump Y.

The above pattern of discard was observed for all the houses in one Boma as well as for ten other Bomas that were investigated regarding rubbish disposal practices. Each house in a Boma usually has its own entrance door made on the main perimeter fence. Every wife will therefore have her own rubbish dumps equivalent to X and Y (Figure 5: 7). In some cases, however, a house might not have an external door on the main perimeter fence but will have a minor internal fence of a few stakes to protect it from the cattle. Rubbish from such a house is discarded on this minor fence. The small stock dung from such a house is carried outside and dumped into another house's dump Y - the distance between the dump and the house being critical in choosing on which dump Y to throw the dung. Thus what seems to be true of Maasai Boma rubbish disposal practice is that rubbish from the houses is repeatedly discarded on the inside of the nearest fence. The initial rubbish dumped on a single spot acts as a magnet for subsequent dumping which in the long run will result in two large and discrete rubbish dumps (e.g. X and Y in Figure 5: 7) both with lenses of ash that was added to the rubbish dumps periodically. Both dumps tend to increase in size vertically rather than horizontally.

Having looked at rubbish disposal patterns from the viewpoint of activity area (house) and associated activities
I now examine rubbish disposal practices within the whole Boma and its environs.

The area of the Boma that houses the cattle and small stock will be considered as a single activity area although activities will vary spatially within it. Before examining specific rubbish disposal practices, let me briefly look at how the Maasai manage the ubiquitous cattle dung to be found in Bomas. According to Maasai informants three ways are used. One, the women sweep the dung, when it is dry, into heaps at the centre of the Boma and subsequently burn it. However, how often this method is used was difficult to ascertain during my fieldwork. Of the ten Bomas studied, only in one did I see piles of ashes presumably from this activity. Thus it would appear it is not a method that is frequently used in dung management. Two, during the rainy season, runoff can be an effective agent for washing the dung downslope since many Bomas are located on gently sloping areas. A gully is dug on the upslope side of the Boma when it rains and women churn the dung with the runoff using sticks and hands. The excess uncompacted dung is thus swept downslope leaving a hard surface of compacted dung that looks like a cemented floor. However, my fieldwork was conducted during a dry spell and this method was not observed in operation. Three, when the dung can not be managed through the above methods, an extension of the Boma is built adjoining the old one and all livestock are moved there. This is to allow the dung to dry up and become
compacted after which the area is reoccupied. However, all the while the houses continue to be occupied. The dung from the small stock rooms is dug and manually carried outside where it is added to the outside rubbish dump already noted. In the new extension a small house is built and is used when guarding the herds at night. It would seem this method of dung management is the one used most extensively as is attested by numerous raised and extended spreads of dung observed adjacent to many occupied Bomas.

There are certain specific types of rubbish whose disposal area is governed by the cultural traditions of the Maasai. Basically these are the types of rubbish generated during important cultural ceremonies. For instance during the circumcision of a girl, a small special pot with everted lips and a round body is used to store cleansing water overnight. If such a pot were to break accidentally, custom demands that its potsherds should be thrown into the Boma, preferably at the centre, where cattle trample on them. The cattle are deemed to embody all that is pure and clean, bordering on 'godliness' so to speak. This, it is believed, wards away any witchcraft, were one of the potsherds to be picked by a person with evil intentions towards the initiate and her family. The potsherds are trampled upon and buried in the cattle pen within a matter of days. When other types of pots and also gourds break the pieces often end up in the segregated rubbish dumps - e.g. X and Y in Figure 5:7.
The second category of culturally governed rubbish disposal patterns concern bones from cattle, goats and sheep specifically slaughtered in connection with various cultural ceremonies. These include (a) the ceremony to welcome a new baby. When a wife gives birth custom demands that a sheep be slaughtered for her and all those who come to wish her and her baby well; (b) the burial of the head of the family. The eldest son is required to slaughter a fat bull whose fat is used to annoint the deceased before he is interred; (c) cleansing ritual of a woman who has habitual miscarriages. When an expectant mother miscarries more than once she is thought to have indulged in sexual relations with a man hence the premature miscarriage. In such a case a cow is slaughtered to cleanse her together with the man responsible.

In all of the above ceremonies tradition demands that the animal be slaughtered, roasted and consumed inside the Boma and all bones subsequently thrown inside the cattle pen. The hearth is made at the centre of the cattle pen. However, dogs disperse the bones as well as children who often walk out of the Boma with the bones and discard them there. This appears to be allowed since only adults are traditionally restricted from transporting such bones outside the Boma.

For all these ceremonies, there appears to be a single behavioural pattern in the sharing of the meat and subsequent discard of bones. Below I use the habitual miscarriage
ceremony which I witnessed at Nguswen (Muswen), approximately seven kilometres from the Lemek shopping centre on the road to Lolgorien, to illustrate the discard patterns of the bones. Figure 5:2, shows the Boma where the ceremony took place and the various activity areas as regards butchery, meat roasting and consumption and the actual cleansing ritual.

Butchering was done at the area marked (X), roughly semi-circular and measuring two by three metres. The meat was placed on Leleshwa branches which were thrown on the perimeter fence at (A) at the end of the ceremony. Thus, this area was clear of any debris at the end of the day. The hearth (CH) was located two metres from the butchery area. Immediately after one side of the cow was skinned, all the ribs were cut at their articulation joints with the vertebra and were roasted and shared among the butchers and all the men present, including me. The ribs are shared whole and are never cut into pieces. After everybody got a rib, they retired to an area next to the perimeter fence at (A). After eating all the meat including the periosteum which was scraped with a knife, the rib bones were dropped in front of the seated men at (r) (see Figure 5:3).

When butchering was completed, the viscera were removed, cleaned and cooked by boiling on the hearth with a big sufuria. This was the only type of meat that was boiled. According to Maasai traditions all ceremonial meat is supposed
Distribution of meat at Nguswen during the ceremony for cleansing of a victim of habitual miscarriage.

LEGEND

- Internal protection fences
- X Butchery area
- CH Central hearth where the meat is cooked
- H Hearth inside the small stock guard room
- GSP Small stock pen (sheep and goats)
- rrr Ribs picked clean of all meat
- vvv Various types of bones, long bones are broken for the marrow here
- ☘ Men sitting area, the meat is eaten here
- ☮ Women seated in a circle around the butchery area
to be roasted. All the limbs were severed at the joints, the forelimbs together with the scapula, and were roasted as single units on a wooden rack made over the hearth. Meat was then carved from the bones which were subsequently severed at the joints - i.e. into complete longbones. Some of the meat pieces and whole bones were given to the herdboys and other children who retired to spots of their choice within the Boma. The men then took some of the boneless meat and all remaining bones and retired to the small stock guardroom (B) to the north of the Boma. All the meat was placed on a 'table' of Leleshwa leaves and the men sat round it eating the boneless meat first. When they were through with this, each man picked a bone and found himself a place to sit. Some sat inside the guardroom and others near the outside perimeter fence and the internal fence of the small stock enclosure (GSP). This is marked (VVV) in location (B) in Figure 5: 8. After all the meat was picked from the bones, marrow was extracted by either cutting off both the distal and proximal ends of the bones or hacking at the middle of the bone or using a heavy hammer and anvil to break the bones into two roughly equal portions. Once the marrow was removed and eaten the bone fragments were dropped just in front of the men. Bone flakes were also left around the anvils where the bones were cracked.

It is important to state that the initial areas where the bones were deposited were not the final resting place for all bones. After three days I observed that most of the longbone
portions had disappeared. Only small bones and bone flakes which did not contain any meat scraps or even ligaments, were in their original spots. Since the women agreed that they never clean away these bones due to their cultural values, it was concluded that dogs must have scavenged the more attractive longbone portions leaving behind only the less attractive. As noted earlier, although bones from ceremonial butchery are not taken out by adults, according to my informants, dogs are allowed to scavenge them since they are "only animals," harmless but beneficial to society. One reason could be that the dogs act to warn them of predators at night and as such considering the Maasai attachment to their livestock, this appears a genuine and important reason. Furthermore, all the bones that were given to the herdboys and other children were discarded outside the Boma.

All the while, when the above activities were taking place, women were singing outside the Boma. When the actual ceremony started they entered the Boma and sat in a circle round the hearth and the remaining meat was shared among them by the men. The women were given only meat without bones hence the area around the hearth had no bones at the end of the ceremony. The diameter of the circle varies with the number of people and the size of the open area at the middle of the Boma. The implication of this ceremony for bone discard patterns are important. Theoretically we would expect bones from a whole animal to be found at the middle
of the Boma. However, this is not the case due to the transport of some bones outside the Boma by children, animal scavenging and other taphonomic processes after deposition. The paucity of bones at the middle of a Boma is illustrated by Lomèk East Boma (Fig. 6: 2) where interviews with the original owners revealed that several ceremonies were conducted there. Secondly, unlike bones which can be scavenged outside the Boma, we would expect to find stone tools made for the special purpose of butchering and traces of manufacture in the middle of the Boma if the people used stone for their implements. Thus, although the middle of the Boma will have little or no bone, we would expect to find other durable materials that were associated with cultural ceremonies of the site's inhabitants in a similar archaeological context.

The immediate area outside the Boma has two locations - (M) and (W) in Figure 5:9 - which are often associated with a single house. Area (W) measures about four metres in diameter and is used by women only during the initial stages of food preparation (e.g. chopping meat into convenient pieces for boiling later inside the house) and sometimes for the manufacture of ornaments, gourd handles, etc, during the day. Normally it is located about six metres from the main entrance on any side of the outside rubbish dump (dump Y in Figure 5:7). It also acts as a children's playground. Thus we would expect to find debris associated with these activities such as bone flakes from chopping of meat as well as manufacturing debris associated with ornament making.
Fig. 5:9 Illustration of activity area centred on the open hearth and shade tree in the immediate area outside the Boma.
for example. Also children's playthings such as pebbles are left here to be used in subsequent games.

About 10-15 metres from the Boma entrance there is an area of approximately three metres diameter, where possible under a tree, with an open hearth and a honestone. A stake windbreak is constructed on the direction of the prevailing wind. This area (M) is used by men only during deliberations on herd management and other social affairs as well as for resting during hot parts of the day.

The important point to note concerns the other activities conducted in this area. These are the ones that are likely to leave debris that can be expected to pass into the archaeological record. While resting or talking the men busy themselves with manufacturing and repairing all kinds of artifacts. On many occasions, for example, I observed men manufacturing and repairing stools, sandals, clubs, flywhisks and skin bags. The latter were passed on to the women at area (W) to sew on beads for decoration. The debris from all of the above activities was left in situ - i.e. dropped in front of the manufacturers without any attempt to clean it away. However, I observed that large wooden debris was tossed into the fire as additional fuel. The small sized debris, for example useless pieces of skin, were pushed near the hearth. The distance between where the debris was dropped and the fire appeared to be determined by the air temperature. When it was cold, especially in
the mornings, the men tended to conduct various tasks closer to the fire for obvious reasons - the distance could be as close as 3/4 of a metre. When it was hot the men tended to move away from the hearth following the shifting position of the shade.

The above behaviour tends to complicate debris patterning in area (M) in relation to the associated facilities. For instance, in an archaeological context, if the hearth is visible, the hearth/debris association can be determined with certainty, but it would be impossible to extrapolate the shade/debris association without the benefit of the original tree and its canopy size. Thus the point that can be made is that most of the small debris was left in the general area of its generation, with the hearth and the shifting positions of the shade being the important variables determining the specific location of deposition in view of the prevailing temperatures at different periods of the day. However, from an archaeological perspective, very little manufacturing debris would be visible due to the perishable nature of the material used by the Maasai in the manufacture of various artifacts.

2. Meat Feasting Sites (Il Pul)

As was noted in section 5:2 there are two variations of these sites. First I will examine the meat and soup feasting site used by all members of a family except the Morans, here referred to as 'family 01 Pul'.
The arrangement of the physical facilities - i.e., activity areas - has already been discussed in section 5:2. Figure 5:10 illustrates the various activities and the bone discard behaviour that take place in the family Ol Pul.

The frequency with which cattle, goats and sheep are slaughtered in these site types depends on several factors. Generally these will include the wealth of its users as well as their general health. If a member of a family falls ill or if the head of a family is rich enough and feels that his family needs a treat or if the family's fat supply is depleted, a healthy and fat steer is slaughtered in the Ol Pul. All family members go to the Ol Pul together with friends to feast on the meat and soup that is made with the bark of certain trees and shrubs known to have medicinal properties.

Butchering is done at area (X) (see Fig. 5:10) and as is the Maasai custom all ribs from one side of the animal are roasted on the outside hearth even before skinning of the carcass is complete. These are consumed and the rib bones dropped next to the hearth (H). The men then return to complete the butchering after which some meat is chopped into convenient pieces for boiling and the remainder is stored in the smaller enclosure on the meat rack. This activity is carried out at location (X) where some useless bone flakes (in terms of their broth making potential) are left in situ. While the meat/soup is cooking, the head, the tarsals and carpals are singed to remove the hair from the skin. Those from small animals such as sheep and goats
Fig. 5:10 Activity area, activities and bone discard behaviour in an Ol PuL.

- Sleeping Area
- Hearth
- Meat storage rack.

KEY
- Very dense bone distribution
- Relatively dense bone distribution
- Bone splinters and flakes and other small bones e.g. small stock ribs
- Men sitting
- Butchery site

SS SS Bone splinters and flakes and other small bones e.g. small stock ribs

1m Stack of firewood
are roasted and eaten there and then. The bones are normally chopped at both their distal and proximal ends and the marrow sucked out and eaten. Those from cattle, which are larger, are broken at the middle using an anvil of wood or stone and a heavy object (e.g. clubs) or hacked repeatedly at the middle with a sword until the marrow is reached and eaten. However, it should be pointed out that due to their size, cattle bones are often not eaten after singling of the hair but are boiled together with the head for soup. The important thing to note is that both ends of sheep and goat bones are left in situ where they were chopped off, especially around the firewood stack which is used as an anvil. The shaft tubes of these bones, without their distal and proximal ends, are thrown near the hearth. In a similar manner the two halves of cattle metatarsals and metacarpals with both the distal and proximal articular ends intact, end up near the hearth after marrow extraction.

When the meat/soup is ready, the meat is placed on Leleshwa leaves (see (A) in Figure 5:10) and adults squat round it eating. Towards the end of the session each individual picks a bone or two and retires to a choice spot where he sits down. When all the meat has been eaten the bones are thrown in the area near the fire. Marrow bones are broken as noted above and the bone splinters are left in situ whereas the larger pieces are tossed near the hearth. After the soup is drunk the dregs or bone juice are dumped at the side of the hearth.
The hearth acts as a magnet for dumping of bone refuse. In Figure 5:10 it can be seen that the densest distribution of bones is near the hearth, on the side that people do not sit - i.e. between the fire and the stack of firewood. The bones in this area are often the larger ones whereas small bones such as ribs of sheep and goats are normally dumped in front or at the side of the eating men around the meat heap in location (A) illustrated by (ssss) in Figure 5:10. Bone splinters are also illustrated by (ssss) in the areas where the men retire after most of the boneless meat has been consumed at (A) and engage in marrow extraction.

The tossing of the larger bones near the hearth is a form of preventive maintenance of the sitting area since not all people carry sitting stools to the Ol Pul. Only very old men carry their stools more out of habit. All other people clear their sitting place on the ground of all debris which is then thrown near the hearth where nobody sits.

When the people have eaten their fill they lie down or just sit in the Ol Pul talking. However, during this time some people engage in manufacturing new clubs and sticks, skin belts, scabbards and so on. The debris from these tasks are left in situ. Thus archaeologically one can expect a similar site to have traces of artifact manufacture, as reflected by the discarded debris and old manufacturing
tools. However, due to the specific nature of Maasai material culture which involves highly perishable materials such as skins, wood, etc., most if not all of these manufacturing activities are unlikely to leave any archaeological traces.

As noted elsewhere the smaller enclosure is used only at night by the young men who guard the meat when the other family members have gone back to the Boma. The hearth here is used only for warmth since all cooking is done on the outside hearth. Thus we can not expect to find food debris such as bones in this section of the Ol Pul. The only features that we can expect to find archaeologically are the hearth and possibly the raised bed platform which results from repeated addition of fresh Leshuwa leaves every time the Ol Pul is in use (see Fig. 5:17 and Plate 5).

The other variation of the meat feasting sites are the Moran II Puli (see section 5:2). From the outset I wish to point out that during my fieldwork it was not possible to observe activities in these sites due to the distances involved from Lemek to the nearest rockshelters. The information contained herein is based on Gramly’s (1975) work on the rockshelters near Leshuta in Narok district, and my personal observations of these same rockshelters in August 1984 and September 1985. See Plate 4 and 5 of the Leshuta rockshelter and also Figure 5:4.
Moran II Puli sites are either located in rockshelters or clearings deep in the forest. The latter is a true duplicate of the family Ol Pul already discussed. Thus we expect all activities observed and discussed for these sites to be similar except that the actors are Morans.

In the case of a rockshelter Ol Pul, butchery is done outside preferably under a tree and the roasting and boiling of the meat is done inside the shelter. The methods already noted for bone treatment also apply in this case. One point to note is that due to the restricted nature of a rockshelter most of the bones are not accorded any special disposal and end up scattered about in the rockshelter around the hearth with larger bones forming accumulations on the talus slope where they are thrown after the meat and marrow has been eaten. In these meat feasts each Moran endeavours to supply a steer due to the prestige accorded a person who does so. Also there is a general preference among the Morans for beef although sheep and goats will do in the scarcity of steers either from raids or from their families. Thus a predominance of cattle bones should be expected.

Other activities in rockshelters are often conducted while resting. These include repair and redesigning of ornaments, renewal of the ochre pigment dressing on their bodies and weapons, and grinding ochre using the glenoid cavity of the scapula as a mortar and a smooth pebble as a grinder.
Also the excess ochre pigment is purposely wiped in linear designs on the walls and ceilings of the rockshelters. This is the rock art that has been attributed to these feasting Morans in East Africa.

3. Seasonal Cattle Camp

The layout of these sites was discussed in chapter 5:2. The points raised below are based on information from the Maasai and my personal observations of Kimani seasonal cattle camp occupied during the drought of 1984. The site is shown in Map 1:1. However, it is of interest, in terms of future researchers' well-being, to point out that abandoned seasonal camps are infested with multitudes of fleas which might make any investigation most unpleasant.

As noted earlier these sites are very temporary and transient, making their visibility from an archaeological perspective very dubious. The houses are similar but smaller than those in a Boma and they are not internally subdivided. They contain a hearth between three stones where meals are prepared. The area behind the hearth is used for sleeping, as usual in these short-term sites the beds are made of Leleshwa leaves. Figure 5:11 illustrates the inside of one such house (also see Pl. 3).

The length of time that a seasonal camp is to be used is determined by the continued availability of pasture and water in the vicinity. This factor, thus, determines how
Fig 5:11 Illustration of a single house in a Maasai seasonal cattle camp.

- Outer perimeter thornbrush fence
- Entrance
- House
- Cattle pen
- Refuse composed of bones, ashes and other unwanted items like skins, paperbags, etc.
- Beds of Lelesha leaves
- Hearth with dots representing three stones
permanently the houses are built. Sometimes, for example, houses are not built at all and herders sleep in the open while at other times they are not roofed in the traditional style but are roofed with portable skins. The occupiers of these camps mainly subsist on traded grain, some milk and occasionally meat. All food preparation is done inside the house. Rubbish is scattered around the hearth away from the sleeping areas and only very occasionally is it swept and thrown on the nearest fence. However, the amount of rubbish is very small. Ashes from the hearth are periodically removed and dumped near the fence together with the little rubbish that may be inside the house.

Generally, it appears that the effort expended in maintenance of these camps is negligible on account of their transient nature. However, one important point to note is that the people often engage in manufacturing various utilitarian items such as stools and clubs. These activities are conducted inside or outside the house depending on the time and temperatures during the day. Thus one would envisage debris from such manufacture to occur archaeologically, depending of course on the durability of the raw material and the finished tools.

In modern seasonal camps the Maasai use tin cans for food preparation but according to my informants one or two clay pots were taken there by the women during the old days before the introduction of metal tins. If these pots broke
the potsherds were thrown anywhere outside the house but very often near the small refuse heap on the fence. This is to be expected since once rubbish has been dumped on a particular spot, it acts as a magnet for further dumping.

On the whole one can conclude that refuse disposal patterns in seasonal camps are not as clearly defined as in the Boma. This, as noted above, is a result of the ephemeral and transient nature of the camps themselves as well as the traditional division of labour among the Maasai community whereby the women are regarded as the maintainers of settlements and the men their defenders, with the children taking up the future roles of their genders.

4. Butchery Sites

These types of sites can be created within a matter of hours and can either be reused on subsequent occasions or a new one can be made. The selection of a new site or abandonment of an old one is determined by the conditions thought to be important. These include its seclusion from the Bomas, availability of firewood and shade trees.

As noted earlier a butchery site consists of a single open hearth where the meat is cooked. During reuse of such a site a new hearth is made next to the old one or the excess ashes are scooped out of the centre and spread outwards and the fire kindled in the space so cleared.
This activity results in what, archaeologically, would appear as one extended hearth. The hearth might have three stones used to support the pot over the fire, especially if some of the meat is boiled. Although most of the meat is roasted on these sites, that from sheep, which tends to be extremely fat, is boiled to avoid loss of the fat were it to be roasted. This was confirmed by my informants as well as my observations of a sheep butchered at Ol Doinyo OleNabala (see Map 1:1) where all the meat, including the ribs, was boiled. However, most butchery site hearths do not contain the three stones noted. Meat is roasted by skewering it on sticks planted on the ground beside the hearth (see Pl. 6).

The actual slaughtering and dismemberment of an animal is done on a spot located at an approximate distance of three metres from the hearth. This spot is marked by the presence of part of the braincase since the Maasai do not eat the brain and it is removed together with part of the cranium and dumped at this spot. The horns are hacked off the head and also dropped here at the butchery site. The vertebra is split to remove the spinal cord which is never eaten (plate 7). Thus barring scavenger activity, bone fragments from these activities can be expected to be archaeologically visible. The jaw bones - mandibles and the maxillae - and the dentitions are sent back to the Boma where they are boiled and eaten and the bones disposed of as already discussed in section 5:3a.
In accordance with usual Naqsaï custom, ribs from one side of the animal and sometimes one forelimb, together with the scapula, are roasted before skinning of the animal is complete. These are shared among those present. The amount of meat roasted at this stage depends on the number of people present at the site. The metacarpals and metatarsals are also roasted and eaten as we noted earlier. The distribution of the meat and the subsequent discard of the bones is illustrated in Figure 5: 12.

In the initial sharing of the ribs, forelimbs, carpals and tarsals, the men sit in a semi-circle around the hearth. The bones are cracked for marrow using the methods already described and are dropped between the seated men and the hearth in the area marked by (xxxx) in Figure 5: 12. Thus one would expect to find longbone shaft tubes and their detached articular ends, phalanges and ribs in this area.

When butchering and dismemberment is completed the meat is shared into two parts: one will be eaten at the butchery site by the men and the other will be sent back to the Boma for the women and children. The latter will be treated in the manner already noted for the Boma. When the meat belonging to the men is ready, it is placed on Leleshwa leaves and they sit round eating at location (M). The bones, once picked of all meat, are cracked for marrow and dropped either in front or to the side of the eaters. When the men are finished with the meat, a roughly circular
Fig. 5:12 A Butchery site at Ol Doinyo Ole Nabala where butchering, meat consumption, bone treatment and discard were witnessed.

**KEY**

- **M** Meat placed on a table of Leleshwa leaves
- Eating areas where all the Men sit picking pieces of meat from the communal table M. This becomes the drop zone of the bones (see text for details).
- Men seated while the meat is cooking on the hearth.
- Drop zone of bones by the seated Men (⊕)
scatter of various discarded bones will clearly be visible about three metres from the hearth.

The meat shared to the Boma includes the vertebral column, the two hindlimbs, the head and all the internal organs excluding the liver and heart which are only eaten by the men. However, as pointed out earlier the amount depends on the number of people that were present at the butchery site as well as the size of the animal carcass to be shared.

In conclusion, it appears that a butchery site will have three localized bone scatters. First there will be the flakes and the horns which result from processing the head and the vertebra at the butchery area. Secondly there will be the semi-circular scatter already noted - (xxxx) in Figure 5:12. Finally there will be the circular bone scatter at (M). This scatter, however, will lack phalanges since these are roasted together with metacarpals and metatarsal and dropped around the hearth. In all the three butchery sites where bone treatment was witnessed by this researcher, the phalanges were not split lengthwise to extract their marrow but were always dropped next to the hearth after all the adhering scraps of meat were eaten. This was also confirmed by my informants who agreed that the amount of marrow in the phalanges was not worth the effort.
5. The Manyatta

A Manyatta and its associated facilities has already been discussed in section 5:2. It is simply a warrior village hence it involves mainly activities associated with warriorhood. It should, however, be pointed out that all the information given below was acquired through ethnographic interviews since in modern times true Manyattas are no longer extant (also see section 5:2). Thus it was not possible to observe the activities described herein at firsthand.

Rubbish disposal practices in the Manyatta approximate those already recorded for the Boma. The houses and their immediate areas are swept daily and the refuse dumped on the nearest fence.

The warriors subsist on milk and meat only. An interesting phenomenon is that meat meals are never eaten inside the Manyatta. Sheep and goats are slaughtered and consumed several hundred metres from the village, in an Ol Pul similar to the family Ol Pul already discussed. Cattle are slaughtered even farther afield at sites deep in the forest or in rockshelters. The only meat brought back to the Manyatta for the women and the young people consists of the head, neck and the viscera. In the case of a steer, one hindlimb might be added. Also if the vertebra is not fat, it is shared to the women. However, the humerus is traditionally sent back to the Manyatta specifically for
the elders who advise the warriors.

Thus one would expect very few bones to be found in a Manyatta since most of the meat is consumed outside its confines. The bone discard behaviour outside the Manyatta approximates that already discussed for the family Ol Pul and the butchery sites.

In the Manyatta traditional beer is made in large round gourds and pots. If these break, the sherds are discarded inside the enclosure but those that break outside are left there. However, these vessels are never taken outside the houses. If any vessel was used in any of the initiation rites for the Morans, when broken, its pieces are traditionally discarded at the middle of the cattle pen. Thus we would not expect these sherds outside the Manyatta.

Having adduced information about how refuse is organised in the different site types, chapter six examines bone modification (causes and effects). It is important to note that bones form one of the major constituents of humanly derived refuse in the different site types. The rest of chapter six deals with the analysis of data from the bones collected from Maasai abandoned sites. These are used to add weight to the ethnographically documented refuse disposal and bone modification patterns. Using the ethnographic information, models of refuse disposal and bone modification are formulated and the data from bones from abandoned sites are used for testing the hypotheses.
CHAPTER SIX

BONE MODIFICATION AND DISCARD

6:1 Ethnographic Bone Modification.

As stated in section 2:4 bone modification is a result of the treatment it undergoes through human and animal behaviour and other taphonomic processes. In the preceding sections the various Maasai behaviours that potentially modify bones have been alluded to. These include butchery techniques, secondary processing, distribution of meat among a site's occupants and the associated specific modifications such as cutmarks, burning and fragmentation of particular anatomical parts during consumption of the meat. These activities and the consequent bone damage are examined in more detail below.

Butchery Techniques.

The following is a summary of the steps followed in butchering an adult cow and is based on my observations of the activity at Muswen in Lemek Location, as well as information from the Maasai. It conforms to the standard pattern employed by the Maasai in all butchery. The implements used are their simis (swords) — every Maasai man owns one — and small hand knives similar to modern kitchen knives.

The cow butchering proceeded as follows:

1. Using the horns, the cow is knocked down and its legs are held firmly to the ground by four men. A sharp knife
is driven through the back of the neck at a position between the atlas and the occipital condyle in such a way as to reach and sever the spinal cord. The cow dies almost at once.

2. The animal is placed on its back by four men, each holding and pulling the legs upwards and sideways. The skin is slit along the ventral line from the neck to the udder. Cuts are also made along either side of the udder and along the inner portion of both hind and forelegs to the distal end of the cannon bones. The skin on the left side is then pulled away from the body and carefully cut away intact using a knife. The muscles that twitch the skin are left adhering to the body. Once this process has started and a handhold has been made between the skin and the body, finger knuckles are used to push and peel the skin from the body, literally pulling it away. Using this technique with occasional selective cutting in places, the skin is completely freed from the left side and both left legs.

3. The cannon bones are carefully removed using a knife, by cutting at the contact between their proximal end and the adjacent articulation. The cannons and adjacent bones in their skin and the hooves are left intact. These are then placed on the fire which has been kindled in the butchery site hearth. When all the hairs have been singed, the now hot hooves are hit with a club and fall off the
cores. When sufficiently cooked they are removed from the fire and placed beside it.

4. The left forelimb is removed by two men; one pulls it upwards and away from the body and the other uses a knife to sever the attachments which hold the scapula to the rib cage. With a lot of finnese, this is easily accomplished and the forelimb which now includes the scapula, humerus and radius-ulna comes away cleanly with all bones intact.

5. The ribs of the left side are removed as a single unit. A slightly lateral ventral incision is made in the abdominal region so that the intestines are exposed to avoid damage to them and the probable emission of their contents. Those ribs that are joined to the sternum are separated using a simi. The rib package is then removed by pulling upwards towards the vertebral column, and the ribs are severed at their joints with the vertebrae. However, inexperienced butchers tend to chop the proximal heads which are left attached to the vertebral column. These ribs are immediately roasted and when ready are shared together with the cannon bones among all those that are present at the site. The meat from the cannon bones is eaten and the metacarpals and metatarsals are cut at both their articular ends with a simi or broken or hacked at the middle, using a heavy object or simi, and the marrow is sucked out. The resultant bone splinters are then
discarded around the hearth as has already been discussed. Meanwhile butchering is at a standstill and is only continued after this eating session.

6. The left hindlimb is removed by two men as before, one man holds the limb and the other cuts. An incision is made directly to the head of the femur, and the ligaments which join it to the acetabulum are severed with a knife. Thus the hindlimb is freed with the femur and tibia intact as a single unit. The specific steps taken illustrate that the Maasai use finnese rather than force and that they know just where the joints are located and can cut directly to them.

7. The blood which has collected in the chest cavity is scooped out and saved to be used in making a kind of meat stew. The carcass is then turned over to allow the butchering of the right side. To this end a number of leafy Leleshwa branches are cut and arranged to form a clean mat on the ground adjacent to, and along the length of the cow backbone. The removing of the skin, forelimb and hindlimb from the right side proceed in the manner noted for their counterparts on the left side.

8. The next step is the removal of and processing the digestive system. The whole system is removed together with the contents of the chest cavity as an intact unit. By cutting, the neck, the esophagus and trachea are
severed and with selective cutting in places all the chest cavity organs are pulled towards the posterior where the rectum is also cut so that together with the four stomachs, they form one single bundle when pulled out. This bulky bundle is then pulled about four metres away from the body where the different organs are separated and cleaned. The liver is roasted and eaten by the oldest men present.

9. The right ribs are removed in a similar procedure as their left counterparts. The sternum is removed on its own. The head is left connected to the vertebral column and the pelvis.

10. The head is severed at the atlas/axis joint using a knife. The neck is then severed from the rest of the vertebral column. Using a simi the vertebral column is cut crosswise just above the sacrum, and the pelvis is removed attached to the caudal vertebrae as one piece. In some cases the pelvis is hacked lengthwise with a simi. Sometimes the vertebrae are split lengthwise through the middle to remove the spinal cord which is then discarded (Plate 7).

11. Finally the horns are removed through a combination of pulling and hitting the sides with a wooden club until they come out of their horncores. This, however, is only done if the horns are undamaged and are usable as drinking vessels. Otherwise the horns are chopped off at their base with the head and are discarded.
From the above present day Maasai butchery techniques, it should be noted that the longbones, (with the exception of the vertebrae, ribs and sometimes the pelvis) survive the primary butchering process intact. The skull remains almost complete, while, as noted, the ribs and the vertebrae are extensively damaged. Only the split tubes and chopped off ends of the metacarpals, phalanges, some ribs from the left side, the horns and the contents of the digestive system are left on the actual butchery site and its immediate area. The finesse with which the various bones are severed means that cutmarks will be localized on the articulation areas of the anatomical portions and will not be found on the other parts of the bones as far as primary butchering is concerned.

The Maasai butchery and carcass dismemberment strategy is an example of how the amounts of muscle and the character of connective tissue in an animal condition man's selection of the most effective mode of dismemberment. In turn this is also influenced by the intended use of the carcass — e.g. sharing to people that tradition decrees must have a share.

The ways in which different ethnic groups dismember the anatomy of animals, particularly ungulates, have been recorded by several workers. The Maasai, Dassanetch, Akamba and Kalenjin by Gifford (1977); the !Kung San by Yellen (1977a and b); and the Nunamiut Eskimo by Binford,
Fig. 6:1 Dismemberment practised by various ethnic groups during butchering. The boxed numbers refer to carcass specimens taken together as a unit but not necessarily in an ordered sequence of dismemberment as Nos. 1, 2, 3--etc would suggest. (Adapted from Binford, 1978).

<table>
<thead>
<tr>
<th>BODY PART</th>
<th>MAASAI</th>
<th>KALENJIN</th>
<th>AKAMBA</th>
<th>CAPRINE TCH</th>
<th>ROVINE TCH</th>
<th>IKUNG SAN</th>
<th>NUNAMIUT</th>
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<tbody>
<tr>
<td>Skull Mandible</td>
<td>1</td>
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<td>Atlas/Apis</td>
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<td>Cervical Vert.</td>
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<td>Ribs</td>
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<tr>
<td>Upper Lumbar Vert.</td>
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<td>Radio-cubitus</td>
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</table>
(1978) are some of the examples. Fig. 6:1 compares the ways in which these groups partition an animal during butchering.

In Fig. 6:1 the horizontal double lines separate different units of the carcass, whereas the single horizontal lines separate sub-units according to different ethnic dismemberment practices. The dotted lines separate different sub-units which are occasionally, but not always, taken together depending on the intended use - e.g. in sharing, lower foreleg acts as a convenient handle in transportation hence the whole leg is removed as a unit without disarticulating between the carpals/meta-carpals joints.

An examination of the figure reveals several points of interest:

1. All the groups separate the head from the neck at the occipital condyle and atlas vertebra joint.

2. All groups separate the neck from the remainder of the vertebrae except the Kalenjin and Dassanetch (caprine) who further sub-divide atlas/axis from cervical vertebrae.

3. All groups separate the front leg from the axial skeleton. Further sub-division of the leg into upper and lower parts generally is done between the carpals and the distal radio-cubitus.
4. All groups separate the hind-leg from the vertebrae. However, there is considerable variability in the degree to which half the pelvis is left attached to the hind-leg instead of the axial skeleton, and/or taken out as a single separate unit. Where steel swords or axes are used in butchering the pelvis and/or sacrum are butchered off with the hind-leg. Where small knives are used, the pelvis and/or sacrum are butchered off with the lumbar vertebrae or as a separate unit.

5. All groups generally treat the vertebral column with ribs and brisket as a separate unit. However, again there is considerable variability in the way the thorax and vertebral section is processed into smaller sections. All groups except the Kalenjin and Akamba treat the ribs as an independent unit.

The butchering sequence varies somewhat from group to group. However, the points at which cuts are made on the bony structure of animal are very similar due to the limited number of specific areas on a caprine or bovine anatomy that allow easy disarticulation. Subsequent disarticulation of the carcass into manageable pieces during secondary processing is conditioned by the method of cooking and/or intended use of various parts - mainly inter-age/sex meat sharing. Thus, this will show considerable variability in the bone damage due to the variation of meat-sharing inter-group traditions and customs. This has important
implications for interpretations of damage on archaeological bone assemblages; an aspect to be discussed in detail in chapter 7:2.

**Secondary Processing.**

Most of the bone damage as far as the Maasai are concerned is done during the process of meat distribution, cooking and consumption. According to Maasai informants and my personal observations, all longbones are severed into single longbone joints as units. Further subdivision of these bones and consequently the intensity of damage will depend on the number of people whom custom decrees must have a share. In most cases, however, longbone joints are shared whole without further chopping up.

It is important to note that meat sharing among the Maasai is only done to the relations of the owner of the animal, who for one reason or other can not go to where the meat eating is carried out - e.g. Ol Pul or Boma. Very little, if any at all, of the meat is shared to other occupants of different Bomas. According to Maasai custom all the meat belongs to the owner of the animal and anybody wanting a share takes himself to the former's Boma and eats the meat there. Thus it seems to be reasonable to state that meat distribution outside the Boma or butchery area is very limited and therefore we expect it to have negligible effects on the distribution of the bones in relation to the actual area of butchering and consumption - i.e.
outside the Boma whose owner has slaughtered an animal and the related Ol Pul or butchery site. However, in this connection it should be noted that a considerable amount of sharing is carried on between the butchery sites and Ol Pul on the one hand and the Boma on the other.

Variation in cooking practices seems to play a considerable role in bone breakage and damage. This is conducted in the various sites either through roasting or boiling. As has already been alluded to, meat roasting is very common in all the Maasai sites except the Boma. For example, we have seen how the Maasai roast all ribs from one side of an animal even before butchering is complete. This activity results in almost complete ribs except for their proximal heads which are chopped off and left attached to the vertebral column during primary butchering — after the meat has been eaten. As far as the longbones are concerned, the Maasai custom is to roast the joints (e.g. humerus, femur, etc) as a whole single cut for large animals like cattle; and the whole limb (e.g. femur/tibia, and scapula/humerus/radius-ulna) intact as one unit for small stock like sheep and goats. These meat joints are either skewered on sharpened sticks planted in the ground very close to the fire or are placed on a wooden rack built over the fire (see Plate C). They are disarticulated at the joints after the meat has been carved from the bones. We can note three points of relevance to bone modification.
in this connection; first cutmarks will be relatively concentrated and localized around the articular joints both for large and small stock. Secondly, burning of bones will occur on longbone ends and the associated dense bones like astragulus, calcaneum, etc of large animals and on the ankle/wrist bones (e.g. distal radius and tibia) of small animals. This is on account of the fact that these are the only areas of the bones that are exposed to the open fire whereas the other parts are covered by the meat. Lastly the bones that contain marrow are broken and discarded through the various methods we have already noted.

The other variation of meat preparation commonly employed is boiling in water with medicinal herbs and shrubs. This method results in extensive bone damage. When meat is prepared for boiling it is chopped up into convenient pieces depending on the size of the pot. These days the Maasai use aluminium pots of variable sizes but in the old days, according to my informants, clay pots were used which were traded from neighbouring groups, especially the Dorobo and more recently the Kikuyu since the Maasai never made pots. However, it was not possible to establish the most commonly used pot sizes. The Maasai chop longbones, cattle ribs and all other large pieces into smaller cuts that will fit in a given pot. The longbone ends that contain the spongy bone as well as the marrow sections are chopped to permit the blood and marrow to seep into the soup.
For meat that is boiled we can note several points as regards bone breakage and damage. Firstly the spongy longbone ends will be split lengthwise. Secondly the marrow sections of these bones will show chopping or hacking marks at the middle of the shaft thus rendering longbones into two roughly equal parts.

Thirdly large ribs - e.g. from cattle - will be chopped crosswise into pot-sized pieces. Lastly other bone parts such as the pelvis will show hackmarks received when they were reduced into pot-sized pieces.

The greatest degree of bone damage is done during meat consumption. The Maasai pick the bone completely clean of all meat scraps by combining the use of their teeth and simis (swords). Often I observed the Maasai using teeth and simis to cut away ligaments from longbone ends inflicting extensive cutmarks on the bones. Also in this process the simi was used to cut a toothhold on the periosteum by a combination of cutting crosswise and scraping lengthwise up and down the bone. This action resulted in fine cutmarks running across such bones. The worst victims of this action were ribs and to some extent longbones. After all the meat has been picked from the marrow bones which were not chopped up during cooking, they are broken for marrow in the ways already noted and discarded since they are of no further value to the Maasai.

In conclusion Maasai bone modification can be said to
be a compound of the damage inflicted during primary butchering and the final phases of processing for distribution and cooking. As noted, further damage is done during the consumption phase. Once the bones have been picked of all meat and marrow has been eaten, they are discarded in the various ways already discussed. Thus it can be seen that faunal remains modification and patterning is a result of traditional or cultural behaviours of the Maasai in relation to butchering, processing and consumption of meat. In this connection, however, it is important to note that once people are through with the bones scavengers, especially dogs, take over and gnaw the bones until they no longer yield any eatable meat scraps. This, together with natural and taphonomic processes (e.g. weathering) act on the same bones to modify and pattern them further, thus complicating the picture for future archaeologists. However, bearing these cautionary points in mind one can use the ethnographic evidence presented above to formulate hypotheses and construct models that can be tested against the archaeological record as regards the modification and patterning of faunal remains.

The bone damage patterns noted above are illustrated using the results of the analysis of the bones I collected from abandoned Maasai sites in the sections that follow.
Maasai Butchering Techniques: Analysis of Samples from Abandoned Sites.

This section attempts to determine what kinds of factors affected bones after they had been discarded, and the extent to which these effects were random. In addition, through a form of attribute analysis of these bones (e.g., cutmarks, fragmentation and burning in relation to position and form on different anatomical parts) it is hoped to reinforce ethnographic observations of these attributes. Thus, in a way the analysis of the bone sample from abandoned sites tests the ethnographic patterns observed in the preceding section.

As already stated, all visible bones were collected from an abandoned Maasai Boma and Ol Pul. In a sense, these bones provided a kind of an archaeological sample, albeit a recent one, and it is possible to treat abandoned sites of this type as one might treat material from any other surface collected sites.

It is important to note several points before presenting the analysis of the bone samples. Firstly, just as the way in which the Maasai butcher their animals is culturally determined and may or may not be repeated by different human groups, so too it can be argued that each archaeological context is unique and that the observed results of bone preservation modification in each context will be unique and may not be applicable in
other situations. However, by examining attributes of the bones relating to their modification - e.g. cutmarks, fragmentation, burning, etc. - it is possible to use such ethnographically documented data to suggest interpretations of archaeological bones with similar modification attributes. Secondly, in a context like the above, it is necessary to distinguish between "absolute" and "relative" patterns of preservation. It may be assumed that the absolute rate of preservation - i.e. the total number of bone fragments which survive in recognizable form - will vary enormously depending both on the nature of the surface where they were deposited, and on the subsequent geologic and taphonomic events. However, this does not necessarily hold true for the relative pattern of preservation. Yellen (1977), Brain (1981) and Binford (1978) have shown that the physical nature of the bones themselves, their 'archaeological' context and the way in which they were originally broken, to a great extent, determines the relative rate of their disintegration. Thus, in this connection the cultural imprint (i.e. cultural bone breakage among the Maasai) takes on real importance as concerns bone preservation. However, risking repetition, animal behaviour, geologic and taphonomic processes will be just as important as the cultural ones in archaeological bone preservation, but these variables are outside the scope of this thesis and are therefore not examined.
Cattle, sheep and goat bones from a Boma abandoned in 1978 and an Ol Pul last used in 1981 form the basis for the following analysis. The Boma, according to my informants, was occupied for about 10 years before its abandonment in 1978, and the Ol Pul was intermittently used since the 1960s. However, it was not possible to reconstruct the various steps of specific activities (in relation to butchering) conducted on these sites from my informants’ information. For instance, all agreed that the Boma was occupied throughout the year by a part of a family for all the years noted, but when it came to actual numbers of animals slaughtered and consumed in the respective sites, the only answer that they could agree on was "very many". However, my informants were more precise about the activity areas in both sites and the patterns of bone discard (see section 5:3).

At each of these two sites a grid was constructed and all surface features - i.e. houses and hearths - and observable localized bone clusters and all dispersed bone fragments were mapped. The bones were then collected for further analysis in Nairobi. The reference collection of the Osteology department of the Kenya National Museum was used for taxonomic and anatomical identification of the bones.

Analytic Methods

As noted elsewhere the faunal remains which this section
deals with were surface collected from the whole area covered by the two sites: Lemek East Boma (Fig: 6:2) and Lemek North Ol Pul (Fig. 6:3). Each of the two bone assemblages was treated as a sample of all the bones discarded by the site’s inhabitants. It is known among archaeologists that animal scavenging and other taphonomic processes act on assemblages after discard and deposition. For example, in the two bone assemblages dealt with, there is a paucity of loose teeth and smaller dense bones of the extremeties (e.g. manus and pes, and tarsus and carpus) which suggest that these were trampled upon and buried in the unconsolidated substrate of the sites. This is supported by the occurrence of mandibles which were without a single tooth attached. Thus it would be misleading to attribute all bone modification and the assemblage composition to the sites’ creators. These points make it difficult to evaluate the reliability of estimates.

However, a comparison of the composition and condition of the bone samples with the ethnographic observations can, to some extent, evaluate its - and by extension other archaeological samples - reliability as a source of reconstructing past human behaviour. For example, all Maasai butchery is done away from the Boma and selected meat cuts are shared to it. These include all or some part of the limbs, the neck, vertebral column, pelvis, head and the intestines. All ribs and sometimes one or both forelimbs are roasted and eaten at the butchery site. This meat
Fig. 6:2 LEMEK EAST BOMA: Density of bones; number of pieces are entered in appropriate squares.
Fig. 6:3 LEMEK NORTH OL PUL: Density of bones number of pieces are entered in appropriate squares.
sharing habit is entrenched in Maasai traditions, governing butchery and meat consumption. Thus, in any bone sample derived from Maasai Bomas, we would expect non-representation of body parts consumed in the butchery sites. This point will be pursued further in the section dealing with bone discard models.

Bones from Lemek East Boma were surface collected in five metre-grid squares (Fig. 6:2). This grid was chosen because after careful examination of bone concentrations on the whole site it was clear that concentrations formed discrete oblong clusters that roughly covered an area of five square metres. Only those bones that lay loose on the surface were collected. Bones from Lemek North Ol Pul were collected in a one metre grid on account of the smaller size of the site and the observed concentration of most bones around the open hearth (Fig. 6:3). Again only loose surface bones were collected.

The bone samples were isolated into (a) maximally identifiable (b) minimally identifiable, and (c) non-identifiable scrap. The first refers to those bones that were complete body parts or had most diagnostic morphological features sufficiently preserved to enable taxonomic identification to species level. The second refers to those bone fragments that had little preserved diagnostic morphological features and permitted identification only to a less specific level. In all cases this enabled identification either to genus,
tribe or family level. The third refers to those poorly preserved bone fragments with no diagnostic features. These were recorded as non-identifiable but in view of the fact that all identified bones belonged to ungulates, it is likely that the non-identifiable scrap belonged to this class. These bones were counted and evidence for burning and cutmarks, if present, was recorded.

For both the identifiable and less identifiable bones, a variety of other attributes were recorded. These included, in addition to anatomical and taxonomic identification, presence of conjoinable fragments of the same bone, and of articulation between elements in one anatomical unit. The surface condition of the bones was examined using the weathering criteria suggested by Behrensmeyer (1978). This involved recording of the weathering stage of the bones as reflected in surface flaking. The presence of cutmarks and chopping marks were recorded according to their position on the bones. Evidence of burning was also recorded according to position and intensity.

As indicated above the maximally identifiable bones could be assigned to appropriate species with considerable certainty. However, for the minimally identifiable bones preserved information was insufficient to distinguish two members of the same taxon known to be present in the samples - i.e. Capra hircus (goat) and Ovis aries (sheep)
of Caprini tribe. Such elements were recorded at the appropriate supra-specific level of identifiability. The non-identifiable scrap which was assumed to derive from bovids was assigned to one of the five size categories as used by Gifford, et al, (1980); very small (5-15kg); small (16-35kg); medium (40-60kg); Large (70-250kg); and very large (300-850kg) - see Fig. 6: 1/5.

Minimum numbers of individuals (MNI) - (i.e. the minimum number of individual animals in any one bone sample) - used in inter- and intra-site comparisons were reckoned as follows.

The most numerous anatomical parts for nearly all the species represented at Lemek East Homo and Lemek North Ol-Pul were teeth. Most of these (about 90 per cent) were still attached to the maxillae and mandibles. This permitted a more precise reckoning of minimum numbers for each species than would have been possible had another anatomical region than the maxillae and mandibles been chosen.

Following Gifford and Crader (1977), teeth were divided into the following four relative eruption/wear groups; a task made easier by the predominance of teeth attached to the jaws.
I. Neonate; very young juvenile with deciduous premolar very slightly worn; first molars erupting.

II. Sub-adult; deciduous premolars moderately to heavily worn or absent; permanent premolars erupting to slightly worn; third molar not fully erupted; unfused limb epiphyses.

III. Prime adult; permanent teeth fully erupted with slight to moderate wear.

IV. Aged adult; teeth heavily worn with little crown remaining; internal enamel crescents in bovid lower first and second molars absent.

As Gifford, et al, (1980) noted, this system of aging animals is extremely crude compared with Schaller’s (1972) eight to ten dental wear classes. She further noted that it distinguishes only a few actual age classes (i.e. new-borns, sub-adults and aged) from a whole range of different ages which in some larger animals may stretch over several years.

Maasai ethnographic information shows that they concentrate on prime-adults and sub-adults for their meat supply. Sheep and goats provide the bulk of this supply. Adult cattle are slaughtered for ceremonial purposes.

Thus, in view of this it was felt that the age classification discussed above was adequate. Hence more precise evaluations
of enamel height to determine approximate age in years were not undertaken.

Second, the most numerous right or left tooth element within each of the above dental wear classes were worked out and used as the MNI estimate for that class. Special care was taken to classify teeth (that were not attached either to the maxillae or mandible) possessed by two adjacent dental-wear classes to their most probable class.

It should also be noted that left second phalanx and one left scapula were used to estimate MNI for adult and juvenile cattle respectively in the absence of any teeth attributable to these classes.

Third, the MNI totals of all of the classes were summed up for individual species to obtain its total MNI. On the whole this procedure has the effect of increasing the estimated numbers of individuals relative to MNI estimates derived from a species assemblage that has not been age-grouped. However, these totals are considerably lower than those to be derived from age estimates based on enamel-wear studies.

MNI statistics are handy units of inter- and intra-site comparisons since as Chaplin has stated they "..... involve no hypotheses and .....(are) - purely factual" (1971: 69-70). However as Gifford, et al, have argued
"... they should not be assumed to reflect the true number of animals of given species processed at a site, nor should they be used as the basis of such even more tenuously derived statistics as meat weights and kilocalorie estimates" (1980:68). The MNI figures and the total number of bones (Fig. 6: 4/5) illustrate this very well.

Various methodological problems regarding inter- and intra-site comparisons using MNI estimates have been pointed out by Grayson (1978). He has noted that the proportional relation between the number of bones in a given taxon and the MNI estimates for that taxon changes with sample size such that as sample size increases each addition of identified elements has progressively less effect on the MNI estimate. For example, a taxon represented by a single identifiable element has an MNI of one, whereas one represented by 20 identifiable elements is highly unlikely to have an MNI of twenty, or even half that due to the statistical chances of drawing 20 identical elements. Faced with this problem Grayson (op cit) has suggested that comparisons of abundance be made only among taxa with similar proportional relations between the total number of identifiable bones and the derived MNI statistic. This relation can be expressed as a ratio of the MNI divided by the total number of elements attributable to that taxon - (E). However, as Gifford, et al (1980) point out, at present there is no widespread agreement on how best
to define the range of MNI/E statistics which may be permissible to compare.

Table 6:1 and 2 present these figures for Lemek East Boma and Lemek North Ol Pul respectively.

Table 6:1

<table>
<thead>
<tr>
<th>TAXON</th>
<th>MNI</th>
<th>E</th>
<th>MNI/E</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cattle</td>
<td>4</td>
<td>48</td>
<td>0.08</td>
</tr>
<tr>
<td>Goat</td>
<td>7</td>
<td>106</td>
<td>0.07</td>
</tr>
<tr>
<td>Sheep</td>
<td>8</td>
<td>116</td>
<td>0.07</td>
</tr>
</tbody>
</table>

Ratio of minimum number of individuals (MNI) to total number of identifiable bones (E) for different taxa represented at Lemek East Boma.
An examination of Table 6:1 and 2 shows that the MNI/E ratios are very different for the two sites. It may be noted that those species with relatively high MNI figures and specimens (E) have roughly similar MNI/E ratios. (e.g., goat and sheep in Lemek East Boma). As Gifford, et al has pointed out ".....the causes of variability in MNI/E statistics for taxa with roughly similar numbers of elements are as yet poorly understood." (1980:69). However, it can be suggested that the observed inter-site discrepancy of the ratios (Table 6:1 and 2) may be due to the processing of potentially identifiable elements in the two sites. For instance only selected meat cuts are shared to the Boma from butchery sites whereas nearly the whole of the animal is consumed and all bones discarded in the Ol Pul. This may influence the MNI/E statistic differentially for different anatomical parts in the two site types. The
bone sample from a Boma lacks in those bone elements not shared to it from the butchery site, whereas in an Ol Pul we theoretically expect to find bones from a whole animal.

Assemblage Composition

A total of 760 bone specimens were collected from Lemek East Boma and 360 from Lemek North Ol Pul (Table 6:3 and 4). Lemek East Boma yielded 270 maximally identifiable bones and 331 minimally identifiable scraps of long-bone shafts, ribs, vertebrae and teeth. The identifiable bones were sufficiently complete and well preserved to allow some level of anatomical and taxonomic identification. These derived from domestic cattle, sheep and goats. A similar picture is portrayed for the bone specimens from Lemek North Ol Pul whose figures are presented in Table 6: 4.
Table 6:3  Summary of the overall composition of the faunal remains sample analyzed from Lemek East Boma.

<table>
<thead>
<tr>
<th>CATEGORY</th>
<th>NUMBER OF PIECES</th>
<th>%</th>
<th>NUMBER BURNED</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximally Identifiable</td>
<td>270 (35.5)</td>
<td></td>
<td>18 (6.7)</td>
<td></td>
</tr>
<tr>
<td>Minimally Identifiable</td>
<td>331 (43.6)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tooth Fragments</td>
<td>15 (2)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vertebral Fragments</td>
<td>70 (9)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rib Fragments</td>
<td>90 (11.8)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Appendicular Fragments</td>
<td>156 (20.5)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-Identifiable Scrap</td>
<td>159 (20.9)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TOTAL</td>
<td>760 (100)</td>
<td>331 (100)</td>
<td>57 (7.5)</td>
<td></td>
</tr>
</tbody>
</table>
Table 6: Summary of the overall composition of the faunal remains sample from Lemek North Ul Dul

<table>
<thead>
<tr>
<th>CATEGORY</th>
<th>NUMBER OF PIECES</th>
<th>%</th>
<th>NUMBER BURNTED</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximally Identifiable</td>
<td>58</td>
<td>(16.1)</td>
<td>1</td>
<td>(1.7)</td>
</tr>
<tr>
<td>Minimally Identifiable</td>
<td>249</td>
<td>(69.3)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tooth Fragments</td>
<td>3</td>
<td>(0.8)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vertebra Fragments</td>
<td>10</td>
<td>(2.8)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rib Fragments</td>
<td>150</td>
<td>(41.7)</td>
<td>64</td>
<td>(25.7)</td>
</tr>
<tr>
<td>Appendicular Fragments</td>
<td>86</td>
<td>(23.9)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-Identifiable Scrap</td>
<td>53</td>
<td>(14.7)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TOTAL</td>
<td>360</td>
<td>249</td>
<td>65</td>
<td>(18.1)</td>
</tr>
</tbody>
</table>
Taxonomic Composition

The identifiable bones from Lemek East Boma and Lemek North Ol Pul are composed of remains of domestic cattle, sheep and goats. However, it should be noted that 83 bone elements (Fig. G: 4) were not sufficiently complete to allow them to be assigned to appropriate species and were grouped under the family name caprinae. It is felt that although most of these may belong to sheep or goats, it would be misleading to assume so. This is due to the fact that some of these bones may possibly belong to small and medium wild animals (e.g., Grant's gazelle, Thomson's gazelle, Impala, etc., which abound in the vicinity of the two sites). This contention, however, argues against the widespread belief that the Maasai do not include wild animals in their food resources. This belief is not completely accurate as I gathered from my field-work. Although very reluctantly, Maasai informants did tell me that they kill and eat wild animals — especially Impala — during famines when they have no other alternatives. Most Maasai rarely reveal such information due to fear of game scouts who enforce the laws against poaching of wild game. This fear is reinforced by the Maasai customs which prohibit consumption of wild animals. Adherence to these customs, however, are possible only under conditions of plentiful food supply. For instance, in August 1984, there was drought in Maasailand and many other parts of Kenya. During a field-trip to Narosura at this time, 1
observed numerous copper and steel wire snares put at strategic points on animal paths in the bush. Also I had the fortune to observe a half-butchered Grant's gazelle caught by one of these snares. Unfortunately the butchers fled when they saw us, having mistaken us for game scouts, and thus availing me no chance for an interview. However, during subsequent interviews with other Maasai they told me that they eat wild game during famine and dispose of the bones and the skin either by burying them or throwing them far from their settlements. Furthermore such bones should not be mixed with those of domestic animals lest the latter die; a taboo widely believed and respected.

From the foregoing several important points can be made. Firstly, it appears that theoretically we should not expect to find wild animal bones in Maasai settlements. However, the validity of this point needs evaluating. There is, I believe, a strong possibility that at least some wild animal bones will enter bone assemblages in Maasai settlements, however hard they try to dispose of them far from their homes. This belief is on account of the fact that various meat cuts are shared to the home settlements. The patterns of processing, consumption and discard of the bone remains will lead to at least some bone fragments and possibly smaller bones being left in the settlements. This proposition, however, can be elucidated only by observing and documenting the patterns of processing, sharing and the subsequent bone discard regarding wild animals, a difficult task for an outside observer.
A similar case may be noted for 134 elements attributed to **Bovidae**. These might include both domestic and wild ungulates but due to their fragmentary nature, they could not be assigned to appropriate species. The Maasai have fewer taboos attached to eating meat of buffalo and eland which are rightly regarded as very close cousins of cattle. Thus, elements of these animals can be expected to form part of the bone assemblages. However, no specifically diagnostic elements from these animals were found in the two samples discussed here.

Summarized in terms of MNI estimates (Fig. 6: 4; Table 6: 5), the Lemek East Boma bone sample portrays a preponderance (78.9 per cent) of domestic caprines - i.e. sheep and goats. Of this sheep dominates with 42.1 per cent followed closely by goats with 36.8 per cent and lastly cattle with 21 per cent. This order of species representation is not reflected at the Lemek North Ol Pul (Fig. 6: 5; Table 6: 6). Cattle predominate with 43 per cent; sheep and goats, if combined, represent 57 per cent; each contributing 28.5 per cent.
Fig. 6.4 Overall species composition of the bone assemblage expressed in terms of MNI with numbers of identifiable bones entered within the bars and number of elements attributable only to family recorded below.

Lemek East Boma.

TOTAL MNI for all species

<table>
<thead>
<tr>
<th></th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sheep</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>116</td>
</tr>
<tr>
<td>Goat</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>106</td>
<td></td>
</tr>
<tr>
<td>Cattle</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>48</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Caprinae</td>
<td>83 - Small to medium ungulates</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bosidae</td>
<td>135 - Large to very large ungulates</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Fig. 6:5 Lemek North Ol Pul

Total MNI for all species

<table>
<thead>
<tr>
<th>Animal</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
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<tbody>
<tr>
<td>Cattle</td>
<td></td>
<td>27</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sheep</td>
<td></td>
<td>10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Goats</td>
<td></td>
<td>21</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Caprinae</td>
<td></td>
<td></td>
<td>14</td>
<td></td>
</tr>
<tr>
<td>Bovidae</td>
<td></td>
<td></td>
<td></td>
<td>38</td>
</tr>
</tbody>
</table>

14 - small to medium ungulates.

38 - large to very large Ungulates.

Table 6:5 Minimum number of individuals in each age class for each species in the entire bone sample. Entries are arranged in descending order of MNI. The column marked 'diagnostic' records the body part from which MNI estimate was derived.
Table 6:5  Lemek East Boma

<table>
<thead>
<tr>
<th>TAXON</th>
<th>AGE CLASS</th>
<th>NUMBER OF PIECES</th>
<th>MNI</th>
<th>DIAGNOSTIC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sheep</td>
<td>Neonate</td>
<td>8</td>
<td>1</td>
<td>Right Maxilla</td>
</tr>
<tr>
<td></td>
<td>Juvenile</td>
<td>19</td>
<td>3</td>
<td>2 Left Mandibles and 1 Left lower Molar 1</td>
</tr>
<tr>
<td></td>
<td>Adult</td>
<td>54</td>
<td>4</td>
<td>Right Maxillae</td>
</tr>
<tr>
<td></td>
<td>Aged</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>116</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>Goat</td>
<td>Neonate</td>
<td>25</td>
<td>3</td>
<td>Left Mandibles</td>
</tr>
<tr>
<td></td>
<td>Juvenile</td>
<td>31</td>
<td>3</td>
<td>Left Maxilla</td>
</tr>
<tr>
<td></td>
<td>Adult</td>
<td>27</td>
<td>1</td>
<td>Left Maxilla</td>
</tr>
<tr>
<td></td>
<td>Aged</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>106</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cattle</td>
<td>Neonate</td>
<td>10</td>
<td>1</td>
<td>Right Mandible</td>
</tr>
<tr>
<td></td>
<td>Juvenile</td>
<td>14</td>
<td>1</td>
<td>Right Mandible</td>
</tr>
<tr>
<td></td>
<td>Adult</td>
<td>18</td>
<td>2</td>
<td>Left Phalanx 2</td>
</tr>
<tr>
<td></td>
<td>Aged</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>48</td>
<td>4</td>
<td></td>
</tr>
</tbody>
</table>

NB: The apparent discrepancy of the totals is due to the varying number of teeth that were attached to the Maxillae and Mandibles.
Table 6:6 Lemek North Ol Pul

<table>
<thead>
<tr>
<th>TAXON</th>
<th>AGE CLASS</th>
<th>NUMBER OF PIECES</th>
<th>MNI</th>
<th>DIAGNOSTIC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cattle</td>
<td>Neonate</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Juvenile</td>
<td>7</td>
<td>1</td>
<td>Right Mandible</td>
</tr>
<tr>
<td></td>
<td>Adult</td>
<td>11</td>
<td>2</td>
<td>Right Mandible</td>
</tr>
<tr>
<td></td>
<td>Aged</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>27</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Goat</td>
<td>Neonate</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Juvenile</td>
<td>4</td>
<td>1</td>
<td>Left Mandible</td>
</tr>
<tr>
<td></td>
<td>Adult</td>
<td>14</td>
<td>1</td>
<td>Left Mandible</td>
</tr>
<tr>
<td></td>
<td>Aged</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>21</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Sheep</td>
<td>Neonate</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Juvenile</td>
<td>1</td>
<td>1</td>
<td>Left Scapula</td>
</tr>
<tr>
<td></td>
<td>Adult</td>
<td>7</td>
<td>1</td>
<td>Left Maxillar</td>
</tr>
<tr>
<td></td>
<td>Aged</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>8</td>
<td>2</td>
<td></td>
</tr>
</tbody>
</table>

Note: The note below Table 6:7 also applies for the totals above.
An examination of the tabulated data regarding the assemblage composition (Table 6: 3 and 4), MNI estimates (Fig. 6: 3 and 5) and the age structure (Table 6: 5 and 6) of domestic animal bones permits several inferences to be made. Firstly a comparison of the total number of bones collected from each site and the related MNI estimate derived from these bones shows that the number of animals killed in the two sites has been underestimated considerably. This contention is made in view of the ethnographic evidence pertaining to the two sites. The Boma, according to my informants was inhabited consistently for the last 10 years prior to abandonment in 1978 and the Ol Pul was intermittently used since the early 1960s. Some quick calculations show that according to the MNI estimates less than one sheep, goat or cow was slaughtered per year either in the Boma or in the Ol Pul; a conclusion that is most unlikely. This underestimation is tied up with the degree of preservation of faunal remains as well as the inbuilt methodological problems of MNI calculations and data recovery methods.

The species composition both at Lemek East Boma and Lemek North Ol Pul clearly reflect features of the Maasai stock culling system. They mainly depend on small stock - caprines - for meat protein requirements, and hence the preponderance of these species in the bone assemblages. Only older juveniles and prime-adult goats and sheep are regularly killed for food supply. This is borne out by the figures in Table 6: 5 and 6. It should be pointed out
that at Lemek East Boma, sheep as a single species predominate.
A possible explanation for this is the reliance on this
species for the family fat supply, which is likely to be
adequately provided by sheep rather than goats which tend
to bear less fat, or alternatively sampling bias.

Thirdly, on the basis of MNI estimates, older juveniles
and prime-adult cattle are represented by 2 individuals
in the Boma and 2 in the Ol Pul. The significance of this
is that they represent age-classes that according to
popular belief are not culled by East African pastoralists
since they are prized for milking and future breeding. This
contention, however, appears to have been given disproportionate
emphasis. It is true the Maasai do rarely kill cattle for
home consumption, and when they do, only aged animals are
killed. However, contrary to this belief, only healthy
adult cattle are killed during culturally significant
ceremonies. The importance of these ceremonies in Maasai
culture makes the killing of healthy adult animals obligatory;
an aspect of their culture highly respected within the tribe.
Furthermore there is, among adult Maasai, a preference
for meat from mature animals. This is one instance where,
at least in view of relevant Maasai ethnographic evidence,
we would expect the entry of adult or breeding age cattle
remains into archaeological bone assemblages.
Weathering and surface Modification

This section examines the surface condition (degree of weathering) and modification of bones from the two samples. In addition to documenting bone modification patterns, it will also throw light on the factors that affected bone preservation, especially those related to human treatment of the bones. The assumption here is that the more the bones are fragmented through human behaviours the less the likelihood of their preservation as identifiable specimens. This, together with other taphonomic processes will affect the amount and parts of bones that are recovered from a site.

The vast bulk of even the identifiable bone, with the exception of teeth, at Lemek East Boma and Lemek North Ol Pul, is fragmentary. The only bones recovered in complete or nearly complete condition were the dense bones of the extremities - carpus and tarsus, manus and pes - but these formed only a small fraction of the overall bone assemblages. Perhaps due to their small size, they were more easily buried in the unconsolidated substrate of the sites through trampling by animals and the site inhabitants. This would also explain the observed paucity of loose teeth - of all the teeth recovered 90 per cent were still attached to the maxillae and mandibles with 10 per cent simple loose teeth. However this proposition
can only be verified through an excavation; a task not done in my field-work for reasons given elsewhere.

A high degree of fragmentation of bones is not an uncommon feature in archaeological sites. Although the samples dealt with here are not 'true' archaeological samples, at least they have been subject to animal scavenging, trampling, taphonomic processes such as weathering and of course human modification. All these factors are responsible for the observed fragmentation and by extension preservation of the faunal remains from the two sites.

The surface condition - i.e., degree of weathering and its characteristic flaking of bone surfaces - of bone specimens in the two samples varied. The Lemek East Boma sample, although possessing fresh, sharp articular surfaces and edges of fractures, displayed weathering cracks and flaking patterns typical of sub-aerial alteration (weathering stage one - after Behrensmeyer, 1978). Medium to large mammals' bones have been shown to develop these patterns within six months of exposure in various parts of Eastern Africa (e.g., Behrensmeyer, 1978; Gifford, 1980). Bone specimens from Lemek North Ol Pul, displayed similar fresh, sharp articular surfaces and edges of fractures but did not portray the weathering condition noted. To some extent this can be explained by the fact that the Ol Pul is located in a shady area, thus checking on intense physical weathering from direct sunlight.
Other bone modifications in the two samples are solely due to human agency and includes butchery marks, chopping marks and burning. These types of modification are common on both identifiable and non-identifiable elements in both bone assemblages. These seem to form distinctive patterns with regard to particular anatomical regions of the animals represented in the two sites. In Chapter 6: information was adduced regarding the butchery and culinary practices of the Maasai which can be tabulated to show the expected modification of various body parts, as determined by the mode of processing. This can then be compared with the actual modification of various body parts collected from the sites (Table 6: 7). The archaeological implications are considerable. For instance, if archaeological butchering and culinary practices, regarding a given site, were similar to the documented Maasai ones, then such information of expected modification can play an important predictive role in the interpretation of faunal remains from such a site.
Table 6.7  Expected ethnographic bone modification of different body parts according to their method of processing compared to the observed modification patterns of the collected bone sample from Leek East abandoned zona and Leek North. All Falls

<table>
<thead>
<tr>
<th>BODY PART</th>
<th>METHOD OF PROCESSING</th>
<th>EXPECTED ETHNOGRAPHIC MODIFICATION</th>
<th>LEEK EAST ABANDONED ZONA</th>
<th>No. OF PIECES</th>
<th>LEEK NORTH</th>
<th>No. OF PIECES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Head</td>
<td>Killing/Dismembering</td>
<td>Cut marks on occipital condyles/stilum</td>
<td>Observed on 100% of both</td>
<td>5</td>
<td>Not represented</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Removal of Horns</td>
<td>Chopping marks at their base with the skull</td>
<td>Not observed</td>
<td></td>
<td>Observed on 67% of horns</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Hair-singing/Roasting</td>
<td>Occipital condyle/incisors are incidentally burned</td>
<td>Not observed</td>
<td></td>
<td>Not represented</td>
<td></td>
</tr>
<tr>
<td>Rib and Sternum</td>
<td>Dismembering</td>
<td>Cut marks and fractures on dorsal rib head</td>
<td>Cut marks observed on 50% of dorsal rib heads</td>
<td>90</td>
<td>Observed on 64% of rib heads</td>
<td>150</td>
</tr>
<tr>
<td></td>
<td>Roasting and consumption</td>
<td>Burning on rib dorsal heads/other exposed parts. Cut marks on rib surfaces</td>
<td>Burning observed on 56% of rib fragments</td>
<td></td>
<td>Burning observed on 70% of rib fragments</td>
<td></td>
</tr>
<tr>
<td>Vertebral column</td>
<td>Secondary processing</td>
<td>Transverse chopping marks on vertebrae</td>
<td>Transverse chopping marks observed on 65% of vertebrae fragments</td>
<td>70</td>
<td>Transverse chopping marks observed on 40% of vertebrae</td>
<td>10</td>
</tr>
<tr>
<td>Pelvis and Sacrum</td>
<td>Secondary processing</td>
<td>Chopping marks on Iliacus/Ilium and Innominate</td>
<td>Chopping marks observed on all 7 pieces represented</td>
<td>7</td>
<td>Chopping marks observed on 75% of pelvis bones</td>
<td>8</td>
</tr>
<tr>
<td>Femur</td>
<td>Dismembering</td>
<td>Cut marks on the proximal/distal end if removed as a unit and on proximal end only if removed together with tibia as one unit</td>
<td>Cut marks observed on 100% distal ends and on 73% of proximal ends</td>
<td>11</td>
<td>Cut marks observed on both proximal ends</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Roasting</td>
<td>Burning on femur head and distal end if roasted as a unit</td>
<td>Burning observed on 73% of femur heads (proximal ends)</td>
<td></td>
<td>Burning not observed</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Narrow Processing</td>
<td>Chopping marks at the middle of shaft tube or on both the proximal and distal ends</td>
<td>Middle shaft chopping marks observed on 64% of all femora</td>
<td></td>
<td>Proximal end chopping marks observed on both elements</td>
<td></td>
</tr>
<tr>
<td>Tibia</td>
<td>Dismembering</td>
<td>Cut marks on the proximal/distal ends if removed as a unit or on distal end only if removed together with femur as one unit</td>
<td>Cut marks observed on 37% of proximal/distal ends</td>
<td>23</td>
<td>Cut marks observed on 83% of proximal/distal ends</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>Roasting</td>
<td>Burning on distal end if astragalus is not attached and proximal end if not roasted with femur as one unit</td>
<td>Burning traces were observed on 4%</td>
<td></td>
<td>Burning not observed</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Narrow Processing</td>
<td>Chopping marks at middle of the shaft or on both proximal and distal ends</td>
<td>Chopping marks on middle shaft were 4%; proximal and distal ends were 82%</td>
<td></td>
<td>Chopping marks on shaft middle were 83%</td>
<td></td>
</tr>
<tr>
<td>Tarsals</td>
<td>Dismembering</td>
<td>Cut marks on the Astragalus and calcaneum</td>
<td>Cut marks observed on 50% of Astragalus and 100% on Calcaneum</td>
<td>2</td>
<td>Not represented</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Roasting</td>
<td>Burning on calcaneum, Astragalus and Navicular-Cuboid</td>
<td>Burning observed on 50% of Astragalus and 67% on Calcaneum</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Metatarsal</td>
<td>Skinning</td>
<td>Circular cutmarks on the proximal shaft</td>
<td>Cut marks observed on all proximal shaft of materials</td>
<td>6</td>
<td>Cut marks observed on 67% of materials</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Hair-singing and Roasting</td>
<td>Burning on proximal end and the shaft if the skin is breached</td>
<td>No burning was observed</td>
<td></td>
<td>No burning was observed</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Narrow Processing</td>
<td>Chopping marks at the middle of shaft or on proximal and distal ends</td>
<td>Chopping marks at middle of shaft were 67%; and proximal and distal ends were 56%</td>
<td></td>
<td>Chopping marks on proximal/distal ends were 67%</td>
<td></td>
</tr>
<tr>
<td>Scapula</td>
<td>Dismembering</td>
<td>Cutmarks on neck and edges of glenoid cavity</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---------</td>
<td>-------------</td>
<td>------------------------------------------</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Filleting</td>
<td>Longitudinal cutmarks on the blade</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Roasting</td>
<td>Rare burning on exposed regions e.g., edges of glenoid cavity</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Humerus</td>
<td>Dismembering</td>
<td>Cutmarks on distal end if removed with scapula as a unit</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Roasting</td>
<td>Burning on distal end</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Narrow Processing</td>
<td>Chopping marks at middle of the shaft or on both proximal and distal ends</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Radio-ulna</td>
<td>Dismembering</td>
<td>Cutmarks on distal and if removed with humerus as one unit and on both proximal and distal end if removed separately</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Roasting</td>
<td>Burning on distal end if roasted with humerus as a unit and on proximal/distal ends if alone</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Narrow Processing</td>
<td>Chopping marks at middle of shaft or on both proximal and distal ends</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Carpals</td>
<td>Dismembering</td>
<td>Cutmarks on exposed carpal bones both ulna and radial carpals</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Roasting</td>
<td>Burning on exposed carpals attached to distal radius - e.g., patella, magnum etc.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Metacarpal</td>
<td>Skinning</td>
<td>As for metatarsals</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Roasting</td>
<td>Burning on proximal end and shaft if exposed</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Narrow Processing</td>
<td>As for metatarsal</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Phalanges</td>
<td>Hair-singing and Roasting</td>
<td>Burning on exposed parts</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Roasting</td>
<td>Cutmarks will appear on plane surfaces and both ends</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Consumption</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cutmarks observed on 17% of neck and edges of cavity</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>----------------------------------------------</td>
<td>---</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cutmarks observed on 47% of scapula blade</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Only 7% of these traces of burning were observed</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Cutmarks observed on 20% of distal ends</td>
<td>6</td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7% showed traces of burning</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chopping marks observed at middle of shaft were 27% and 60% on proximal/distal ends</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cutmarks observed on 20% of distal radius</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Traces of burning were observed on 6% of distal ends</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chopping marks at middle of shaft were 33% and proximal/distal ends 47%</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No cutmarks were observed</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Burning observed on 100% of Patella and 50% of magnum</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cutmarks observed on 42% of metacarpals (proximal end)</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Burning observed on 7% proximal ends</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chopping marks observed for 30% of proximal and distal ends and 33% at middle shaft</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Burning observed on 27% of phalanges</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cutmarks observed on 20% of phalanges</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Of the 270 bone specimens identifiable to species level, 18 (7 per cent) exhibited traces of burning in the Lemek East Boma. The minimally identifiable scrap had 8 per cent of burned elements (Table 6: 5). In Lemek North 01 Pul of the 58 specimens attributable to species, 2 per cent showed traces of burning, whereas the minimally identifiable and non-identifiable scrap had 64 (26 per cent) bone elements that were burned (Table 6: 7). It is likely this contrast reflects the tendency of burned bone to fragment into numerous less recognizable pieces, as was noted by Gifford, et al. (1980) in the Prolonged Drift Faunal remains.

Burning damage on identifiable bones displays particular patterns related to the processing of various cuts of meat. An examination of Table 6: 8 reveals that traces of burning are localized more at natural points where the limbs are severed - i.e. the exposed articular joints and associated and attached dense bones. Both distal and proximal ends of long bones and the associated small dense bones of the tarsus and carpus, manus and pes (e.g. magnum, unciform, navicula-cuboid, astragulus; and phalanges), are the ones that are burned. This is borne out by the ethnographic evidence discussed in chapter 6:1 (also Table 6: 7). This pattern of burning is due to the customary practice of roasting meat in individual long bone joints as single units, with only their ends exposed to the fire. Ribs are especially extensively burned due to
the traditional preference and practice of roasting them during butchery as has been noted elsewhere (also Table 6:7). However, ribs are rarely identifiable and are not included in Table 6:8.

Table 6:8 Incidence and proportion of identifiable bones showing traces of burning.

Lemek East Boma

<table>
<thead>
<tr>
<th>ELEMENT BY TAXON</th>
<th>FREQUENCY OF BURNING</th>
<th>NUMBER OF PIECES</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cattle</strong>:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Astragalus</td>
<td>1</td>
<td>1</td>
<td>100</td>
</tr>
<tr>
<td>Scapula</td>
<td>1</td>
<td>5</td>
<td>20</td>
</tr>
<tr>
<td><strong>Sheep</strong>:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Magnum</td>
<td>1</td>
<td>1</td>
<td>100</td>
</tr>
<tr>
<td>Scapula</td>
<td>1</td>
<td>6</td>
<td>17</td>
</tr>
<tr>
<td>Calcaneum</td>
<td>1</td>
<td>1</td>
<td>100</td>
</tr>
<tr>
<td>Phalanges</td>
<td>2</td>
<td>4</td>
<td>50</td>
</tr>
<tr>
<td>Tibia (Distal)</td>
<td>1</td>
<td>3</td>
<td>33</td>
</tr>
<tr>
<td>Radius (Proximal)</td>
<td>1</td>
<td>3</td>
<td>33</td>
</tr>
<tr>
<td><strong>Goat</strong>:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Astragalus</td>
<td>1</td>
<td>2</td>
<td>50</td>
</tr>
<tr>
<td>Humerus (Distal)</td>
<td>1</td>
<td>3</td>
<td>33</td>
</tr>
<tr>
<td>Femur (Proximal)</td>
<td>1</td>
<td>6</td>
<td>17</td>
</tr>
<tr>
<td>Unciform</td>
<td>1</td>
<td>1</td>
<td>100</td>
</tr>
<tr>
<td>Navicular-cuboid</td>
<td>1</td>
<td>2</td>
<td>50</td>
</tr>
<tr>
<td>Magnum</td>
<td>1</td>
<td>2</td>
<td>50</td>
</tr>
<tr>
<td>Phalanges</td>
<td>1</td>
<td>3</td>
<td>33</td>
</tr>
<tr>
<td>Semi-Lunar</td>
<td>1</td>
<td>1</td>
<td>100</td>
</tr>
<tr>
<td>Patella</td>
<td>1</td>
<td>1</td>
<td>100</td>
</tr>
</tbody>
</table>
Other types of human bone modification are cutmarks and chopping or hacking marks. Cutmarks, either single or multiple, appeared on 77 identifiable and some minimally identifiable elements (those bones that had sufficient morphological features to permit at least some level of taxonomic identification). These were concentrated in certain anatomical regions of the bones. In the species represented at the two sites, cutmarks were clustered around the elbow, wrist, hip and ankle joints (Table 6:9 and 10). This is due to the butchery techniques already discussed. Minor cutmarks also appeared on the length of bones without any perceptible pattern and these are inflicted through filleting during consumption. Chopping or hacking marks appeared on most of the vertebrae, middle of long bones, both proximal and distal articular ends of long bones and the pelvis. These were inflicted during secondary processing to remove the spinal cord, extract the edible marrow from long bones and to dismember the pelvis into convenient pot-size pieces (see chapter 6:1, Table 6:7).

To conclude this section on the analysis of bones from abandoned Maasai sites it is important to note several points. The patterns of the ethnographically expected bone modification are to a great extent supported by the results of the analysis of the bones from abandoned sites. The latter are potential archaeological samples and herein lies the importance of the perceived patterns as an aid to
Table 6:9 Incidence and proportion of identifiable bones showing cutmarks and multiple cuts in Lemek East Boma.

<table>
<thead>
<tr>
<th>ELEMENT BY TAXON</th>
<th>FREQUENCY</th>
<th>PIECES</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>CATTLE:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Tibia (PX)</td>
<td>1</td>
<td>1</td>
<td>100</td>
</tr>
<tr>
<td>Tibia (DS)</td>
<td>2</td>
<td>2</td>
<td>100</td>
</tr>
<tr>
<td>Tibia (SH)</td>
<td>1</td>
<td>2</td>
<td>50</td>
</tr>
<tr>
<td>Patella</td>
<td>2</td>
<td>2</td>
<td>100</td>
</tr>
<tr>
<td>Scapula (blade)</td>
<td>1</td>
<td>5</td>
<td>20</td>
</tr>
<tr>
<td>Scapula (glenoid)</td>
<td>2</td>
<td>5</td>
<td>40</td>
</tr>
<tr>
<td>Calcaneum</td>
<td>1</td>
<td>1</td>
<td>100</td>
</tr>
<tr>
<td>Metatarsal (DS)</td>
<td>1</td>
<td>1</td>
<td>100</td>
</tr>
<tr>
<td>Atlas</td>
<td>2</td>
<td>2</td>
<td>100</td>
</tr>
<tr>
<td>Acetabulum</td>
<td>1</td>
<td>1</td>
<td>100</td>
</tr>
<tr>
<td>Humerus (DS)</td>
<td>1</td>
<td>1</td>
<td>100</td>
</tr>
<tr>
<td><strong>SHEEP:</strong> Phalanges</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Humerus (DS)</td>
<td>2</td>
<td>2</td>
<td>100</td>
</tr>
<tr>
<td>Acetabulum</td>
<td>2</td>
<td>2</td>
<td>100</td>
</tr>
<tr>
<td>Tibia (DS)</td>
<td>2</td>
<td>3</td>
<td>66</td>
</tr>
<tr>
<td>Tibia (PX)</td>
<td>1</td>
<td>3</td>
<td>55</td>
</tr>
<tr>
<td>Calcaneum</td>
<td>1</td>
<td>1</td>
<td>100</td>
</tr>
<tr>
<td>Scapula (blade)</td>
<td>3</td>
<td>5</td>
<td>60</td>
</tr>
<tr>
<td>Scapula (glenoid)</td>
<td>2</td>
<td>5</td>
<td>40</td>
</tr>
<tr>
<td>Radius (PX)</td>
<td>2</td>
<td>4</td>
<td>50</td>
</tr>
<tr>
<td>Radiusuiuna (PX)</td>
<td>1</td>
<td>1</td>
<td>100</td>
</tr>
<tr>
<td>Metacarpal (PX)</td>
<td>1</td>
<td>4</td>
<td>25</td>
</tr>
<tr>
<td>Femur (DS)</td>
<td>1</td>
<td>1</td>
<td>100</td>
</tr>
<tr>
<td>ELEMENT</td>
<td>FREQUENCY</td>
<td>PIECES</td>
<td>%</td>
</tr>
<tr>
<td>--------------------------</td>
<td>-----------</td>
<td>--------</td>
<td>-----</td>
</tr>
<tr>
<td>Goat: Tibia (DS)</td>
<td>4</td>
<td>5</td>
<td>80</td>
</tr>
<tr>
<td>Tibia (SII)</td>
<td>1</td>
<td>5</td>
<td>20</td>
</tr>
<tr>
<td>Acetabulum</td>
<td>1</td>
<td>2</td>
<td>550</td>
</tr>
<tr>
<td>Illium</td>
<td>1</td>
<td>1</td>
<td>100</td>
</tr>
<tr>
<td>Humerus (DS)</td>
<td>3</td>
<td>4</td>
<td>75</td>
</tr>
<tr>
<td>Femur (PX)</td>
<td>3</td>
<td>6</td>
<td>50</td>
</tr>
<tr>
<td>Femur (DS)</td>
<td>2</td>
<td>6</td>
<td>50</td>
</tr>
<tr>
<td>Metatarsal (PX)</td>
<td>2</td>
<td>3</td>
<td>66</td>
</tr>
<tr>
<td>Scapula (blade)</td>
<td>2</td>
<td>8</td>
<td>25</td>
</tr>
<tr>
<td>Scapula (glenoid)</td>
<td>2</td>
<td>8</td>
<td>25</td>
</tr>
<tr>
<td>Radius (PX)</td>
<td>2</td>
<td>5</td>
<td>40</td>
</tr>
</tbody>
</table>

DS = distal end,  
PX = proximal end,  
SII = shaft with neck but without the articular end.

Table 6:10 Incidence and proportion of identifiable bones showing cutmarks and multiple cuts in Lenek North Ol Pul,
archaeological interpretation of faunal remains from similar sites. The localization of modification to particular anatomical regions of the animals has been attributed to Maasai human behaviour as regards customary processing of these regions. Thus, if the patterns of modification in the Maasai case are replicated in an archaeological bone assemblage, the human behaviour responsible would be suggested to us by the ethnographic patterns. Areas of disagreement between the two cases - i.e. archaeological and ethnographic patterns of bone modification - would force us to search for other explanations. Thus such disagreements serve as a torch to light obscure areas for further inquiry as to the human behaviours responsible for the perceived patterns. What this means is that the comparison of the ethnographic pattern
and archaeological ones is not only looking for points of agreement but also throws light on the negative correlations which need further exploration and explanation.

The next section has used ethnographic evidence discussed above and elsewhere to formulate hypotheses which can be used in similar archaeological contexts. These relate to bone discard and modification.

6:3 Bone discard and modification models.

Using the ethnographic evidence discussed in chapters 5:3 and 6:1, it is now possible to formulate some hypotheses. These are in regard to the relationships of Maasai behaviour and faunal remains that would result in modification and patterning regularities of these materials which make potential archaeological constituents. These hypotheses can be framed as models which, upon comparison with and testing against independent archaeological data, can either be refuted, supported and/or modified and can thus be used as 'interpretive tools' in similar archaeological contexts.

On the basis of the foregoing we can hypothesize several points that would be important in the interpretation of faunal remains on Maasai Boma settlements.

The ethnographic evidence shows that the Maasai extensively fragment bones during secondary processing and consumption.
For meat that is boiled, the pot size determines the degree of fragmentation of the bones. In my experience with the Maasai, even when a large-sized pot is used the marrow bones and the spongy bone ends are always chopped up to allow their contents to seep into the soup. Furthermore even when bones are cooked whole, they are chopped up to extract the marrow during consumption. For meat that is roasted, the Maasai roast long bone joints either as single units or attached (e.g. Radius/humerus/scapula) as one unit depending on the size of the flesh on such bones. The Maasai follow a standard practice in all butchery starting with skinning to dismemberment of the carcass. A standard practice is also adopted for marrow extraction; either the long bones are chopped at the middle or both proximal and distal ends are chopped off at the neck. In view of the above Maasai treatment of bone we can hypothesize the following:

(a) A great deal of fragmentation will be exhibited by bones that have been discarded in a Maasai Boma, especially long-bones.

(b) Cutmarks, chopping marks and evidence of burning will be localized in particular anatomical regions of the animals represented in the site. These will be in similar positions forming distinctive patterns on individual body parts.
As we saw in chapter 5:3, the Maasai adopt a conscious site maintenance strategy. Rubbish from within the house and the area between it and the perimeter fence, is swept and discarded on the fence. Also excess dung and some of the rubbish is dumped outside the perimeter fence. Thus as a result of these behaviours a house is associated with two discrete rubbish dumps; one inside the perimeter fence and the other outside the Boma, near the entrance (Fig. 5:7). This pattern of segregated and discrete refuse dumps is usually replicated for all the houses in any one Boma.

The area in the middle of the Boma, used to coral the herds at night, is never maintained and very little refuse is discarded here. We also saw in chapter 5:3 that culturally significant ceremonies are held in this area. However, faunal remains resulting from the ceremonial activities, although supposed to be deposited in this area, contribute little to the refuse due to scavenging by dogs. Thus the middle of the Boma will be characterized by the ubiquitous dung and a few scattered faunal remains and other types of refuse.

In view of the foregoing we can hypothesize that:

(c) Faunal remains will be clustered in particular areas of the settlement in relation to activity areas, especially houses. Areas adjacent to the refuse clusters
will have little or no faunal remains.

Ethnographic evidence pertaining to bone discard behaviour after cooking and consumption was discussed in chapter 5:3. Bones from the same meal are discarded together and at the same time from the house to the designated rubbish dump. Bones from subsequent meals are added to the refuse dumps. Thus a continuous chain of behaviour becomes apparent whereby bones from the same meal end up together on the refuse dumps as an uncorrelated jumble of different body parts. However, no butchery (in most cases) is done inside the Boma, and various cuts of meat are shared to the Boma from the butchery sites. Thus it will not be possible to find all bones from a single animal intermingled in any of the bone clusters. Therefore, in terms of the overall bone cluster assemblage we can hypothesize that:

(d) Different body part representation within any single refuse dump will reflect the unassociated bones from different meals. Also it is possible for parts of the same bone to be cooked as different meals since all meat from the same animal is consumed in small quantities at a time. Thus, the different body parts within the same cluster will not show any correlation, especially for those bones that are cooked separately and at different times.
However, this proposition needs qualifying because taken on its own, it can be misleading. Ethnographic evidence on the processing, cooking, consumption and discard of certain anatomical parts suggests that there should be some degree of correlation in the distribution of specific body parts. These body parts are those that are cooked while still articulated but are disarticulated during consumption. Since discard follows consumption as a chain of behaviour in any ethnographic context, such body parts are discarded at the same time and often in the same locale, thus entering the same bone clusters. The best examples of such bones are the mandibles and maxillae, humerus and scapula, radius and humerus, which the Masaai cook as single units and separate them during consumption. In view of this we can thus advance an hypothesis that is a sub-set of hypothesis (d) above that:

(e) Body parts which are cooked while articulated and only disarticulated during the consumption phase will tend to show some considerable degree of mutual correlation in their discard locations and their within-site spatial patterning - e.g. Mandibles/Maxillae, Humerus/Scapula, Radius/Humerus.

In an effort to examine the goodness of fit of these propositions we can use the evidence from the analysis of the bones collected from Lemek East abandoned Boma. Table 6:3 shows the summary of the overall composition
of the faunal remains. It can be appreciated that proposition (a) is generally borne out by the fact that of the 760 bone specimens, 490 or 64% were fragmented minimally identifiable and non-identifiable scrap. This is explained by what has already been discussed under secondary processing and bone treatment during consumption (chapter 6:2). In addition, it is also important to point out that even for the 270 maximally identifiable bone elements, except for a varying number of teeth, all the other bones were incomplete having been chopped up during the quest for marrow.

An examination of Tables 6:7 to 9 and the accompanying text shows that proposition (b) is also borne out; thus supporting the conclusion that cutmarks, chopping marks and burning are localized only in particular body parts and in more or less specific positions as was discussed in chapter 6:2.

Proposition (c) is also supported by the density distribution illustration of faunal remains in Lemek Eask Boma (Figure 6:2). The diagram shows that there is a clear clustering of bones in regard to certain areas of the Boma. The bone clusters have a strong correspondence with the location of houses as was revealed by the original owners of Lemek East Boma whom I interviewed as to activity areas. The bone clusters within the Boma were associated with single houses for each of them. However, some of
the bone clusters inside the Boma in Fig. 6:2 were accumulated on the smaller internal fences that protect houses from the cattle. The bone concentration near the door to the north-west - (Y) in Fig. 6:2 - was an outside rubbish dump analogous to (Y) in Fig. 5:7. Thus it can be surmized that the perceived bone clustering is not random but is tied to the site's refuse disposal practices.

In an attempt to test proposition (d) bones that were known not to be cooked while articulated and discarded together after consumption were chosen and correlation coefficient (r) statistic was applied. These body parts included femur and tibia which on account of the large quantity of meat are cooked separately, metatarsals and tibia, metacarpals and radius. The results are shown in Table 6:11. It shows clearly that these body parts have very low correlation coefficient values. When these are compared with those for body parts that are cooked together while articulated (see below) it becomes clear that hypothesis (d) is strongly supported.

Proposition (e) is supported by the evidence from selected body parts which, from the ethnographic information, were known to be cooked while articulated and disarticulated during consumption. Table 6:11 presents the correlation coefficients (r) of these body parts and a number of the
body parts used to test proposition (d) above which were used as a control sample.

Table 6:11  Correlation coefficients (r) of both the bones expected to be correlated, and uncorrelated due to processing and discard methods.

<table>
<thead>
<tr>
<th>BODY PART</th>
<th>(r)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mandibles and Maxillae *1</td>
<td>0.83</td>
</tr>
<tr>
<td>Humerus and Scapula *1</td>
<td>0.73</td>
</tr>
<tr>
<td>Radius and humerus *1</td>
<td>0.34</td>
</tr>
<tr>
<td>Metacarpals and Radius *2</td>
<td>0.16</td>
</tr>
<tr>
<td>Femur and Tibia *2</td>
<td>0.09</td>
</tr>
<tr>
<td>Metatarsals and Tibia *2</td>
<td>0.01</td>
</tr>
<tr>
<td>Metatarsals and Phalanges *1</td>
<td>0.01</td>
</tr>
</tbody>
</table>

*1 - Body parts that are cooked while articulated and disarticulated during consumption.

*2 - Body parts that are disarticulated before cooking.

NB Although metatarsals and phalanges are cooked while articulated they have a low (r) value because these body parts are rarely brought to the Boma but are cooked and consumed in the butchery sites.
An examination of Table 6:11 shows that mandibles and maxillae have the highest correlation coefficient followed by humerus and scapula. These must have entered the bone assemblage together. The radius and humerus are less well correlated. Metacarpals and radius show a low correlation. The radius/humerus observation is possibly due to the unmanageable amount of meat were radius/humerus/scapula to be processed as a single unit. The figures suggest that humerus and scapula were processed as a single unit and radius was processed alone as is borne out by its low correlation with metacarpals. These are joined to the radius and naturally if they were processed together as a unit the correlation would be expected to be high. The body parts used as a control have a correlation coefficient of less than 0.1. The femur and tibia have a lot of meat and hence each is processed as a single unit. Metacarpals and phalanges, and metatarsals and phalanges are processed together but not in the Boma hence their very low correlations.

The above shows one of the strengths of ethnographic data as a source of hypotheses formulation.

The Lemek North Ol Pul, to some extent, also supports the above propositions. Of the 360 bone elements recovered from this site 302 or 84 per cent were fragmented minimally identifiable and non-identifiable scrap; thus supporting
proposition (a). Again this is partly explained by the Maasai meat processing and consumption habits in this type of site. Even the 58 maximally identifiable bones were bigger fragments that had retained sufficient diagnostic morphological features to enable anatomical and taxonomic identification.

Proposition (b) is borne out by the data presented in Table 6:7 - column of observed modification attributes - and Table 6:10. The localization of cutmarks and chopping marks to particular regions of anatomical parts, as noted earlier, is related to the butchery, processing and consumption practices of the Maasai. Burning, however, seems to be poorly represented. Only one of the two metatarsals of all bone specimens attributable to specific species, showed traces of burning. This underrepresentation is possibly due to the fact that most of the meat in an Ol Pul is boiled rather than roasted on an open fire.

Proposition (c) and (d) are borne out by an examination of Fig. 6:3. Bone clustering is concentrated around the hearth and is a result of Maasai bone discard behaviours in Ol Pul sites. Most bones, irrespective of body part, tend to be thrown into a restricted area centred on the hearth which acts as a 'magnet' for dumping. This is explained by the need to keep the restricted sitting area free of bones. However, bones are never tossed directly
into the fire. Correlation coefficients of the same bones as those used for the Boma to test proposition (d) and (e) show that there is very little correlation between different body parts.

Proposition (e) does not seem to hold true at Lemek North Ol Pul possibly due to differing processing and discard methods.

Table 6:12 Correlation coefficients (r) of bones expected to be correlated on account of the processing and discard methods. Correlation coefficients are arranged in descending order.

<table>
<thead>
<tr>
<th>BODY PART</th>
<th>(r)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Femur and Tibia</td>
<td>0.42</td>
</tr>
<tr>
<td>Radius and Metacarpal</td>
<td>0.38</td>
</tr>
<tr>
<td>Tibia and Metatarsal</td>
<td>0.28</td>
</tr>
<tr>
<td>Mandible and Maxilla</td>
<td>0.04</td>
</tr>
<tr>
<td>Humerus and Radius</td>
<td>-0.07</td>
</tr>
<tr>
<td>Metatarsal and Phalanges</td>
<td>-0.09</td>
</tr>
<tr>
<td>Metacarpal and Phalanges</td>
<td>-0.13</td>
</tr>
<tr>
<td>Humerus and scapula</td>
<td>-0.17</td>
</tr>
</tbody>
</table>

An examination of Table 6:12 shows that those bones expected to be correlated, especially mandibles and maxillae, humerus and scapula have very low correlation.
coefficients (e.g., the latter has a negative correlation coefficient). None of any of the chosen body parts has an \( r \) of 0.5. Thus the hypothesis that body parts which are articulated when cooked and only disarticulated during consumption will show a strong correlation is not supported by the Lemek North Ol Pul. Thus alternative explanation must be sought. Scavenging by wild animals after Ol Pul was abandoned and of course sampling bias may be the reasons for the clear differences between the Ol Pul and Boma data. Also the different refuse discard practices discussed for the two site types seem to be responsible for the differences (see chapter 5:3). In an Ol Pul bones are discarded away generally in areas not used for sitting. Thus it is unlikely that even those bones disarticulated during consumption will end up in the same locale. The conscious refuse organisation in the Boma is centred around the discrete refuse dumps. Thus bones consumed together are most likely to end up in the same refuse dump and possibly in the same locale barring post-depositional disturbance.

Chapter seven is an attempt to use the bone modification and refuse discard model (see above) to demonstrate its potential for archaeological interpretation. Hypotheses derived from the refuse discard model are presented but further work at Prolonged Drift is needed to verify them.
The final part of the chapter offers discussions of the salient points of the thesis and suggests the path for future research. It also contains the conclusions.
7:1 The application to archaeological data of the faunal remain modification and discard model to illustrate its interpretive potential.

The Prolonged Drift bone assemblage (Gifford, et al, 1980) was chosen for the projected task because it is the most important and well studied Pastoral Neolithic bone assemblage in East Africa. Gifford, et al, have postulated that "---- with many wild ungulate species and a substantial minority of domesticates, the faunal assemblage from Prolonged Drift may well represent the debris of an economic system no longer extant in the region, as might logically be expected of a site deriving from the earliest phases of food production in East Africa" (1980:57). They further note that "--- There are interesting implications in regard to present day land use - an aspect of archaeology to which too little attention has been paid" (1980:57). While the Prolonged Drift assemblage represents a different economic and technological system to the Maasai data, this is part of its value as a test for my ethnographic observations. Thus it allows me to identify and highlight areas of contrasting behaviour as well as similarities.

The assumption to be made here is that if Prolonged Drift, butchering and culinary practices were similar to the modern
Maasai practices, we would expect similarities in the bone modification and discard patterns. However, it should be pointed out that the similarities themselves are not important per se. What is of more importance is the role they play in sharpening and highlighting areas of negative correspondence. Thus the negative areas stand out and require alternative explanation which, when arrived at, aid our interpretation of the archaeological assemblage.

The principal concern of this thesis has been to examine Maasai behaviour in regard to general bone modification and incidental fragmentation, and discard patterns in different site settings. More specifically, cutmarks, burning and marrow processing patterns on bones have been examined in relation to their location and intensity on different body parts. Perhaps, therefore, the most productive mode of comparison is to examine for the same general patterns and the more specific attributes noted above.

Firstly, the high degree of bone fragmentation in archaeological sites is widely recognized by archaeologists (e.g. Ongango-Abuje 1977a; Gifford, et al, 1980; Daly, 1969). This is believed to be due to both human and other taphonomic processes. Gifford, et al, (1980) noted that at Prolonged Drift of 165,426 bone elements, 161,721 pieces or 97.7 per cent were fragments of minimally
identifiable scrap. This was, to a great extent, attributed to the processing activities of the Prolonged Drift inhabitants. This can be compared with 64.4 percent of similar fragmentary bones from Lemek East Homo which shows that at both sites generally the bulk of the bones are fragmentary. However, it should be pointed out that the two sample sizes are so different that too much importance cannot be attached to the detailed percentages. The Maasai data tend to confirm the suggestion that pre-depositional processes, among which human behaviour is a major factor, are responsible for the bulk of bone fragmentation. Sample sizes apart, the difference in percentages tend to suggest that post-depositional processes increase the degree of fragmentation. For example, Gifford, et al. (1980) showed that there was a very strong association of "soil shattered" bones within the main bone mass of Feature 15. We may also add that excavation methods as an agent of bone fragmentation must be considered as is evidenced by fresh breaks of conjoinable bone fragments. Thus there is a need to establish detailed proportions of fragmented bones in relation to the agents responsible in order to arrive at a reliable level of comparison. Also this calls for a consideration of the sample sizes being compared. It is, however, not possible to take these points into consideration partly due to the difficulty of gleaming this information from the Prolonged Drift study and partly due to limitations on time to go
through the Prolonged Drift bone assemblage and establish the proportions of fragmented bones as per agents.

In connection with bone fragmentation we can point out that no one of the agents can be overemphasized to the exclusion of the others. We need to rigorously consider bone damage attributable to each agent (e.g. burning, cutmarks, weathering, soil shattering of bones, fresh conjoinable breaks on bones, etc.). By establishing the intensity of, say human induced damage, one is then in a position to weigh the importance of other processes of bone damage and vice-versa. Thus, although the importance of human activity in bone modification and fragmentation is indicated at Prolonged Drift, further work is needed along the lines suggested above.

At Prolonged Drift, of some 3700 identifiable bones only 37 or one per cent showed traces of burning, whereas 8.2 per cent of the minimally identifiable bones were burned. At Lemek East Boma, out of 270 identifiable bones 18 or 6.6 per cent exhibited traces of burning, whereas 8 per cent of the minimally identifiable scrap were burned (Table 6:3). Generally the occurrence of burning is comparable at the two sites and shows the greater tendency of burned bone to fragment easily into less recognizable pieces. The difference in the figures of Lemek East Boma
identifiable bones from those of Prolonged Drift identifiable bones probably reflect the higher relative percentage of identifiable bones in the former example.

Of more importance, however, is the localization of burning in particular regions of bone elements. This burning damage to identifiable bones reflect certain trends in the processing of various cuts of meat. Gifford, et al (op. cit) noted that most burning damage was localized at the natural points for severing the upper and lower hind leg. It was further noted that the proximal and distal elements - e.g. proximal femur, distal tibia and calcaneum were the only points damaged by burning (Gifford, et al, op. cit, Appendix II e). This pattern compares quite favourably with the one noted for Lemek East Boma (Tables 6:7 and 8) which is due to the Maasai method of roasting leg units (Chapter 6:1; 6:2). D. Gifford noted this same burning damage pattern among modern pastoral Maasai and Dassanetch.

Table 7:1 presents the proportions of identifiable bones with signs of burning both at Lemek East and Prolonged Drift. First it should be noted that due to the difference in the sample sizes as already noted, there appears to be disproportionate representation of burned elements. Thus Table 7:1 should be read in conjunction with Table 6:6 and 8 which show the ethnographically
expected burning damage and its location on individual bones and the observed damage on bones collected from Lemek East Boma. Secondly, proportions apart, the occurrence of burning appears on the same body parts and on similar locations in the two samples. Therefore it is reasonable to conclude that the Prolonged Drift burning damage fits the ethnographic model reasonably well.

Cutmarks, either simple or multiple, were recognized on 377 bone specimens at Prolonged Drift. These were localized to particular anatomical regions - mainly around the elbow, wrist, hip and ankle joints (Gifford, et al., op. cit., Appendix II a–C). This clustering of cutmarks, concentrated on similar anatomical regions, were noted in the small Lemek East Boma bone sample (Table 6: 9 and also 7). This pattern of cutmarks is due to the primary and secondary processing of carcasses by the Maasai discussed in Chapter 6:1. Table 7: 2 presents the incidence and proportions of cutmarks on different bones both at Prolonged Drift and Lemek East Boma.
Table 7:1

Incidence and proportion of identifiable bones showing traces of burning in the Prolonged Drift and Lenek East Boma bone assemblages.

<table>
<thead>
<tr>
<th>ELEMENT BY TAXON</th>
<th>LENEK EAST BOMA</th>
<th>PROLONGED DRIFT</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>f</td>
</tr>
<tr>
<td><strong>LARGE BOVIDS</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Carpal or Manus Bone</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Tarsal or Pes Bone</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Main Metatarsal</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Vertebrae</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Scapula</td>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td><strong>SMALL/MEDIUM BOVIDS</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Carpal or Manus Bone</td>
<td>8</td>
<td>4</td>
</tr>
<tr>
<td>Femur (PX)</td>
<td>6</td>
<td>1</td>
</tr>
<tr>
<td>Humerus (DS)</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>Tibia (DS)</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>Radius (PX)</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>Calcaneum</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Naviculocuboid</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Vertebrae</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

N  Total number of identifiable bones
f  Number showing burning traces
f/N Proportion of burned bones
PX Proximal, DS - Distal
Table 7: 2  Incidences and proportion of cutmarks on identifiable bones at Prolonged Drift and Lemek East Boma.

<table>
<thead>
<tr>
<th>ELEMENT BY TAXON</th>
<th>PROLONGED DRIFT</th>
<th>LEMEK EAST BOMA</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>f</td>
</tr>
<tr>
<td>LARGE RÕVIDS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Scapula (Blade)</td>
<td>9</td>
<td>1</td>
</tr>
<tr>
<td>Scapula (Glenoid)</td>
<td>14</td>
<td>1</td>
</tr>
<tr>
<td>Humerus (PX)</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Humerus (DS)</td>
<td>21</td>
<td>12</td>
</tr>
<tr>
<td>Tibia (PX)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tibia (DS)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tibia (SH)</td>
<td>19</td>
<td>14</td>
</tr>
<tr>
<td>Radius (PX)</td>
<td>13</td>
<td>7</td>
</tr>
<tr>
<td>Radius (DS)</td>
<td>14</td>
<td>3</td>
</tr>
<tr>
<td>Acetabulum</td>
<td>27</td>
<td>11</td>
</tr>
<tr>
<td>Ilium</td>
<td>11</td>
<td>1</td>
</tr>
<tr>
<td>Ischium</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Calcaneum</td>
<td>24</td>
<td>11</td>
</tr>
<tr>
<td>Astragulus</td>
<td>64</td>
<td>27</td>
</tr>
<tr>
<td>Atlas</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Patella</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>Atlas</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Femur (PX)</td>
<td>14</td>
<td>6</td>
</tr>
<tr>
<td>Femur (DS)</td>
<td>6</td>
<td>4</td>
</tr>
<tr>
<td>SMALL/ MEDIUM BOVIDS</td>
<td>f</td>
<td>N</td>
</tr>
<tr>
<td>---------------------</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Humerus (DS)</td>
<td>21</td>
<td>11</td>
</tr>
<tr>
<td>Humerus (PX)</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>Tibia (DS)</td>
<td>17</td>
<td>4</td>
</tr>
<tr>
<td>Tibia (PX)</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>Tibia (SH)</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Radius (PX)</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Radioulna (PX)</td>
<td>18</td>
<td>8</td>
</tr>
<tr>
<td>Radius (DS)</td>
<td>11</td>
<td>4</td>
</tr>
<tr>
<td>Scapula (blade)</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Scapula (glenoid)</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Acetabulum</td>
<td>35</td>
<td>23</td>
</tr>
<tr>
<td>Humerus</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>Metatarsal (PX)</td>
<td>27</td>
<td>16</td>
</tr>
<tr>
<td>Metacarpal (PX)</td>
<td>6</td>
<td>3</td>
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<tr>
<td>Femur (DS)</td>
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<td>-</td>
</tr>
<tr>
<td>Femur (PX)</td>
<td>17</td>
<td>2</td>
</tr>
<tr>
<td>Calcaneum</td>
<td>18</td>
<td>6</td>
</tr>
</tbody>
</table>

N = Total number of identifiable bones
f = Number showing cutmarks
f/N = Proportions of bones with cutmarks
PX = Proximal
DS = Distal
SH = Shaft
An examination of the above table again shows the disproportionate effect of the different sample sizes being compared. This apart, cutmarks do appear on the same regions in similar bones. This can be attributed to the similar processing of these particular parts of meat.

In regard to bone damage, one area where there does not seem to be any correspondence between the Prolonged Drift sample and the ethnographic case study is in the treatment of long bones in the quest for marrow. In the former sample, metapodials of bovids displayed specific patterns of damage reflecting splitting of bones lengthwise or what Gifford, et al (op cit) calls "sagitally sectioned". This contrasts sharply with the Maasai evidence (chapter 6:1) where marrow-bearing bones are either chopped at the middle of the shaft rendering them into two roughly equal parts or both proximal and distal ends are hacked off and marrow sucked out. This practice leaves a kind of long-bone shaft tube. Smaller marrow bones such as phalanges, however, were not broken at both sites probably because their marrow content was not worth the effort.

At this stage, I can only offer suggestions to explain the non-correspondence of marrow extraction processes at Prolonged Drift and in the Maasai case study. The Prolonged Drift inhabitants used stone tools whereas the
Maasai use steel swords and knives. Thus technological differences seem to be the most reasonable explanation. It is easier to chop up bones with steel implements than stone tools. However, this suggestion can only be supported by actual experiments on bones and microwear analysis of stone tools; something outside the scope of this thesis. This then, constitutes one interesting area for future research.

Another area that is deemed illuminating is the examination of the nature and function of both Prolonged Drift and Lemek East Boma and their refuse disposal practices. Gifford, et al, (op cit) eliminated competing alternatives and adopted the working hypothesis that Prolonged Drift was a kind of: "residential base camp... an encampment consisting of all, or a demographically representative sample, of a local foraging unit (men, women and children)" (1980: 87). This hypothesis is supported by the wide range of extractive, processing and maintenance activities as reflected in the enormous variety of artifactual and biological debris recovered from the site. Gifford, et al, (op cit) point out that the recovery of remains of animals normally found in different habitats, the presence of an enormous amount of flaked stone and evidence of time consuming tasks like stone bowl manufacture at Prolonged Drift, shows that the site had a long span of occupation.
Secondly the development of secondary refuse concentrations and deliberate clearance of debris from zones of intensive use are usually attributed to long-term occupations (e.g. Schiffer, 1976; Gifford, 1980). On this basis Feature 15 (the excavated midden at Prolonged Drift) was assumed to represent a kind of rubbish dump and the relatively open spaces, with little or no debris adjacent to the midden, were assumed to be a result of the site maintenance activities. Binford (1978) has, however, argued that relatively short term, special-purpose mass processing stations may assume the aspects of a midden in a short period. Gifford, et al, (op cit) have, however, counter-argued that this can not apply to Prolonged Drift on account of ".....the coincidence of so much debris from a number of behaviourally distinct manufacturing and processing chains in one midden tends to persuade us that we are, truly, dealing with the midden, or refuse disposal area, of a residential camp" (1980: 89).

Assuming that the case for Prolonged Drift as a long-term occupation site has been established, and that the rubbish disposal patterns are true, I can now offer some comparisons with the Maasai data. Map 7:† is a reproduction of Figure 3 in Gifford, et al (1980: 60) showing feature 15 and two main trenches that were excavated. It also shows other
Map 7.1: Prolonged Drift site plan, showing Feature 15 and two main trenches and the outcrops of the stratigraphic units.
test-pits excavated to establish the extent of Feature 15. By comparing Map, 7:1, and Fig 6:2, which shows the density distribution of bones in Lemek East Boma, in conjunction with relevant ethnographic data from the Maasai study, I can offer one of the possible interpretations of Prolonged Drift.

First, if Feature 15 is a kind of refuse dump then it is possible that it correlates with refuse dump (Y) outside the Boma enclosure (Fig. 6:2) which is synonymous with refuse dump (Y) in Fig. 5:7. Alternatively Feature 15 could also represent any one of the bone clusters inside the Boma (Fig 6:2) which are synonymous with refuse dump (X) in Fig. 5:7 associated with a single house.

The above comparisons are made on account of the fact that areas adjacent to Feature 15 and the ethnographic refuse dumps are clear of most, if not all, debris. Also the concentration of all types of remains in the restricted area of Feature 15 supports the comparison since as was discussed in Chapter 5:3 all unwanted items in the Maasai case end up in one or the other of the two rubbish dumps. However, this comparison presumes that refuse disposal organisation was similar in the two sites. I am aware of the possibility that this may not be the case. The size of Feature 15 is not comparable to the Maasai refuse dumps and it may represent one major dump where all refuse from the whole site was discarded. However, the occurrence
of smaller refuse patches resembling Feature 15 in content (see below) makes this supposition most unlikely. Thus tentatively there appears to be a reasonably strong case for the comparison. Consequently the implications for making predictions, their testing and interpretation in regard to activity areas and features, become a distinct possibility.

Second, most of Feature 15 dense concentration was exposed to ascertain its limits. "...It was found to be irregular and elongate, vaguely crescentic in form, with the concave side to the south-east" (Gifford, et al., 1980: 61). The areas adjacent to Feature 15 were nearly free of any debris except for the two additional trenches - S43 and S51 metres - which had been put at arbitrarily chosen points in an effort to gather more information on areas surrounding the Feature 15 midden. These yielded dense accumulations of secondary refuse resembling that of Feature 15.

On the basis of the above data in conjunction with relevant Maasai data it is possible to suggest that if Feature 15 represents dump (Y) in Fig. 6:2 then S43 and S51 meters may represent any of the bone clusters, inside the Boma - e.g. in squares 25 E/35N and 35E/30 - 40N in Fig. 6:2. If Feature 15 is assumed to represent any of the bone clusters inside the Boma, the adjacent squares with few or no bones would represent similar zones in any direction from the outer edges of Feature 15.
However, the above suggestions for interpreting Prolonged Drift can be misleading if they are taken at face value without further formulating predictions and hypotheses which can be tested either to confirm, support or refute the suggestion. Using relevant ethnographic data I can now offer predictions which, on present data from Prolonged Drift, can not be tested. However, they form an important area for future work at the site which can support, refute or refine the interpretive suggestions. To carry out this task we need data in the form of occupation floors, hearths, activity areas, houses, etc. This type of data can clarify exactly where Feature 15 fits within the Maasai refuse discard model; thus ascertaining what type of refuse dump it is as well as its associated features like houses. Thus the predictions that follow are in relation to the areas that are most likely to yield these features:

(a) Feature 15 was found to be irregular and elongate, vaguely crescentic in form, with the concave side to the south-east (see above) which argues for the fact that the refuse might have been deposited on the inside of a barrier (e.g. a roughly circular arc of a perimeter fence?) on the south-east (Fig. 7:1). On analogy with the Maasai lay-out of refuse dump (X) in relation to the house inside the Boma enclosure (Fig. 5:7), we can hypothesize that any features associated with Feature 15 would most likely
be found to the south, south-west and north-west of the midden.

(b) Alternatively if we use the analogy with the Maasai refuse dump (Y) (Fig. 5:7 and 6:2), we can hypothesize that features associated with Feature 15, if present, would most likely be found to the north-east and south-east of the Midden.

The Maasai ethnographic model of the relationship between secondary refuse discard patterns and the lay-out of features such as houses has played an important suggestive and predictive role in the interpretation of Prolonged Drift. Further research at Prolonged Drift would establish the reliability and validity of this model. While having considerable potential implications for faunal remains patterning and lay-out of features at Prolonged Drift, this model can also be useful for interpretation of other pastoralist sites. In order to do this a rigorous testing and refining procedure needs to be adopted using a whole range of other pastoralist archaeological sites.

7:2 DISCUSSIONS AND CONCLUSIONS

Information has been adduced regarding inter-site patterning and modification of faunal remains which has been attributed to site specific human behaviours in
the different types of sites extant in the modern Maasai settlement system. Description of how individuals and activities are arranged in these sites has been offered in the framework of facilities and activity areas such as houses and hearths. The nature and spatial ordering of social units whose interactions result in faunal remains patterning and modification have also been examined. Within this general framework it is possible to attempt a discussion of the factors that determine where specific activities will take place. The archaeological implications of the observed patterns as regards approaches to spatial analysis of excavated sites are considerable.

In order to understand the relationship between a specific activity and where it may occur, we need to consider several points. I wish to acknowledge that what is discussed below is based on some aspects of Yellen's (1977) conceptualization of the !Kung camp and activity patterning. Only relevant aspects such as individual nuclear families and their related activity areas and the consequent material patterning are used in this work. Firstly we need to distinguish between those areas of the Boma that belong to and are used by individual nuclear families - by nuclear family is meant one wife with her children residing in one house within any one Boma - and those areas that are communally used by all inhabitants of one Boma. Secondly as concerns the nuclear family area, we
need to draw a line separating it from areas where special activities take place. Thirdly we need to consider the factors that impinge on the location of an activity. These include, in addition to the social context, factors such as the amount of space required by an activity, its measiness, and the time of day. This rather complex set of interactions, therefore, seem to argue against the widely accepted notion that there exists a direct correlation between a specific activity and a unique location of its byproducts. This assumption, unfortunately underlies most archaeological interpretations of artifacts and associated activity areas.

The structure and function of Maasai houses has been discussed in Chapter 5:2. The house serves as a place to store private belongings, for food preparation and consumption, and other social activities regarding the welfare of nuclear families. Manufacturing of various artifacts is occasionally done inside the houses (see Chapter 5:3). Therefore the house can be said to demarcate the area belonging to a single nuclear family or social unit. As already noted the arrangement of Maasai houses along the internal perimeter of the Boma reflect social relations of the social units occupying them.

The hearths inside the houses are used both for warmth and cooking and serve as a focus for all organised domestic activities. As we have seen byproducts
or any waste matter from different activities are discarded around the hearths. However, due to the conscious maintenance strategy adopted by Maasai women, the house as an intensive use area, is swept clean and the rubbish discarded into the refuse dumps located outside. Thus one important characteristic of a house is the associated rubbish dumps (see Fig. 5:7 - (X) and (Y)). These dumps will normally contain an assortment of waste byproducts of all the different activities conducted inside the house. This simple picture of refuse cluster patterning is duplicated for all the houses in any one Boma. Thus, it is true to say that the discrete rubbish dumps in any Boma will reflect the different types of activities carried out within the houses. By implication, if the Maasai used stone tools to make various artifacts and in other nuclear family related activities, we would expect to find them intermixed with other forms of discarded items in the refuse dumps. This shows it would be therefore, misleading to conclude that the materials recovered from a refuse midden were used within the bounded area of such a midden from an archaeological perspective. Thus, although the observed refuse patterning in Maasai houses has important implications for archaeological interpretations, it is equally important to bear in mind the social context of any material being interpreted.

The above clustering of activities and the resultant debris results in some parts of the Boma being devoid of
any or most discarded materials. For instance the open area at the middle of the Boma is communally used by the occupants of such a Boma to coral their combined herds. It is also used during culturally significant ceremonies. Activities conducted in this communal area, however, leave little or no debris to speak of. As has been noted elsewhere only very few bones from the miscarriage cleansing ceremony (Chapter 5:3) were finally deposited inside the middle of the Boma due to scavenging by dogs, and to some extent the activities of young children who discarded the bones outside the Boma.

Other areas that are used communally are the butchery sites and meat/soup feasting (Ol Pul) sites. The pattern of refuse discard as regards these sites, as we saw in Chapter 5:3, is determined by the relative size of the sitting area in relation to the open hearth and the positioning of the meat. Thus, bones are discarded in the open areas next to the hearth which acts as a 'magnet' for bone dumping (see Chapter 5:3 Fig 5:12 and Fig 6:3). Apparently, therefore, refuse in these sites is generally discarded within the locales of its generation which clearly differs with the patterns recorded for the Bona.

It is important to note that the patterns of refuse discard recorded for the Boma seem to be repeated in varying degrees both in seasonal cattle camps and the
Manyatta. However, it appears the length of time that these sites are occupied is the major factor that determines the amount, discreteness, and consequently the visibility of the refuse discard patterns.

However, several factors impinge on and blur the simple picture of discard patterns presented for different Maasai sites above. Generally the area where a specific activity takes place and the location of its byproducts seems to be determined by whether the entire group or only an individual nuclear family is involved in such an activity. Some activities, especially those connected with ceremonial butchery and consumption of meat in butchery and meat-feasting sites, are communal in nature. They involve either representatives of more than only a nuclear family or most, if not all, of the Boma members and others from neighbouring Bomas. Thus, we would expect some bones from ceremonial activities to end up in nuclear family related refuse areas.

Some activities, although nuclear family related, require a lot of space, and others are so messy that they would disturb activities in a nuclear family house if conducted there. A case in point is the treatment of animal skins. Fresh skins belong to the family that owned the animal. They are pegged horizontally on the ground to dry. They also attract vermin and scavengers. Hence, although it is a nuclear family related activity, skin
drying is done outside the Boma, generally opposite
the house of the owner of the skin. Other activities such
as ornament manufacture both by men and women; and
manufacture of various artifacts are often carried out
outside the Boma in roughly designated areas (see Fig 5:9
and accompanying text). Sometimes initial food preparation
is done outside the Boma (Chapter 5:3). As noted elsewhere,
activities conducted outside the Boma are not always
associated with single houses - i.e. nuclear family. For
example, women from several different houses might congregate
in one area (such as (N) in Fig 5:9) and carry out
manufacturing of necklaces and even chopping meat into
pot-size pieces and carry these back into individual
houses. Also children from different houses may use this
same area as a playground. Thus, any debris resulting
from these activities and left here will not reflect a
single nuclear family related activity. In a sense the
area assumes the characteristics of a communal one if only
for the diverse family units whose activities will be
represented. Thus, in this case it is misleading to speak
of a nuclear family/activity area/debris association.

Another factor that complicates the simple picture
of nuclear family/activity area/debris association and
the communal use/activity area/debris association is the
occurrence of the resting area outside the Boma (area (N)
Fig 5:9). Manufacturing of various items is carried on
in this area as the people rest or discuss matters pertaining to their socio-economic system. As noted elsewhere, (Chapter 5:3) debris from all activities undertaken are left in situ, with the exact location of deposition being determined by the prevailing air temperature and/or the shifting shade from the shadow of the tree in relation to the open hearth. However, some activities might have been started and carried out in different areas, such as Ol Pul or inside the family dwelling, and only the finishing stages of these activities are carried out in this area. Thus, although some of these activities are nuclear family related, debris from them will be located in different locales. Furthermore area (M) (Fig. 5:9) is not nuclear family specific and can be used by any member of the Boma or visitors from other Bomas for that matter.

When we consider all these complicating factors, it behoves us to be extremely cautious when predicting the refuse discard patterns from an archaeological perspective partly informed by the Maasai data. From the foregoing section and what was discussed in chapter 5:3 several generalizations can be made. First the location or locations where an activity takes place are not randomly scattered. There appears to be a particular pattern that underlies the spatial distribution of specific activities. Secondly the byproducts from many kinds of
activities do form debris clusters which can be distinguished on the ground. Thirdly on the basis of location and function it is possible to hypothesize and define several kinds of activity areas: (1) The communal activity area (i.e. area that is used by a large part or all of the site inhabitants). This area includes the middle of the Boma where the combined herds are coralled and the meat-feasting and butchery sites. The first of these areas will be characterized by very little debris with a lot of dung and the last two sites will be marked by an open hearth, often extended sideways to cover a considerable area due to its repeated use for a long time. These hearths are associated with a lot of bone debris discarded around them (for details see chapter 5:3). (2) The nuclear family activity area (i.e. an area that is exclusively used by one single family from the same house). This includes the entire house with all its internal features such as hearths and beds as well as the associated secondary refuse dumps (Fig. 5:7). This is the area where nearly all family related activities are undertaken and as we have seen has clearly defined refuse discard patterns. (3) Special activity areas. These are areas where more than members of one family are likely to be represented and on the whole less time is spent in them and consequently fewer activities will be represented. In Figure 5:9 these are the areas
designated (W) and (M). As noted earlier, especially in area (W), the activities carried out there are single family related but members of more than one family are represented. Thus, the type of debris left behind will represent activities of different houses and as such it would not be right to associate such debris with a specific house. Therefore, although the type of debris and activities carried out in specific activity areas are similar to those of the nuclear family, we need to distinguish them from the latter.

The archaeological implications of the observed patterns of associations between activity areas and debris are considerable. In regard to where a particular activity may occur, it becomes clear that in inter- and intra-site patterning of material remains it is almost impossible to differentiate between subsistence and manufacturing activities on the basis of their material remnants. Various stages of the same activity, as has been noted, sometimes may occur in the different sites and/or different activity areas in the same sites. This makes it untenable to make any reliable conclusions as regards activity area/debris associations. This seems to argue strongly against the widely accepted archaeological assumption that activities are segregated spatially or arranged by type within a single site; and by implication associated material remains are functionally
related. As has been indicated by Whallon (1973), all present-day spatial analysis seem to be based on this idea. Thus, the Maasai data presented in this work make this model questionable.

This work has used observed ethnographic evidence of Maasai behaviour in relation to modification and patterning of faunal remains. Thus I have documented the patterns of modification of various body parts and the bone discard patterns on the different types of sites extant in the Maasai settlement system. I then checked these patterns against the observed ones on bones collected from abandoned Boma and Ol Pul sites. As indicated in chapter 6:2, to a great extent the expected patterns derived from a priori ethnographic knowledge, are supported by the observed ones.

One of the major objectives was to gather Maasai ethnographic data that, when formulated into hypotheses and tested against independent archaeological data, could be used as an aid in the interpretation of archaeological pastoralist sites. In this connection, an attempt was made to compare the ethnographically derived model of modification and bone discard patterns with the published data from Prolonged Drift (Gifford, et al, 1920).

With this brief summary of the contents and objectives of the preceding pages, I can now offer some conclusions.
The findings of this research are the subject of chapter five and six. I have differentiated between the various types and functions of Maasai sites and examined how Maasai behaviour results in modification and discard patterns of faunal remains. One conclusion, in this connection, is that it seems the observed patterning of bones is due to the type, structure and function of a given site. For instance, the Boma is a long-term occupation site as reflected by its structure and function. The houses are more permanent than those of a seasonal cattle camp which is a short-term occupation site. The Boma is also the 'nerve centre' of all Maasai socio-economic activities. Thus a conscious site maintenance strategy is adopted which consequently results in organisation of refuse into 'middens' in segregated and restricted areas. Conversely, Ol Pul and butchery sites are intermittently used. They cover smaller areas and faunal remains patterning results from clearing bones from the restricted sitting area. However, this activity is not as organised as the maintenance of the Boma. The bones are thrown anyhow in areas not used for sitting. The open hearth acts like a 'magnet' for further discard but bones are never thrown directly into the fire but on the sides.

These points imply that spatial patterning of bones can be used as an index for diagnosing the structure and
function of other pastoralist archaeological sites.
However, on its own, this is not a very useful criteria for the suggested task. Thus it needs to be coupled with a detailed examination of bone modification patterns. These patterns are influenced more by the traditional butchering, secondary processing and consumption practices of their creators, than the type and function of the site. Thus the bones bear a "cultural imprint" alluded to in chapter 2:4. In chapter 6:1 we saw that the initial butchery process does not portray strong cultural differences in the bone damage patterns (also see Fig. 6:1). The subsequent secondary processing is the major agent of cultural modification and, by extension, will portray inter-ethnic group cultural differences and similarities (e.g. Yellen - in Ingersoll and Yellen, 1977; Isaac, 1968; and Binford, 1972). The differences and similarities will, therefore, reflect interregional variations. Thus, a detailed analysis of bone element representation and specific damage patterns can provide archaeologists with an additional index of similarity between archaeological assemblages in a region. As Gifford (1977) has suggested, analyses of butchery patterns, for example, among assemblages of Late Stone Iron Age and from Age sites in the eastern Rift Valley and adjacent highlands of Kenya and Tanzania might provide new insights into the problems of recent migrations of
pastoralists into this region. It is important to point out that we should, however, guard against in-losing the ethnographic present on the prehistoric past.

The use of specific, unprovable ethnographic analogy was discussed in chapter 2:2. While it was argued that such use is not scientifically conclusive, it was also shown that it is hard to avoid in archaeological interpretations. The comparisons of bone modification patterns in the Prolonged Drift assemblage and the Lemek East Boma sample illustrate that specific ethnographic analogy may play an important, if only suggestive role. For example, the two samples seem to agree reasonably well on bone fragmentation, cutmarks and burning damage patterns. The first is a result of human agency and other taphonomic processes; the other two are a result of the dismemberment strategy and secondary processing practices and associated influencing factors - e.g. traditional customs and intended use of various parts. For instance, burning damage, particularly, depends on the mode of preparation of a meat cut. The actual position of burning damage depends on whether the bone is covered by flesh or not. For example, the Maasai roast long-bone joints - e.g. humerus - as single units without first filleting the meat. Thus, only the articular ends are likely to be burned. Therefore, if say, the shaft of a humerus was burned, we can conclude that this happened
after the meat was filleted and consumed. This has important implications for the interpretations of burning damage on bones from archaeological sites where we want to establish the actual human behaviours responsible for observed burning damage. The actual position of burning can suggest to us the method of preparation of the bones involved. This proposition, however, needs more supportive evidence from a whole range of other ethnographic contexts for it to be useful as an aid to archaeological interpretation.

Bone modification patterns in regard to marrow processing were shown to differ at Prolonged Drift and Lemek East Boma. It was suggested that this is due to technological differences. This leads us to consider the role played by iron and steel tools on the perceived bone modification patterns. These tools are more efficient in carcass dismemberment than stone tools, and when used, result in a distinct bone modification pattern. This, from an archaeological perspective, implies that "---it may be possible, on the basis of specific damage patterns on archaeological bone, to diagnose the entry of the regular use of iron into activities of prehistoric peoples as well as the entry of mass-produced iron implements into their economies" (Gifford, 1977:222).

Bone modification patterns in regard to the use of stone or iron tools, however, is an area that requires further
research for it to be of use in archaeological interpretation of prehistoric pastoralist sites.

Using the correspondence of bone modification patterns at Prolonged Drift and Lemek East Boma, it is reasonable to assume that some aspects of butchery and secondary processing practices were similar. Furthermore, Prolonged Drift was a long-term occupation site (Gifford, et al., 1980). This is on account of the segregated accumulation of different types of secondary refuse in restricted areas. In chapter 5:3 it was shown how a conscious site maintenance strategy among the Maasai results in discrete refuse dumps analogous to the excavated midden - Feature 15 - at Prolonged Drift. This strategy also results in zones that contain very little, or no debris at all; a case represented at Prolonged Drift (Gifford, et al., op. cit.). Thus again it is reasonable to assume that refuse discard patterns may have been similar at both sites.

In chapters 5:3 and 7:2 (see discussions) I have demonstrated that the spatial patterning of activities (although particular activities may occur in more than one place) reflects underlying social rules - e.g. site maintenance strategy. The implications of this are that, in addition to delineating the nature and type of activities carried out in a given site, it is also possible to
reconstruct the apparently abstract aspects of social organisation. For instance refuse clustering reflects organised disposal practices and consequently length of site occupation. When the contents of these refuse dumps are analyzed for attributes such as modification patterns, spatial correlations of different body parts and their richness, they can inform us about culturally meaningful patterns.

On the basis of the ethnographic model as regards the lay-out and structure of Maasai refuse dumps, I have suggested ultimately testable predictions regarding the location of features such as houses at Prolonged Drift. While these predictions can be supported or refuted by further excavation at the site, the Maasai model needs more refinement in regard to the structure of refuse dumps in order for it to be of greater predictive value. For instance, the spatial correlations of different types of refuse (such as between different body parts of an animal within the same refuse dumps) in relation to the activity areas where they were produced needs further work. This may permit criteria to be established upon which various types of refuse can be related to unique activity areas. This refinement of the ethnographic model has important implications for the interpretation of different pastoralist archaeological sites.
Bone modification patterns, bone clustering into refuse dumps, and the structure of different types of refuse form part of the key to a better understanding of pastoralist sites. For instance, it was noted at the beginning of this thesis that Ambrose (1984) has postulated that Savannah PN occurrences were similar to the settlement strategies of modern pastoral societies, notably the Maasai, Barabaig and the Samburu. This postulate is based on the roughly similar economy and environment, which alone do not warrant the conclusion of similarity. Thus if it can be shown that, for a wide range of Savannah PN sites, bone modification patterns, clustering of bones into refuse dumps and the spatial correlations of different types of refuse are in agreement with the Maasai model, Ambrose's proposition can arguably be supported thus strengthening its validity and reliability. Conversely it can be shown to have flaws if there are unexplained differences. Thus, this stands out as one important area where future research can aid our understanding of the East African Pastoral Neolithic.

Lastly, the Maasai bone modification and refuse discard model and its predictive value is insufficiently detailed at the moment to be of specific use in interpreting different types of archaeological assemblages. This, however, can be overcome through more observation and rigorous testing against a large suite of
independent pastoralist sites. I believe its potential use has been illustrated in the Prolonged Drift bone assemblage.

Empirical clustering techniques should have been used; but they were not, mainly due to the grid square methodology used to collect the bones during fieldwork. Thus, cluster comparison of different body parts was not done for all body parts. However, the few on which statistical correlation was applied (Tables 6:11/12), while serving their purpose, could have been more refined and useful if the actual positions of all body parts were exactly mapped on the ground. Therefore, further research ought to proceed along these lines.

The foregoing, hopefully, has demonstrated the contribution that the ethnoarchaeological approach can make to the interpretation of excavated sites. Used judiciously, ethnographic data will play an important predictive role as to the most productive line of inquiry in an attempt to interpret pastoralist archaeological assemblages.
PLATES

Plate 1. A Maasai Boma (*enkang*). The Boma is on the left middle background of the picture; note the openess of the vegetation around the Boma enclosure.

Plate 2. A seasonal cattle camp. The branch hedges separate individual stockpens within the larger roughly circular enclosure, each with a house for the stock owner.

Plate 3. A seasonal cattle camp unroofed house.

Plate 4. Inside the Leshuta Rockshelter.

Plate 5. Outside the Leshuta Rockshelter showing the roughly semicircular fence on the talus slope. The gate is directly opposite the men.

Plate 6. Maasai methods of roasting meat:
(a) Commonly used in butchery sites and generally for relatively small pieces of meat.
(b) Commonly used during ceremonies where relatively large quantities of meat are roasted.

Plate 7. A vertebral column of a goat, severed at the neck and split lengthwise to remove the spinal cord. The pelvis is also split into left and right elements and left attached to the two vertebral pieces.
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