ETHNOARCHAEOLOGICAL INVESTIGATIONS ON DOMESTIC STOCK AGE SPECTRA FROM PASTORAL NEOLITHIC SITES IN KENYA

by

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A

T H E S I S

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I certify that this thesis is my original work and has not been published by or submitted to any other University or institution.

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ABSTRACT

This study is designed to address an interpretive problem that has arisen during the study of animal bones from Pastoral Neolithic sites in Kenya. A solution to this problem, it is suggested, could be obtained through an ethnoarchaeological study of the formation of animal bone assemblages on contemporary pastoral settlements.

Pastoral Neolithic age mortality structures of domestic faunal assemblages from sites in South-Western and the Central Rift Valley of Kenya show significant differences from those the ethnographic literature suggests are created (Marshall 1986). Questions then arise whether the patterns in Pastoral Neolithic faunal assemblages are as a result of Neolithic herd management and subsistence practices that differ from the contemporary ones; or whether those patterns were brought about by bone discard and post discard destructive processes which create archaeological age profiles that differ from those created through human culling practices.

The objective of this study is to explore factors affecting the formation of archaeological sites and the preservation of animal bones. Specifically, a study of the factors that affect the age structure of domestic faunal remains found on contemporary pastoral Maasai settlements is done. Subsequently, these factors and processes are interpreted to offer generalizations and hypotheses that could explain, and

predict certain age structures shown in domestic faunal assemblages from Pastoral Neolithic sites in Kenya.

Using the information and inferences from the Kuku Plain on current herd structures and mortality patterns, it is argued that in some instances differential discard and post-discard taphonomic processes may not determine faunal age distribution. Instead, the mortality patterns that would affect a herd are the same patterns that one would expect in a faunal and potential archaeological sample. Higher rates of mortality affect the adult or reproductively active animals (rates which are mostly undesired) whilst lower rates of mortality affect old animals. The fewer or more the age category in the live herd, the fewer or more they are represented within that given category in the archaeological record.

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> 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
>
> (Diane Gifford-Gonzalez 1984:250)

CHAPTER ONE

INTRODUCTION

1.1. Introduction

This introductory chapter sets the operational premises for this study. A statement of the research problem, the aims of the study and the methods used are addressed. Background information to the research area is also provided.

This study is designed to exploit ethnoarchaeological research techniques and data to explore questions raised by zooarchaeological studies of Pastoral Neolithic subsistence activities in Kenya. In particular, it is the aim of this study to collect ethnoarchaeological data from contemporary pastoral *Maasai* settlements on the factors that affect the age structures of domestic faunal assemblages. Knowledge of these, from an ethnoarchaeological perspective, is potentially useful in the understanding and interpretation of the factors and processes that might have created the age structures of faunal assemblages from Pastoral Neolithic sites in Kenya.

Ethnoarchaeological studies base their operation on the fact that the archaeological record and its meaning is dependent upon a large body of knowledge which links human activities (i.e., dynamics) to the consequences of these activities that may be apparent in material things (i.e., statics) (Binford 1983). The archaeological record, thus, is a body of "statics" where need arises that archaeologists by means of "theoretical tools" translate this static form and the (our) contemporary observations associated with them, into meaningful statements about past human behaviour. In essence then, ethnoarchaeology is a type of research strategy that, in its form as "theoretical tools" and "explanatory models", examines the linkages between human behaviour and material remains within contemporary systems in order to contribute to the understanding and interpretation of archaeological data. As Stanilawski observes, albeit his restriction to artifacts, ethnoarchaeology is

> the direct observation field study of the form of manufacture, distribution, meaning, and use of artifacts and their institutional setting and social unit correlates among living non-industrialised peoples for the purposes of constructing better explanatory models to archaeological analogy and inference. (Stanilawski 1974:18).

The theoretical basis for ethnoarchaeology is therefore the use of analogies derived from present situations to aid archaeological interpretation of past events and processes. Watson adds, the reason why archaeologists do this is "to provide ourselves with as many and as valid interpretive hypotheses as possible to help us understand, explain, and predict archaeological remains" (Watson 1976:278). Thus, the archaeological record by itself "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" (Gifford-Gonzalez 1984:250).

However, Binford (1967) has argued that we cannot justifiably employ analogies from ethnographic observations for the interpretation of archaeological data unless they are accompanied by a rigorous testing procedure. Analogies and ethnoarchaeological models should therefore serve to prompt more searching investigations rather than being seen as means of offering interpretations which are conclusive. This study then, aims at possible generation of information and ultimately models that can be compared with and tested against archaeological data and against similar ethnoarchaeological studies among different peoples. It is hoped that a contribution towards the construction of generalizations that are potentially useful in the interpretation of prehistoric pastoral adaptations in Kenya will be made.

1.2. General Remarks on Zooarchaeological Age Profiles

Considerable attention is currently being paid to information on the age of the animals represented in archaeological faunal samples. Studies of age mortality profiles can be a valuable aid to our understanding and interpretation of past human subsistence activities, herd management practices, and economic life ways in general.

Most frequently, age profiles are interpreted using generalised models from biological studies of wild animals (e.g., Klein 1982a, Klein and Cruz-Uribe 1983, 1984) or domesticated herds (Payne 1972, 1973). A catastrophic age profile for example, is one where a living mammal population that is essentially stable is suddenly wiped out by a catastrophe, such as an epidemic disease, extreme drought or flood. In this type of profile, successively older age classes will contain progressively fewer individuals (Klein and Cruz-Uribe 1984).

Another kind of theoretically expectable profile is that known as attritional; where prime age (reproductively active) adults are under-represented relative to their live abundance, while very young and old individuals are over-represented. Such a profile is made up of those population members who die of starvation, accidents, predation, endemic disease, and other routine attritional factors that affect the very young and old individuals most heavily (Klein and Cruz-Uribe 1984).

A similar theoretical approach could be talked of with regard to the domestication of animals. In this case as well, age profiles appropriately estimated from a faunal sample could be an aid to the understanding and interpretation of subsistence and herd management practices. For, as Payne (1973) observes, when animals become dependent on man, and when man in theory chooses exactly which animals he will kill, what is killed will again depend on a number of factors. Among other things, it will depend on the products for which the animal is being kept, on the seasonal availability of fodder and water, on the fertility of the animal, and on whether breeding is practiced (Payne 1973:281). A change in any one of these might cause a considerable change in the kill-off and subsequently what may come to rest as an archaeological faunal sample. So to speak, an archaeological faunal age profile that is fairly representative and well analysed takes up the important role by which an archaeologist can be able to explain and predict past `systemic' processes.

However, a question that arises for archaeologists is whether or not these age profiles accurately reflect man-induced hunting or kill-off patterns. Risk may exist that the inferences we make from age profiles ignore the extent to which certain pre- and post-discard processes have affected and biased the samples and profiles. For instance Klein and Cruz-Uribe (1984), Payne (1973), and Bunn and Kroll (1986), assume that there were known stable structures and characteristics in the live population which represent certain age profiles. To the contrary, kill-off patterns or even hunting patterns (and therefore the faunal age profiles that might result) will vary with varying proportions of females to males, the size of the live population, and the ratio of productive to non-productive animals.

Interpretations of age profiles do not also consider the extent to which non-human site formation factors have affected and biased the analysed samples. A bone assemblage may include animals that died of natural causes, for example of drought or disease, and a sample may consist of only animals which have died a natural death. Even though bone modification analysis could establish that human processing and therefore human induced death occurred, this is not in itself conclusive because of the likelihood that man may have scavenged on animals killed by natural causes.

Archaeological faunal samples may be deficient or rich in individuals of one or another age class for reasons that have nothing to do with mortality patterns. Young or old individuals may be missing because their bones were selectively destroyed pre- or post-depositionally. Alternatively for large species, older individuals may be under-represented because the bone collector rarely introduced their bulky skulls to the site (i.e., the schlepp effect). It follows then that one cannot simply distinguish a limited number of different kinds of man-animal relationships, or patterns of exploitation, each distinguished by a characteristic kill-off pattern. The same pattern can be a product of different situations, and an archaeologist must use other evidence to distinguish them.

One other theoretical issue worth noting here is that interpretable age profiles cannot be constructed from small samples. As seen above, the minimum sample size available for interpretation will depend on a mix of factors. If only one factor is responsible, then an interpretable profile may result from relatively few individuals. Whereas if multiple factors are involved, then many individuals may be necessary (Klein and Cruz-Uribe 1984).

Lastly, it is important that meaningful interpretations about past human behaviour and archaeological processes be dependent upon accurate methods of estimating the age at death of an animal. There are several ways that the age of an animal at death could be estimated based on archaeological faunal samples (see Chaplin 1971). The use of one or the other method largely depends on the type of faunal remains that age is being estimated from. Since archaeological faunal remains are fairly well represented in dentition because of their durability, and that dentition reflect relatively well the taxonomic characteristics of the sample under study, two methods have been put to wider use. These are tooth wear/eruption sequences and crown-heights. One case to cite is the use of a quadratic formula developed and widely used by Klein and others (1983, 1984) for calculating age-at-death of an animal from enamel crown heights of deciduous premolars and permanent molars. Gifford-Gonzalez (in prep., pers. comm.) has encountered and recognised problems when applying this method to cattle teeth from African Neolithic sites. Her research seems to indicate that some bovines have a pattern of tooth wear substantially different from that described by the quadratic formula given and used largely by Klein and others. Considering that molars do not wear quickly at first as predicted by the Klein model, the formula when used tends to under-age animals up to three years after eruption of each molar. The implications of the use of this method and other methods that yield significantly questionable estimates for age profiles and therefore interpretations are obvious.

Age mortality profiles are important sources of information that archaeologists can apply to interpret past human behaviour and processes on the basis of zooarchaeological remains. But hope for plausible interpretations rests on the ability to discern and evaluate various and possible processes (human and non-human) that may affect, shape, or bias the age profiles. The cautious and judicious interpretation of age mortality profiles must also be preceded with refined and as accurate as possible analytical methods.

1.3. The Research Problem

It has been shown in the foregoing section how age mortality profiles from zooarchaeological remains could be a valuable resource to our understanding and interpretation of prehistoric subsistence and herd management patterns. Albeit difficulties in drawing conclusive information on this, there is an obvious relationship between how man manages herds and the resulting patterns derived from the analysis of the faunal remains. Adequate information on the characteristics of the live population appears very crucial to the understanding of the resultant archaeological patterns. Such information is unfortunately scarce but in recent years, economic and development oriented anthropologists and vetenarians have started to collect such data in Africa.

Modern pastoral cattle are mainly managed for herd growth and for milk, thus maximising the number of females and the adult age class (Dahl and Hjort 1976; Meadows and White 1979; Semenye 1980). The largest proportion that can be culled from each herd without damaging its growth is 8% per annum, made up of young bullocks, and old cows and bulls (Dahl and Hjort 1976). As expected, the adult class and in general the more productive individuals in the herd attract more care and protection during times of disease or drought.

Such a pattern indicates that, in a normal case in the first year of a lifespan, calf mortality is 20%. This rate goes down during the next few years and is expected to be about 7%. Animals between four to seven years also generally have the lowest mortality of all, only about 5%. By about 7 to 8 years, the animal death rates increase to about 10%. After the age of 9, the cattle are decreasing in number more rapidly. There is a great deal of variation in life expectancy but between 9-15 years appears about average, and up to 40% mortality may be expected among animals of 11 years old (Dahl and Hjort 1976).

Information on age mortality profiles and kill-off patterns for small stock is adversely scarce. The lifespan expectancies of sheep and goats is given as 5.5 to 6 years (Dahl and Hjort 1976).

An overall lamb mortality rate is given to be 28.5% for lambs under 6 months. In goats, the rates range between 29.54% to 45.3% depending on whether the kids are first births, twins or whether the kids are single births. Data for rates in older sheep and goats is lacking. However, we expect that after the first year of birth to about 3 years, mortality rates have reduced due to increased ability of the animals to resist diseases, and fewer animals are being culled. A less than 20% mortality rate seems reasonable. Between 3 to 4.5 years, death rates are lowest due to further reduced rates in natural mortality and kill-off. The animals have now attained productive age and are largely preserved for breeding purposes. After 5 years, death rates from kill-off increase drastically since they have outlived their productive role as breeders.

A comparison between the age profiles estimated from Pastoral Neolithic faunal samples in Kenya with those that contemporary pastoral herd management and subsistence patterns suggest are created, show significant differences.

In a total cattle sample of 89 individuals (from 5 sites), 10 (11.23%) of these are neonates. The juvenile age class is made up of 21.34% (MNI=19), whereas the adult age class and the aged class are represented by 53.93% (MNI=48) and 13.48% (MNI=12) respectively.

Almost a similar pattern emerges in the sheep/goats samples from the 5 Pastoral Neolithic Sites. In a total of 109 individuals, the neonate age class makes up 7.33% (MNI=8), juvenile 29.35% (MNI=32), adult 57.79% (MNI=63), and the aged class 5.5% (MNI=6).

Age profiles of Pastoral Neolithic faunal assemblages represent almost a reversed situation from that suggested by contemporary pastoral modes of herd management and subsistence. This contradiction amounts to the total research objectives of this study. This study in essence then, is an attempt of inquiry into possible and probable factors and processes (human and non-human) that affect age mortality profiles of domestic faunal assemblages. It has the goal of explaining the significant differences apparent between Pastoral Neolithic age profiles and those that ethnographic literature on modern pastoral production systems and subsistence practices suggest are created.

1.4. Aims

In view of the research problem discussed in the preceding section, this study will address two hypothetical issues; that the differences between the age profiles of domestic faunal remains from Pastoral Neolithic sites in Kenya and those expected from our knowledge of contemporary pastoral herd management and subsistence practices may be explained by two hypotheses.

Hypothesis 1:

Pastoral Neolithic faunal assemblages on the average represent different herd management and subsistence practices from the contemporary ones. Credence of this hypothesis rests on three possibilities;

(a) Neolithic Pastoral systems may only be comparable to those of today's very well-off pastoralists. Among contemporary pastoral systems, it is only the very well-off pastoralists (one who on the average keeps and subsists on about or more than 200 head of cattle and 300 head of sheep and goats) who may be less constrained in slaughtering more animals from the adult age class without damaging the productive stability of the herd. Hence, the adult age class will be dominant in the resulting faunal age mortality profile.

(b) The relatively well-off Pastoral Neolithic subsistence modes (compared to today's) were less milk oriented and more reliant on meat consumption. Relatively `more milk oriented' pastoralists (known to be the case for today's pastoralists) will expectedly slaughter very few female animals in the adult age class. In a relatively `less milk oriented' subsistence mode (hypothesised to be the case with Neolithic pastoralists) more animals will be slaughtered in the adult age class.

(c) Pastoral Neolithic culling patterns differ from those practiced by contemporary pastoralists. Here, higher culling rates were carried out on animals in the adult age class and very few animals lived to their old age. This explains the lower number of animals than expected in the older age classes, *contra* the relatively higher number of animals in the adult age class.

Hypothesis 2:

Age mortality profiles of Pastoral Neolithic faunal assemblages do not in essence, represent different "systemic" herd management and subsistence practices, as hypothesis 1 implies. The age mortality profiles that the Pastoral Neolithic faunal assemblages under reference show are the making of taphonomic processes, and not the result of the different culling patterns and subsistence practices. Thus;

(a) The relatively rare representation of animals in the older age classes could be due to the fact that these animals were consumed and their bones discarded at points far away from habitation areas and insignificantly make up the archaeological midden recovered and analysed. A possibility may also exist that the older animals, being more vulnerable to diseases and drought, likely died outside or away from habitation and archaeologically investigated areas. If they died inside the homestead, their carcasses may have been were pulled outside the homestead enclosure and left at the disposal of scavenging predetators.

(b) The faunal material that represents animals in the younger and older age classes, being more fragile was relatively more affected by discard and post-discard destructive processes.

In view of these hypotheses, this study addresses itself to herd management and subsistence practices as seen in domestic faunal remains recovered from among contemporary Maasai pastoralists of Kuku Plain in southern Kenya. Specifically, in addressing these hypotheses, the objectives are:

(a) Collection of ethnoarchaeological information on:

(i) Age profiles and the structure of contemporary herds so that these could be examined in the light of long-term management strategies and herd response to kill-off patterns and natural causes of mortality.

(ii) Culling patterns; in view of the age of animals that are preferred for slaughter and reasons for this preference.

(iii) Post discard site formation processes; in view of how these may affect and model faunal age structures.

(iv) The age profiles of domestic faunal remains.

(b) Analysis:

(i) Compare data on culling patterns with faunal data; to examine and account for the nature of the relationship between expected and observed patterns.

(ii) Compare the ethnoarchaeological data with data from Pastoral Neolithic sites in the central Rift Valley and south-western Kenya.

(iii) Examine and evaluate the hypotheses suggested above.

(iv) Suggest generalizations and explanatory models for the age profiles that are shown by Pastoral Neolithic faunal assemblages.

1.5. Methods of Data Collection and Analysis

This section provides a discussion on methods and the research strategy that was adopted in data collection and in the analysis of these data.

1.5.1. Data Collection

The data required to obtain objective a(i) included information on the size of the stock, species and sex composition, and the age distribution in the herd. The operational use of the term 'herd', refers to those domesticated animals, specifically cattle, sheep and goats under the ownership or management of a pastoral household. Figures for the size of the stock, species, and sex composition were achieved by the counting of animals as they entered the homestead. The data were cross-checked by a recount of the animals as they left the following morning.

The age structure of the herd was obtained by counting animals within four age categories (neonate, juvenile, adult, and aged). For effective communication with informants, equivalent 'terms' or expressions for the age categories in the Maa language were used as shown in Table 1.1.

The counting of animals in each age category was done in the presence of someone with knowledge of the structure of the herd who assisted in the verification of an animal's category. Informants were then asked whether the distribution of age in their herd was ideal to their subsistence and production needs and why.

For objective a(ii) different ways in which the size of the herd was reduced were considered. Stock reduction may come as a result of:

(a) slaughter of animals for routine subsistence needs.
(b) slaughter of animals for food.
(c) mortality through disease.
(d) mortality through drought/starvation.
(e) mortality through accidents and predators.
(f) sale/exchange.
(g) bride wealth.
(h) loan.
(i) gifts.

Most informants could not accurately remember the number of animals that had been 'lost' in a long period and in different ways. Due to this difficulty, informants were asked to provide figures for the past period of one year. The data were recorded on prepared sheets where the number of animals in each age category and sex was recorded. Informants were further asked questions on the influencing factors for their choice of an animal for slaughter in a particular age category.

Table 1.1. Ol*maa* terminology for female and male neonate, juvenile, adult, and aged animals.

	CATTLE inkisha	SHEEP inkerra	GOATS inkimeji
Neonate			
Male	ornoeki	orbalelo leker	orbaleto lekine
Female	ornoeki	orbalelo enker	enbalelo ekine
Juvenile			
Male	orbungai	osatina eker	osatina lekine
Female	entauno noruo	enkuo eker	enkuo lekine
Adult			
Male	orkiteng olong'oni	ormeregesh orner	oloro orkine
Female	enkiteng	enker	enkine orkine
Aged			
Male	orkiteng olong'oni	ormeregesh orker noruo	oloro noruo
Female	enkiteng' noruo	enkiteng noruo	enkine noruo

For objective a(iii) informants were asked general questions on butchery and meat eating practices, such as where animals are slaughtered, butchered, and consumed; whether there are any differences in the age of animals that are slaughtered and consumed for different requirements, and at different localities. In total interviews were conducted in three households.

Information on post-discard site formation processes included an evaluation of possible taphomonic processes of bone discard destruction, and how these may selectively affect faunal remains of animals in the younger or older age classes. Towards this objective, studies that have been done on the relationship between zooarchaeological age profiles and taphonomic processes were examined.

Table 1.2. Sites from which faunal remains were collected.

SITE	SITE NAME	DESCRIPTION	REMARKS
S1	Enkang(*boma*) 1	the main Maasai home settlement occupied all year round by part of a single family or families. Acts as the nerve centre for all activities undertaken within the Maasai social and econmic system.	Interviews also carried out.
S2	Orpejet 1	Maasai meat and soup feasting places located close to the enkang. Used by members of one family or more (but to the exclusion of the female gender). Sheep and goats are mainly the animals sloughtered and eaten.	The meat and soup feasting site used by Enkang 1
S3	Enkang 2A	same as Enkang 1	interviews also conducted
S4	Enkang 2B	same as Enkang 1 and 2A but an extension of Enkang 2A	
S5	Orpejet 2	same as orpejet 1	used by Enkang 2A Enkang 2B
S6	Orpul	Meat eating and places used by Maasai *Morani* (sing. *Moran*).	

Table 1.2 cont'd

		Morani are Maasai youth undergoing training and initiation into adult-hood. Orpul is usually located close to a river and used only by the morani.	
S7	Manyatta	The main home camp used by the *morani*. It is a communal settlement where morani have converged for residential military training and initiation into adulthood.	
S8	Orpejet 3	same as Orpejet 1 and 2 but used by the manyatta	
S9	Olopololi	an enclosed pasture area reserved for sick or weak animals, not strong enough to be moved far from the Enkang	faunal remains collected, largely comprised victims of disease and starvation

In objective a(iv), faunal remains of cattle, sheep, and goats were collected. The material is comprised of surface collections from nine sites, differentiated by their functions (see Table 1.2).

For site S1 (Enkang 1) a 1m grid system was used where specimens were plotted by their catalogue number, quadrat (NE, NW, SE or SW), square unit, and Y and X co-ordinates.

This method was seen as convenient but unfortunately time consuming. Other methods were therefore adopted for other sites. For sites S3, S4 and S6, specimens were plotted with distance and angle from an arbitrary datum point placed approximately at the centre of the site. For sites S2, S5, and S8, the area was divided into square units with level numbers or letters. All the specimens in one single square unit were collected and labeled with the letter or number of the corresponding square.

The Olopololi site (S9) presented some difficulty in that it was too large to be conveniently mapped by a grid system. The area covered about 400 m^2. Most of the specimens collected from this site were largely from complete skeletons. From each skeleton, depending on the level of preservation, a single whole maxilla or mandible was collected, and distance approximated to the nearest tens of metres from an arbitrary datum point.

For the Manyatta site (S7) specimens were plotted to the angle and distance from a datum point. A systematic sampling method was used where specimens from the NNE, SEE, SSW, and NWW compass portions were collected.

For all the sites (except the Olopololi) mapping was done with physical and artificial features plotted.

1.5.2. Data Analysis

The data for analysis largely fell into two categories. One category comprised data on the structure of the herd, age mortality and culling patterns, and meat eating practices. The other category comprised data from the analysis of faunal remains.

In the first category, data on the age structure of the herd was compared with the age structure of the faunal remains. Intersite data comparisons was also done. Data obtained from different households was lumped together to make one single sample for further comparative purposes. Faunal data from different sites was also lumped together to make one single age profile with which to compare data obtained through interviews. Statistical tests were carried out to determine the nature of the relationship between observed frequencies (faunal data) and expected frequencies).

The ethnoarchaeological data that had been collected was then compared with data from Pastoral Neolithic sites. The ethnoarchaeological data and the Pastoral Neolithic data were compressed into one single age profile for each of them. Statistical tests were also done on these data to test the relationship between expected and observed frequencies, followed by relevant discussions of this relationship.

With substantial information available from the above comparative exercises and discussion, the hypotheses suggested were put to test. Thereafter interpretative and explanatory generalizations were offered to account for the age structure of domestic faunal assemblages from Pastoral Neolithic sites in Kenya.

Faunal Analysis: determination of age

A total of 263 dental specimens were collected from all the nine sites. These were used for estimation of age-at-death of the animals. The post-cranial material was not analysed.

In this study, sequences in tooth eruption and wear were used in the estimation of age. Wear stages in cheek teeth were correlated with specific age classes following the work of Payne (1972), and Deniz and Payne (1982), for sheep and goats, and

Grant (1975, 1982), for cattle, and adopted by Marshall (1986).

Six codes with descriptions of different wear stages (see Table 1.3) were adopted from Marshall (1986) and used in correlation with seven different age classes (neonate, juvenile, old juvenile, young adult, adult, aged and very old) (see Table 1.4).

To obtain the number of individuals in each age class, the Minimum Number of Individuals (MNI) was used/calculated.

Table 1.3. Wear stage descriptors and codes used for individual teeth (After Marshall 1986:293)

CODES	WEAR STAGE DESCRIPTIONS
1	Unworn tooth
2	anterior cusps in early, occlusal surface less than 50% dentine exposed
3	cusps of second loph in early wear
4	third loph in early wear
5	all cusps worn more than 50% dentine exposed,equivalent to Payne (1973),Stage III
6	very worn tooth, anterior logh 100% dentine, equivalent to Payne's Stage III

Table 1.4. A summary of general eruption and wear classes used in this study. (After Marshall 1986:293)

WEAR CLASSES	DESCRIPTORS
Neonate	unworn deciduous dentition
Juvenile	worn deciduous dentition, deciduous fourth premolar stage 5, first molar early in wear, pre-stage 5
Old Juvenile	deciduous dentition worn, stage 6, second molar in early wear, pre-stage 5
Young Adult	adult dentition in full wear, third molar stage 5
Adult	Adult dentition in full wear, third molar stage 5
Aged	first and second molars well worn, second molar stage 6
Very old	all teeth extremely worn, very low crown heights, third molar stage six

Dental wear classes were also correlated with actual age and with three broad categories of the animals' lifespan (after

Marshall 1986). The three broad categories each of approximately 33.3% of lifespan corresponded to pre-reproductive, reproductive and post-reproductive periods of life.

In cattle, the average lifespan in Africa is taken to be about 14 years (Dahl and Hjort 1976). The fertility range falls approximately between 4 and 9 years. The neonate, juvenile, and young adult classes in cattle were considered as falling in the first third of lifespan (the pre-reproductive phase; approximately between 1 to 4 years). The adult class was correlated with the second third of (the reproductive phase) lifespan (between 4 and 9 years), and the aged and very old classes with the last third or post-reproductive phase of life-span (9 - 14 years). This information is summarised in Table 1.5.

Table 1.5. The correlation used between cattle dental wear classes actual age and percentage of lifespan (after Marshall 1986:71)

Dental Wear	Wear Class Markers (abbreviated)	Months (estimated)	Portion of Lifespan (%age)
Neonate	unworn decidous	<1	first third, prereproductive (0-4 yrs)
Juvenile	worn decidous, first molar early wear, pre-stage 5	<6	first third
Old Juvenile	second molar in early wear	18-30	first third
Young Adult	third molar in early wear	18-30	first third
Adult	dentition in full wear third molar stage 5	>48	second third, reproductive (4-9 years)
Aged	second molar stage 5	-	last third, post-reproductive (9-14 years)
Very old	third molar stage 6		last third

A similar approach of correlation between dental wear stages, actual age, and age categories was applied to sheep and goats (see Table 1.6).

There were ultimately three categories of data. The first category was that of the 7 age classes. The second category comprised 4 age classes (with the juvenile classes, the adult classes, and the class of aged and very old, being compressed to form one age category for each of them). The last category is comprised of the three broad categories of the animals' lifespan. Comparisons of these data with the Pastoral Neolithic data or data obtained through interviews could therefore be conducted conveniently at any of the three levels of data categorization.

Table 1.6. The correlation used between cattle dental wear classes actual age and percentage of lifespan (after Marshall 1986:72)

Dental Wear	Wear Class Markers (abbreviated)	Months (estimated)	Portion of Lifespan
Neonate	unworn decidous	<1	pre-reproductive (0-12 mths)
Juvenile	worn decidous, first molar early wear, pre-stage 5	>12	pre-reproductive
Old Juvenile	second molar in early wear pre -stage 5	>12	pre-reproductive
Young Adult	third molar in full wear	>24	reproductive (12-48 mths)
Adult	dentition in full wear third molar stage 5	>27	reproductive
Aged	second molar stage 5	-	post-reproductive (48-60 mths)
Very old	third molar stage 6		post-reproductive

1.6. Background to Study Area

Field research for this study was conducted among the pastoral Maasai of Kuku Plain in southern Kenya. Kuku Plain lies approximately between longitudes $37^{o}34'E$ and $37^{o}51'E$ and latitudes $2^{o}43'S$ and $2^{o}58'S$ (see Figure 1.1). The average altitude is 1459m above sea level. The area falls administratively under Loitokitok Division of Kajiado District.

Topographically, the area is a distinct plain with gently undulating slopes. It is bordered to the north by the Chyulu Range and to the south by Mt. Kilimanjaro. Much of the area is composed of deep reddish brown clay loams and flat sedimentary plains with poorly drained soils.

The only permanent drainage system is the Nolturesh River which drains from Mt. Kilimanjaro cutting across the plain. Any other form of drainage in this area is in the form of seasonal streams and swamps. Along the Nolturesh River and seasonal streams, the dominant vegetation is *Acacia kirki*. In the open plain, thorn bushes, wide expanses of open grassland and short thickets are the common vegetation. During the rainy seasons wild animals, notably giraffe, gazelles, did-dik, and warthog, are common.

The area receives a bimodal annual rainfall. Short rains fall between October and December and the long rains between received on the Kilimanjaro foot hills and decreases rather rapidly in the plains (about 821 mm annually). Temperatures are much higher in the open flatish plain with potentially high evaporation rates.

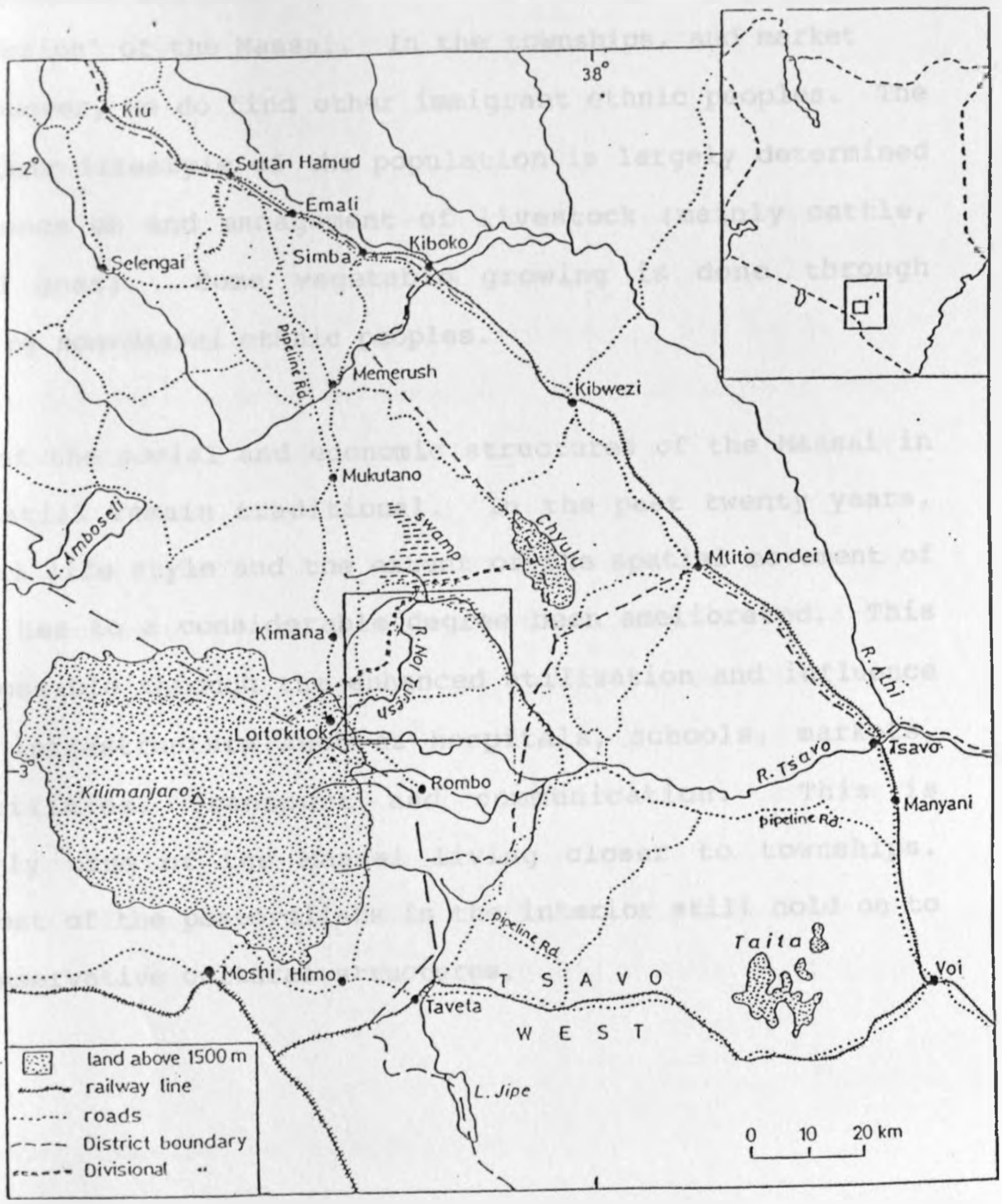

Figure 1.1. Research Area

Ethnographically, Kuku Plain is largely settled by the Kisongo 'section' of the Maasai. In the townships, and market centres, however, we do find other immigrant ethnic peoples. The socio-economic lifestyle of the population is largely determined by subsistence on and management of livestock (mainly cattle, sheep, and goat). Some vegetable growing is done through irrigation by non-*Maasai* ethnic peoples.

Much of the social and economic structures of the Maasai in this area still remain traditional. In the past twenty years, the pastoral life style and the extent of the spatial movement of the Maasai has to a considerable degree been ameliorated. This has been possible through the enhanced utilization and influence of modern infrastructure such as hospitals, schools, markets, water facilities, transport and communication. This is particularly true of the Maasai living closer to townships. However, most of the pastoralists in the interior still hold on to fairly conservative cultural structures.

CHAPTER TWO

ASPECTS OF HERD MANAGEMENT AMONG CONTEMPORARY PASTORALISTS

2.1. Introduction

This chapter addresses selected aspects of herd management practices among contemporary pastoral peoples. It highlights, in a general sense, theoretical issues related to how herds are managed in a pastoral mode of production. In an attempt to keep the chapter as relevant as possible to the research problem at hand, its scope will be restricted to, among other aspects, the conceptual and operational definition of pastoralism. Following this is a discussion of our knowledge of certain aspects of herd management. These includes information on stock sizes and species composition, age distribution, and age mortality patterns/profiles and determinants for kill-off patterns. This body of literature on pastoral production and herd characteristics in general is deemed necessary and important in aid of subsequent explanatory and interpretive phases of this study.

2.2. General Remarks on Pastoralism

2.2.1. Pastoralism Defined

The term `pastoralism' will be considered here, in its own right, as a means of production. To do this is to view pastoralism not only in dimensions of "functions" and "products" of production but also in terms of a peoples' dependence upon livestock as a core means of "production" and "reproduction". With this borne in mind, one avoids the error that Jacobs (1965b:146) made when he suggested that "pastoralists consist of people who either (i) raise livestock mainly for consumption; (ii) raise livestock mainly for trade of social exchange; or (iii) both." This classification as noted by Rigby (1985:130). "depends upon a notion of livestock in its "functions" and "products" and fails to appreciate the emphasis placed on livestock as a means of production by a community".

In defining pastoralism, it is beneficial to observe a common assumption normally made in the literature. Jacobs (1965a:145) notes that Kroeber (1948) ties pastoralism inseparably to nomadism. Goldschmidt (1979) as well uses the term "pastoralism" in a very general sense to apply to all forms of pastoral production. Nomadism in relation to pastoralism denotes the movement from place to place with livestock in search of water and pasture, with minimal sedentarization in places where these are available. The El Parkakyu in central Tanzania are not nomadic in its accurate sense of the term (Rigby 1985) nor are other pastoral Maasai (Jacobs 1965b). Indeed most pastoral societies may be said to be primarily transhumant and only secondarily nomadic (cf. Baxter, 1975; Monod 1975; Salzman 1980).

Various definitions and conceptions of the term pastoralism exist in the literature. To adopt one for operationalization should be done with caution so that assumptions and generalizations are avoided. Generalization on one hand is likely to assume socio-cultural and economic homogeneity among all pastoral peoples. On the other hand, to emphasise one particular aspect of pastoralism would likely ignore the possible significance of other aspects. At a strictly theoretical level, definitions of terms may not have much significance. However, when we operationalize them we face the danger of making assumptions. Given the possible wide range of pastoral economies, it becomes difficult to make use of one particular definition, for each of the different pastoral economies are associated with certain traits unique only to them.

To have a general idea of what pastoralism is and in essence how it relates to certain means of production, Rigby's (1985: 132) matrix for the classification of societies on the basis of primary means of production will be referred to (see Table 2.1)

The matrix above is based only on the varying emphasis given to the means of production. Hence, although "pure" pastoralists in almost all cases consume a variety of agricultural products (cf. Jacobs 1965a), they do not make specific areas of land subject to individual, domestic, kin-group, or age-group rights (Rigby 1985).

From an ecological point of view, Bonte (1973) looks at pastoralism as a correspondence between environmental systems and social systems. Pastoral ecosystems, he notes are based on the exploitation of animal on perennial plant cover (the primary producers) by the herds of herbivorous animals (the primary consumer) with man playing the role of secondary consumer(Bonte 1973:203)

Table 2.1. Classification of societies on the basis of primary means of production (source, Rigby 1985:132)

MEANS OF PRODUCTION	BASIC CATEGORIES		
	settled agriculture	Agro-pastoral (cattle herds)	'pure' pastoralists
land	+	+	-
labour	+	+	+
livestock	-	+	+

\+ = strong primary
\- = weak secondery

Bonte (1973) notes that pastoralism operates at two different levels of appropriation of nature. At the level of the domestic group or even individual, we have the appropriation of herds; the appropriation of pasturage takes place at a collective level in the context of a pastoral community.

From the above, it could be noted that one's definition of pastoralism reflects one or the other aspect that is being emphasised. While Rigby tends to emphasise pastoralism in its aspect as a means of production, Bonte chooses to stress the aspect of pastoralism as an ecosystem. Goldschmidt's definition could be a well rounded one had he used it to refer to pastoralism in general and not just to nomadic pastoralism. From his definition, we could say that pastoralists belong to a class of societies categorised on the basis of two elements: the attendance upon and husbandry of ruminant animals, and the utilization of natural grasses (fodder). The conditions of such an economy in turn require two elements; the availability of domesticates suitable for such exploitation, and available pasture lands that are adequate for sustaining flocks or herds (Goldschmidt 1979). Whereas these factors are common to pastoralists in general in contrast to other modes of production such as agriculture, they do not create an identity. In Goldschimdt's words:

> rubric pastoralism is thus an ideal-type concept. Use of the term means that the pastoral activities have such great importance that sets the patterns of life. Whatever other economic activities that are engaged in, they are accommodated to the demands that animal husbandry makes upon the people (1979:16)

2.2.2. **Pastoral Diversity**

Any study focusing on pastoralism must take into account the extent to which there may be major differences in modes of livestock production among peoples grouped together in a single category such as "pastoral" (Speranza 1982). This withstanding, this section outlines possible lines of subdivisions of pastoral societies and pastoral modes of production. Based on Goldschimdt's (1979) work, diversity in pastoralism can be based on four variables.

The first is the nature of the relationship of the society to agricultural production. Pastoral societies are not entirely free from involvement, either directly or indirectly, with agricultural products. Jacob's (1965a) argument that "pure" Maasai are devoid of such dependence subsumes the fact that the Maasai are extreme in their degree of independence from agricultural products. There are three kinds of relationships to agricultural production.

(i) Those like the Maasai and some Berber societies who are 'independent' as communities from agricultural pursuits though they may have a symbiotic relation to farming communities.

(ii) Those who are an element in a plural society in which they are an "integrated" independent ethnic unit sometimes superordinate to farmers (e.g., the Tuareg, Tutei,and most of the pastoralists in South West Asia); and

(iii) Those who engage in secondary farming activities (classically the case in sub-saharan societies where pastoralism exists).

A second variable is the nature of the terrain in which animals are kept. Under this variable we consider two types of environs: mountainous areas which can only be exploited seasonally involving a periodic vertical shift from wet to dry pasture (transhumance), and relatively flat desert, semi-desert or dry plains, in which movement is horizontal and hence more free ranching.

The third variable is the nature of the animals that are herded. Different animals have different needs and therefore call for divergent responses from their human keepers. A distinction could be made between those pastoralists who exploit primarily or entirely sheep and goats (also Ilamas and alpacas), and those who exploit the large ungulates (e.g., cattle).

The fourth variable is the distinction between pastoralists who maintain mounts (camels, horses or reindeer), and those who are pedestrians. This could have consequences for the degree of mobility.

From these four variables it becomes less difficult to define a particular pastoral group on the basis of its relationship with agricultural production, the nature of the terrain on which animals are kept, the nature of the animals kept, and whether the pastoralists maintain mounts or not. These variables and the factors outline above, have implications for research strategies, and in general their detailed understanding improves our understanding of the intricate social-cultural and economic matrices that accrue from these factors.

Speranza (1982) augments information outlined above with the inclusion of such variables as subsistence and market. He draws a continuum from pure pastoralism at one end to mixed farming/herding at the other end (see Figure 2.1) .

Pure Pastoralism	Semi Pastoralism	Mixed farming/herding
livestock dependent	market dependent	agricultural dependent

Figure 2.1: A continuum on pastoral diversity.

"Pure pastoralists", as so called, raise livestock in order to subsist solely or in large part on the milk, meat, and blood of their animals. They also rely on livestock for purposes of social exchange. They are pastoral in their production orientation as well as pastoral in food dependence. (Examples of these are the Galla and Borana of Kenya and Ethiopia, Bedawib Beja of the eastern Sudan, and the Maasai of Kenya and Tanzania). Pure pastoralism is practised by people who engage in virtually no agriculture; livestock are raised primarily for food consumption and internal social exchange. These pastoralists are not involved in extensive market exchange as a means of subsistence.

"Semi-pastoralists", practice little agriculture but engage in livestock production for market exchange purposes in order to purchase agricultural goods. Though highly pastoral in cultural orientation, in practice they actually depend significantly on agricultural foods for subsistence. The major difference between the two variations in pastoral production are seen in the degree of dependence and reliance on external trade and markets, a feature generally lacking among "pure pastoralists" (Jacobs 1965a). Examples of semi-pastoralists are the Somali of Somalia, Fulani of north eastern Nigeria, and the Tuareg of the central Sahara.

"Mixed farmers/herders": are societies actively engaged in a combination of both herding and agriculture. They sometimes supplement their agro-pastoral activities with food collecting and hunting whenever possible. Examples known are the Turkana, Nuer, and Jie of the Sudan.

With this diversity borne in mind, discussions of pastoral herd management practices will follow with a bias towards pastoralists who have been referred to in much of the literature as "pure" and sometimes "nomadic". Discussions will subsequently concentrate on the Pastoral Maasai.

2.3. The Structure of Pastoral Herds and Aspects of Herd Management.

Dahl and Hjort (1976) have noted with concern the inadequate, scarce, and scattered empirical facts existing in the literature on the structure of pastoral herds. They note correctly that the anthropological literature on pastoral societies is devoid of a 'materialistic framework' and dominated with rather rhetorical ideological and social views. Dahl and Hjort (1976) have made a positive contribution to remedy this situation and much of the data that will be provided in this chapter is drawn from their work.

This thesis restricts itself to cattle, sheep and goats as they are the animals that form the majority of most pastoral Maasai herds. As noted earlier, the mode of pastoral production to be examined is that of "pure" pastoralism as practised by societies such as the Maasai. However, in both of these restrictions, the possibility of reference to other animals kept and other forms of pastoral production exist.

In the succeeding sections, existing literature on stock size, species composition and age distribution of pastoral herds will be reviewed.

2.3.1. Stock Size and Species Composition

Stock size

The average size of a pastoral herd is difficult to determine. This is so because herds are managed in different ecological conditions and environmental areas which are variably affected by climatic conditions. These factors lead to further differences in the number of animals that are kept at one particular time. Drought and epidemics affect the size of herds differently between households and between different ecological zones.

From the literature available, all factors being equal, there is a tendency for pastoralists to keep herds as large as possible. Anthropologists have explained this practice as largely resulting from the social value (as opposed to economic value) that is placed on the herds. Pastoralists see as their ultimate goal the keeping of large herds, a goal that ensures for them high social status and prestige in the society. The social value aspect of herd management could be important in defining social relations and obligations, and as some say in achieving prestige. But this argument subsumes the crucial environmental, ecological, and in general, economic considerations that are directly pertinent to the stability of the herd. Dahl and Hjort (1976) help us to grasp this reality, by arguing that:

> other factors for example unreliable rainfall leads to great fluctuations in the availability of water and grazing, both seasonally and over long periods. For a pastoral household, it is necessary to keep a margin against the risk of having part of the herd killed from a drought or epidemic. The number of animals needed to maintain a long time continuous production is also much larger than the number of animals immediately utilised at a certain period. It could also be argued that the social value system primarily reflects these economic/ecological aspects (Dahl and Hjort 1976:17).

The size of herds is largely a question of the ecological and environmental conditions that are prevailing. One fact that affects the size of a herd, either of one single household or of a whole pastoral group is the availability of water and grazing pasture over a long period. Lack of these, and particularly during drought, a very significant portion of the herd will be lost. With abundant water and grazing pasture the stock grows faster and few animals are lost. Similarly, the absence of diseases ensures a steady herd growth and minimal loss in herds.

Another aspect of stock size relates to the general category or mode of production that characterizes a particular pastoral society. In reference to Rigby's (1985:132) (see Section 2.2. of this Chapter) matrix for the classification of societies on the basis of primary means of production, we would expect that "pure pastoralists", all other variables being equal, will keep more animals than agro-pastoral or settled agricultural societies. This reflects the degree of dependence on whichever means of production pursued. We may establish that increase in the number of animals herded corresponds to the relative importance of herds as a means of production or as a basis for subsistence. In addition, even within what we would term a "pure" pastoral community, the number of animals herded will vary between households or between sets of households depending on the degree to which agricultural products are exploited.

Spooner (1973) has argued a case for the `maximum' and `minimum' size of herds. He observes that the ability of the herdsmen to control the animals in any given topographical situation is a factor in determining the maximum size of the herd. The requirements of the family or other grouping that subsists from the herd are a factor determining the herds minimum size. In other words, the maximum size of the herd relates to the technique of effective management of the herd whereas the minimum size of the herd relates to the necessary subsistence minimum requirements.

Khazanov (1984a, 1984b) however debates against Spooner's argument for a maximum or minimum herd size. He writes that:

> the number of animals which practically can graze together usually depends on a complex combination of ecological factors connected with environment, weather conditions, epizootic circumstances, species composition of herds, biological particularities, and the age-sex structure of herds etc. and also on socio-economic factors such as the number of livestock at the disposal of each separate household, size of the available work force, type of grazing and utilization of animals, etc. and finally, even on cultural traditions and professional kills. Since the majority of these factors are changeable the maximum size of herds is no stable criterion (Khazanov 1984a:29).

According to Khazanov, the minimum size of herds is equally unhelpful. He argues that there is no precise, clear and stable definition of a subsistence wage in a contemporary society. This only, if not largely, "depends on the level of development in the specific society, on economic conjectures, political considerations and even on methods of calculation". Furthermore, he states that pastoral societies or economies "are not autarkic means that the minimum size of herds partly depends on supplementary sources of subsistence (which) vary from one nomadic society to the next" (Khazanov 1984a:29).

For the purposes of this work, the size of a herd if known is potentially useful in determining how the ages of the animals are distributed statistically.

Species Composition

The species composition of herds, and in general other aspects of their structure such as age and sex are determined, first and foremost, by their biological particularities and the nature of geographical conditions (Khazanov 1984a). Playing a role and loosely connected with ecology are socio-economic, political and cultural factors. This will be illustrated with some examples.

In the 1950s, in Mongolia, in identical ecological conditions, well-to-do households kept large stock. The well-to-do were as well more involved with sheep-rearing and the poorer households were involved in goat-rearing.

In Iran, Stauffer (1965) observed that the proportion of sheep and goats kept depends on how far away the markets are from pastoral households. The closer the markets the more sheep there are in the herds, but the further away the markets, the more goats in the herds. This is because there is less demand for goats in the markets and, at the same time, goats are less trouble to tend and give 50-100% more milk.

The adaptive ability of such animals as sheep, goats, and partly of horses and cattle, Khazanov (1984a:26-27) observes, "is far greater than that of relatively specialised species (hence) the geographical distribution of the first group is significantly wider". Nevertheless, he continues to point out, the "adaptive capacities of these animals are one thing, the economic expediency and effectiveness of herding them in specific conditions are another".

Among the pastoral Tuareg of Southern Ayr nation, more sheep are kept than goats. This is because the latter are relatively less adapted to humidity (Dahl and Hjort 1976) and their produce, with the exception of certain specialised breeds, is of poor quality.

There is also a difference between what Khazanov (1984a) refers to as monospecialization (keeping one type of animal species) and multi-specialization (keeping of different animal species). In the extreme north, pastoral societies keep only the reindeer whereas in most parts of the Old World different species of animals are herded at the same time although, of course in different proportions. Prevailing ecological conditions could account for this as Khazanov (1984a:27) notes:

> multi-specialized types relatively are more stable and lasting and permit wider utilization of pasture. The loss or reduction in numbers of the species of livestock can be compensated, to some extent, when other species are available, because capacity to resist different natural disasters, and reproduction abilities, vary amongst different species of animals.

The patterns in which herds can be managed and pastured in specific geographical conditions are dependent on the biological particularities of the animals herded. Among the Bedouins of Arabia, the Tuareg of the Sahara, and the Somali of the Horn of Africa all of whom inhabit extremely arid areas, the rearing of camels on one hand, and sheep and goats on the other, "are rarely compatible and normally differentiated in different areas of economic activity" (Khazanov, 1984a:27). As opposed to this, pastoralism in the Eurasian steppes is often characterized by horses, sheep, and large stock grazing together.

Lastly, the various types of products and their relative importance for a particular group of pastoral societies regulates the species composition of a herd. The keeping of horses or donkeys can be explained in terms of transport. If wool production is more important than other products in a multi-specialised herd then the number of sheep will be proportionally greater. Among the Bedouin of Arabia camel herding is an important source of food. In the Eurasian steppes and in the Middle East, camels are used primarily for transport while among the Turkana a camel is regarded as a type of cow and never used for transport (Gulliver 1955).

From the foregoing, we would say that the species composition of a herd is largely determined by the ecological and environmental conditions within which the animals are maintained and by the biological particularities of the species. The number of animals in each species relative to others is a matter of the relative importance that species has to the herdsmen, and in turn the capacity of the species to expediently adapt to the prevailing ecological and environmental conditions.

2.3.2. **Age Distribution**

Information on the age structure of a herd (*viz* the number of animals of each species in a defined age category) is important for the light this information sheds on, among other things, the relative importance and contribution of each age category to a household's social and economic well being. For this project, the age distribution in a herd is directly relevant to the subject being studied. I have noted that an existing age structure reflects kill-off patterns and age mortality profiles in general and indeed, domestic faunal assemblages' profiles (other factors being equal) reflect what was killed from which herd. This section reviews the nature of age distribution in pastoral herds focusing on cattle, sheep and goats.

Information relevant to this important aspect is frustratingly scarce, scattered, and marred with technical difficulties. Age distribution within a herd is expectedly dependent on the death rates, and difficulties of obtaining good distribution figures can be predicted. Age can be estimated on the basis of teeth but good estimates may not be obtained for animals over the age of five years. One other problem to be reckoned with is the varying compartimentalization of age in the literature.

(a) Cattle

One helpful source of relevant information is Dahl and Hjort (1976). The only limitation to this data is that it only gives figures for female cattle. Table 2.2 shows the average distribution in four different pastoral herds.

Table 2.2: Female cattle in percent of total herd (Dahl & Hjort 1976:43)

	Karamojong Uganda	Western Sudan	Dagota Uganda	General nomadi herds, Demiruren
calves 0-7 mths	12%	4%	6.25-7.25%	
heifers 7 mths-3.5yrs	35%	25%		
cows =/>3.5 yrs	23%	42%	20%	
old cows =/> 9yrs				15%

From the above figures Dahl and Hjort estimate the average female age distribution as shown in Table 2.3. Dahl and Hjort

(1976) also document eight different examples of herds to which ascribed are varying values and attributes. Their objective is to identify possible characteristics of the herd in each example as the herd grows.

Table 2.3. A tentative female age distribution in nomadic cattleherds (Dahl & Hjort 1976:44)

Calves :	0-7 months	13.5%
Heifers :	7 months - 3.5 yrs	25.5%
Cows :	3.5 years >	61.0%
*Old cows		-
		100.0%

*Data on animals > 9 years are not given. However, Dahl and Hjort (1978) note that if the old age in Table 2.2 above is applied, 52% of the cows will be between 3.5 and 9 years old, and 9% will be 9 years old or more.

This effort provides useful information on the possible variability between different herds with varying parameters. The age structures that accompany these variabilities are shown in Table 2.4. For details of each example, see Dahl and Hjort (1976).

Table 2.4: Age structures in the female cattle herds according to examples 1-8 Dahl and Hjort 1976:68)

	Ex.1	Ex.2	Ex.3	Ex.4	Ex.5	Ex.6	Ex.7	Ex.8
proportion of calves	10.1	9.9	5.0	14.6	17.7	19.7	18.9	15.8
proportion of heifers	25.6	27.3	32.2	34.2	35.2	37.3	38.9	33.2
proportion of fertile cows	42.0	42.0	38.4	38.0	47.0	43.1	42.1	46.8
proportion of old cows	23.3	20.8	14.4	13.2	0.1	0.1	0.1	4.2

Parameters for each example:

Example 1: Diminishing herd I: a short calving period with few calves born and many dead.

Example 2: Diminishing herd II: lowering the calf mortality.

Example 3: Increasing the herd I: introducing an improved calving rate..

Example 4: Increasing the herd II: retaining a higher calving rate and fewer dead calves.

Example 5: Increasing the herd III: good calving variables but high mortality for calves.

Examples 6 and 7: maximum increases.

Example 8: the "normal" case. (Dahl and Hjort 1976:68).

From these examples detailed examination will be given to example 8 which the source notes could normally be expected if the data from the survey of literature and the assumptions based on these are correct.

Dahl and Hjort's data lack figures on male cattle. To show a case of the distribution of male cattle, data from Kajiado District (Meadows and White 1979:1981) is provided in Table 2.5.

From the data provided by Dahl and Hjort and Meadows and White, it can be observed that in a 'normal' pastoral herd, the age category between 3 years and 9 years forms the bulk of the stock. Within this, a look at data in Example 8 of Table 2.4

shows that the proportion of fertile cows is 46.8%. Old cows take up the least percentage (4.2%). A similar distribution is

Table 2.5. Pastoral herd structure, Kajiado District (1974) (source Meadows and White (1979, 1981:3)

Age and sex Cohorts	no. of cattle as per the year 1974 (in%)
Females 3 years +	45.2 %
Heifers 2-3 years	8.0 %
Heifers 1-3 years	9.0 %
Female calves	10.4 %
Working bulls	1.5 %
Other males 3 years +	4.2 %
Males 2-3 years	5.0 %
Males 1-2 years	5.3 %
Male calves	10.5 %

shown in Meadows and White's survey of cattle age distribution in Kajiado District. Here, female cows aged >3 years take up 45.2%, heifers follow by 17%, female calves by 10.4% and all the males account for 27.5%.

This distribution could lead to the inference that among pastoral societies, there exists a deliberate effort (other factors being normal) to maximise the number of the most productive animals, which are fertile cows. What brings about this situation is the extra care offered to female calves and that heifers and productive female cows are hardly slaughtered or sold.

(b) Sheep and goats

As was the case with cattle, data on sheep and goats are also scattered and inadequate to be of much help. The sources that can be relied on are the Hunting Report (1974) and Dahl and Hjort (1976).

Table 2.6 show the distribution of age for both female and male goats and sheep in Western Sudan according to the Hunting Report (1974). Information in Table 2.6 is limited in that it is not possible for one to determine the distribution of age in the higher age categories (i.e. over 15 months). This not withstanding a similar age distribution to that of cattle emerges in sheep and goats. It can be seen that 63% of the ewes (see Table 2.5) were above 15 months and that 55% of the

Table 2.6. Age distribution in sheep ad goats (source: the Hunting Report 1974)

Age Interval	Male Sheep	Female Sheep	Total	Male goats	Female goats	Total
0-6m	8.8	13.4		14.8	18.5	
6-15m	9.2	15.3		7.2	16.1	
>15m	4.2	49.1		1.6	41.8	
Total	22.2	77.8	100.0	23.6	76.4	100.0

female goats were above 15 months. Fertile or productive ages of both sheep and goats take up a greater percentage than the lambs and kids. Lambs take up 22.2% whereas the 'adult' category (more than 15 months) take up 53.3%. Kids take up 33.3% (whereas goats aged 15 months) take up 43.4%). As noted in the case of cattle, the number of fertile or productive animals in sheep and goat herds is maximised and of course preference is placed on females.

2.4. Age Mortality Structures and Inferences on kill-off patterns

Mortality can be said to be the relative number of animals that die during one year. Some of the ways through which deaths come about are: slaughter of animals for food (subsistence mortality), from diseases, drought, predators like lions, and to some smaller extent from accidents. In the absence of epidemics or drought, the greatest number of animals die from slaughter for food. When this is the case, pastoralists do not slaughter the animals indiscriminately as regards the animals' age or sex and even the physical condition. These variables are considered and slaughter patterns are observed so that the stability of the herd is maintained and the subsistence base is not endangered. In effect then, pastoral societies operate certain kill-off patterns and this is reflected in the age distribution of the herd. Archaeological faunal assemblages that are recovered may reflect this as well.

Contemporary pastoralists' cattle are mainly managed for herd growth and for milk, thus maximising the number of females in the adult age class (Dahl and Hjort 1976; Meadows and White 1979; Semenye 1980). The largest proportion that can be culled from each herd without damaging its growth is 8% per annum, this being made up of young bullocks, and old cows and bulls. Most bull calves are slaughtered immediately after birth. And in general, animals not required for breeding purposes are kept until the age of 4-5 years, and then slaughtered. Cattle in pastoral herds are seldom slaughtered for food in the same manner that small stock may be. In most instances animals surplus to growth needs are ones that are slaughtered for meals.

Cattle meat is also contributed to the pastoral diet through natural mortality. Milk provides the pastoralists' staple food in many areas (Dahl and Hjort 1976). Milk production in cattle is dependent on the number of adult females in the herd. Given these subsistence requirements and conditions, productive adult cattle and particularly the female ones are well cared for and seldom slaughtered. (A look at the age distribution figures in the preceding section shows this). For male cattle, we expect that the ones slaughtered are those that are not involved in breeding. The highest mortality rate would affect the very young and the very old individuals. Breeding adult and working bulls are found in greater numbers, albeit in less proportion compared to the females.

When natural mortality is considered, we note that the most likely age category to be hit are the neonates and very old . A theoretically expectable age mortality profile is one in which prime age adults are under-represented relative to their live abundance while very young and old individuals are over represented. This type of profile results from factors such as drought, endemic diseases, accidents, predation and other routine attritional factors that affect the very young and the old most heavily (Klein and Cruz-Uribe 1984).

Dahl and Hjort (1976) note that in a normal case, in the first year of lifespan, calf mortality rate is about 20%. This rate goes down during the next few years after birth and is expected to be about 7%. Animals between about 4-5 years old generally have the lowest mortality of all, only about 7%. The animals are mature and the fertile cows making up the majority of the cattle in this interval will be cared for. But about 7 to 8 years, the animal death rates increase to about 10%. After the age of 9 years, the cattle are decreasing in number more rapidly. There is a great deal of variation, but between 9-15 years it appears about average, and up to 49% mortality may be expected among animals of 11 years old (Dahl and Hjort 1976). Table 2.7 shows age mortality distribution according to data given by Dahl and Hjort (1976:37-40).

Table 2.7. Age mortality distribution in cattle (Dahl and Hjort 1976:37-40)

age interval	mortality rate
0 - 12 months	20%
1 - 4 years	7%
4 - 7 years	5%
7 - 9 years	10%
9 - 15 years	49%
	~ 100%

Information on mortality rates and kill-off patterns for small stock (sheep and goats) is equally scarce. The life expectancies of sheep and goats is given as 5.5 and 6 years (Dahl and Hjort 1976). An overall lamb mortality rate is given to be 30.5% for lambs under 6 months amongst sedentary and migratory herds in western Sudan (Hunting Report 1974). About 26.5% mortality rate is given for Maasai sheep (Semenye 1980). In goats, the rates range between 18.8% to 45.3% depending on whether the kids are first births, twins or single births.

eath rates for older animals are lacking. However, Payne's 1973) work in Asvan Kale provides more insights into this ispect of herd management.

Payne notes that when people keep sheep or goats, the age at which the animals are slaughtered depends on a range of factors. These may include; the relative value placed on different products, on the characteristics of the stock, and on a range of environmental factors; in particular seasonal variation in the availability of grazing and feed (Payne 1973).

When meat production is the aim, most of the young males are killed when they reach the optimum point in weight-gain, only a few being kept for breeding. However, in harsh conditions and with poor stock, the owner may want to increase the size of his flock, hence, young females may not be killed at all. In many conditions there will be more young females than are needed to maintain the breeding stock.

If milk-production is the sole aim, the lambs surplus to breeding stock requirements are killed as soon as the yield of milk is not endangered. Among the pastoral societies of Africa, with a classic example of the Maasai, small stock is rarely kept for milk production.

In subsistence economies, herds are not usually kept for a single product. A wide range of subsistence and social demands are placed on the stock. These demands could range from meat and milk for subsistence, social exchange and obligations (e.g., rideprice), breeding, and sale. Kill-off patterns and other orms of stock reduction are carried out in such a manner that ormal subsistence requirements are not endangered. This calls or careful and selective kill-off practices. And as Payne dds, "the balance drawn between the conflicting requirements epends on the relative importance of different products, which is determined in a subsistence economy by the needs of the amily or group."(Payne 1973:282). The profiles cited, it hould be stressed, operate and are only expectable in 'normal' onditions of herd management. Otherwise, the structure of erds in pastoral societies is, more often than not, the product of environmental, ecological and sometimes socio-political factors which herdsmen are required to adjust to.

2.5. **Summary**

This chapter is intended to review selected aspects of herd management practices among contemporary pastoralists with the objective of forming a body of literature which interpretive and explanatory models in subsequent chapters can be drawn from. There are many possible modes of pastoral production, each aving varied subsistence and environmental attributes. Withstanding the pastoral heterogeneity, one pastoral economy (i.e. 'pure' pastoralism) was decided upon as a focus of study. The literature as regards herds structures and management practices is reviewed. It is noted that, albeit scattered and inadequate data, pastoral stock sizes and species composition are mainly determined by the physical and ecological factors in which the animals are herded, and also by the specific biological particularities of the animals themselves. Age istribution, age mortality profiles and kill-off are aspects of he herd management that are reviewed in the last sections of .he chapter. Characteristics of these, it was observed, are letermined by the requirements of the subsistence base which pastoralists strive to maintain by careful and selective herd nanagement practices.

In the succeeding chapter, the aspects of herd management reviewed in the foregoing will be dealt with in particular reference to the pastoral Maasai of Kajiado District in Kenya.

CHAPTER THREE

'HE PASTORAL MAASAI: ASPECTS OF HERD MANAGEMENT WITH PARTICULAR REFERENCE TO KAJIADO DISTRICT

3.1. Introduction

In this chapter, a survey and discussion of selected aspects of pastoral economy is particularised to the pastoral Maasai of Kenya. Although the pastoral Maasai as a distinct socio-cultural and economic group of people transcend administrative and political boundaries, specific reference to Kajiado District has been made with regard to the choice of the district as a research area. Some general remarks on the pastoral Maasai of Kenya, which include their brief history and aspects of socio-economic life, are made. Aspects of herd management, with specificity to stock size, species composition, age distribution, and age mortality profiles and kill-off patterns are discussed.

3.2. The Pastoral Maasai of Kenya: Some General Remarks.

The pastoral Maasai of Kenya are among several Nilo-Hamitic peoples of eastern Africa. Linguistically, the Maasai comprise all the people who speak *Maa* and share close linguistic and cultural affinities with other Nilo-Hamitic speaking peoples, such as the Kalenjin, Turkana, and the Karamajong. However, only the largely pastoral Maasai, inhabiting the Great Rift Valley and the surrounding plains of Kenya and Tanzania (see Figure 3.1) are called by themselves and other Maa-speaking eoples, *IlMaasai* or Maasai (Jacobs 1963). The rest of the aa-speaking peoples (such as the Samburu, Baraguyu, Arusha, aveta, Ngurman, and the Maasai Dorobo) refer to themselves as *loikop*

Both the *IlMaasai* and the *Iloikop* claim to share a common ncestry but are culturally and economically two distinct groups of people. What particularly distinguishes the *IlMaasai* is their persistence in attempting to subsist solely for their livelihood on a purely pastoral mode of production. The *Iloikop* eagerly supplement their pastoral diet by trading for, or even occasionally growing, agricultural foods (Jacobs 1963).

A greater number of the pastoral Maasai in Kajiado District subsist largely (and particularly in normal environmental circumstances) on milk, meat, and blood. This is also true especially for pastoralists inhabiting areas far away from townships and distantly in contact with agro-urban subsistence tendencies.

The land area occupied by the Maasai, and in this case Kajiado, is one of those areas of Kenya where human settlement can be traced to great antiquity. Archaeological evidence suggests that the area was inhabited as early as the Acheulian times, this evidence occurs at Olorgesailie near Magadi, and Isinya near Kajiado Township. The Maasai who inhabit the greater part of the district have always been active participants in Kenya's prehistoric and historic events.

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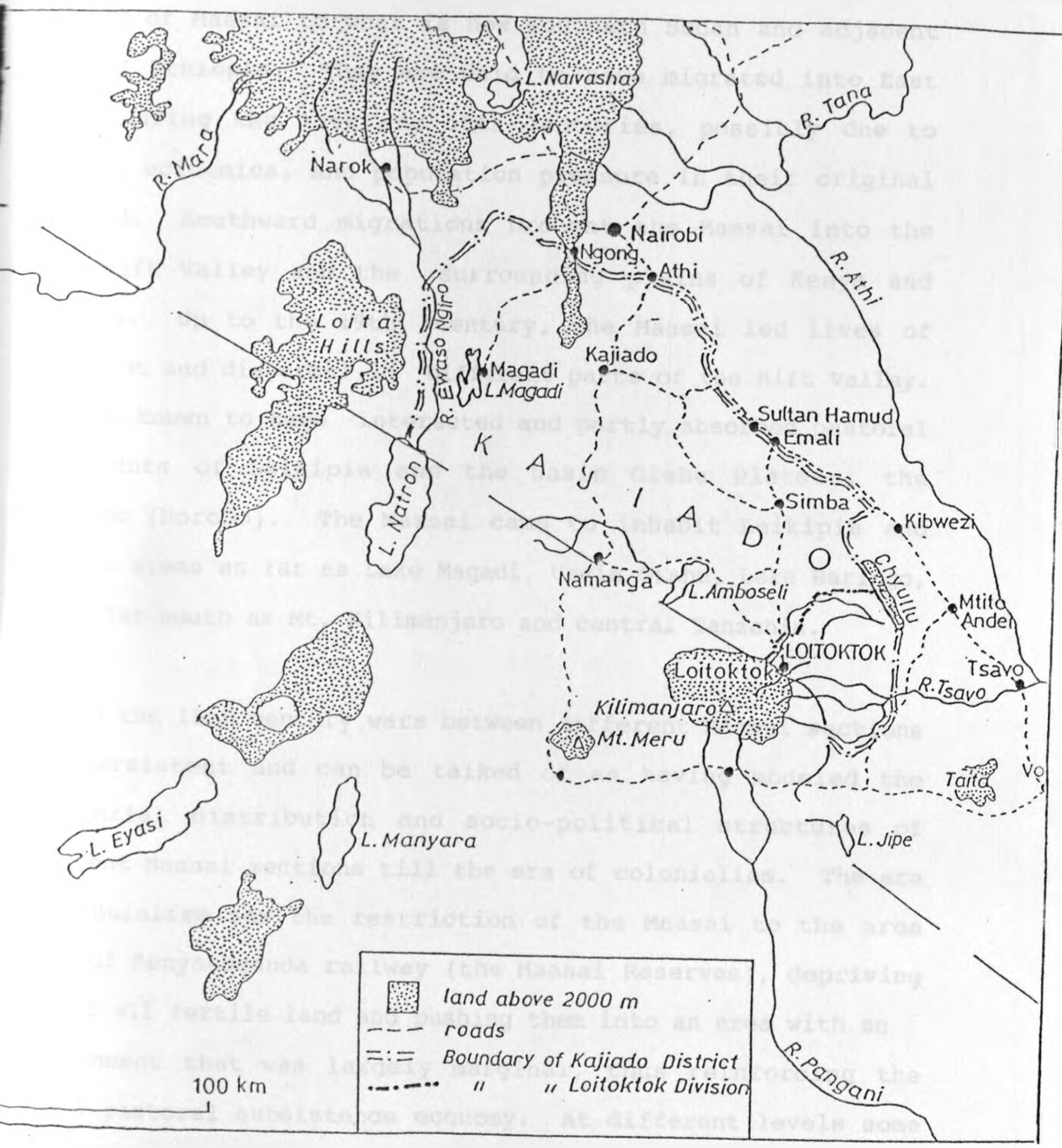
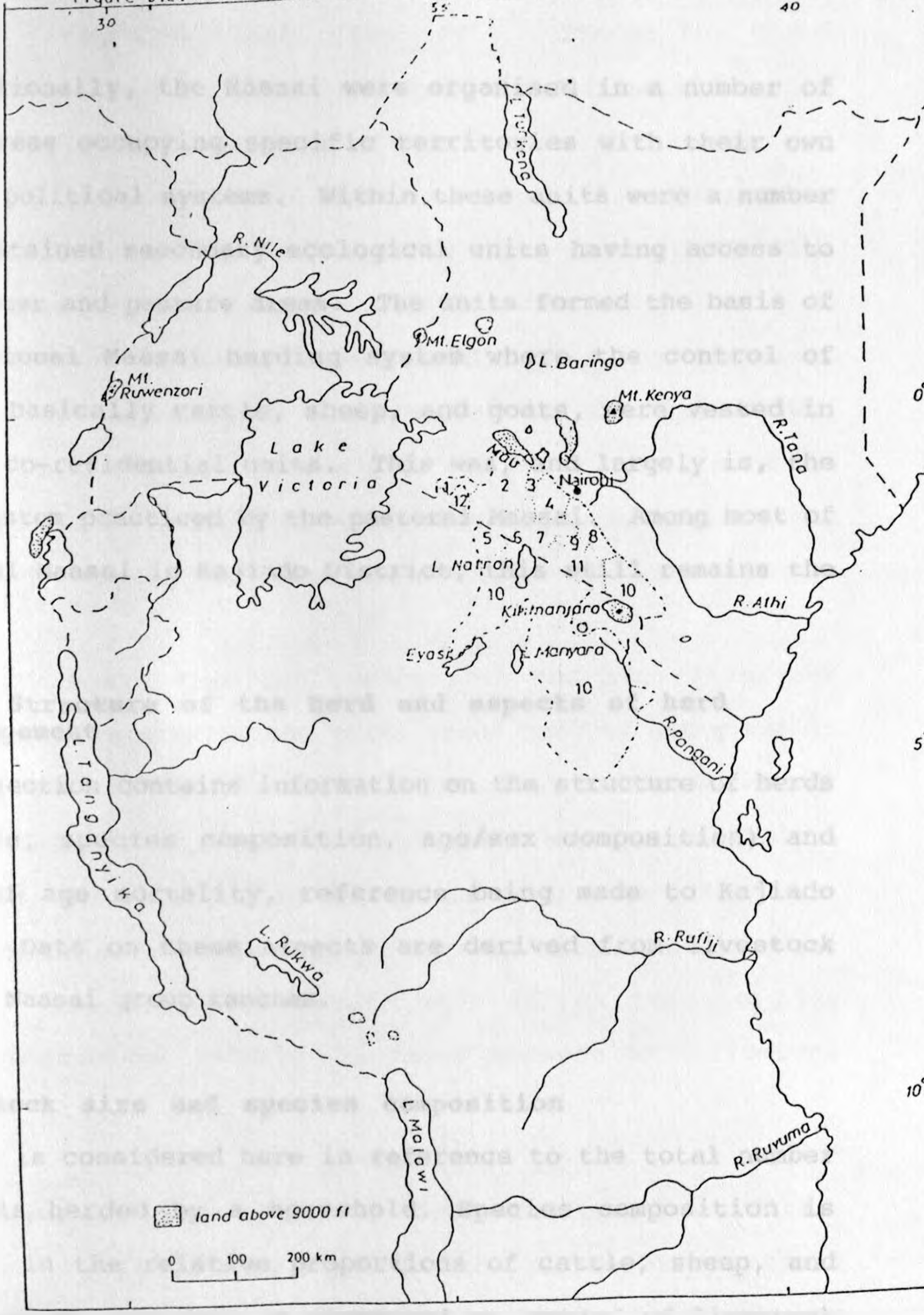
Figure 3.1. Kajiado District: Location



The Maasai community is composed of large sections (*Iloshen*) and there are presently twelve of these sections (see Figure 3.2). Oral and linguistic evidence places the original homeland of Maasai to what is now southern Sudan and adjacent areas of Ethiopia. They are said to have migrated into East Africa during the 15th and 16th centuries, possibly due to drought, epidemics, and population pressure in their original homeland. Southward migrations brought the Maasai into the Great Rift Valley and the surrounding plains of Kenya and Tanzania. Up to the 19th century, the Maasai led lives of settlement and dispersal in different parts of the Rift Valley. They are known to have interacted and partly absorbed pastoral inhabitants of Laikipia and the Uasin Gishu Plateau, the *Ildorobo* (Dorobo). The Maasai came to inhabit Laikipia and adjacent areas as far as Lake Magadi, Uasin Gishu, Lake Baringo, and as far south as Mt. Kilimanjaro and central Tanzania.

In the 19th century wars between different Maasai sections were persistent and can be talked of as having modeled the territorial distribution and socio-political structures of different Maasai sections till the era of colonialism. The era of colonialism saw the restriction of the Maasai to the area south of Kenya-Uganda railway (the Maasai Reserves), depriving them of all fertile land and pushing them into an area with an environment that was largely marginal, thus reinforcing the Maasai pastoral subsistence economy. At different levels some Maasai have been drawn into modern social, economic and political structures. Others have had these structures very

Figure 3.2. Maasai 'sections'



little altered, particularly with regard to their economic and subsistence bases.

Traditionally, the Maasai were organised in a number of distinct areas occupying specific territories with their own autonomous political systems. Within these units were a number of self-sustained secondary ecological units having access to communal water and pasture areas. The units formed the basis of the traditional Maasai herding system where the control of livestock, basically cattle, sheep, and goats, were vested in family and co-residential units. This was, and largely is, the economic system practiced by the pastoral Maasai. Among most of the pastoral Maasai in Kajiado District, this still remains the practice.

3.3. The Structure of the herd and aspects of herd management

This section contains information on the structure of herds (stock size, species composition, age/sex composition) and patterns of age mortality, reference being made to Kajiado District. Data on these aspects are derived from livestock records on Maasai group ranches.

3.3.1. Stock size and species composition

Stock size is considered here in reference to the total number of animals herded by a household. Species composition is discussed in the relative proportions of cattle, sheep, and goats. Much of the data is presented as 'means' of livestock holding per household. Reference is made to three Maasai group ranches in Kajiado District; Olkarkar, Merueshi, and Mbirikani.

The area in which these ranches are located encompasses ecological and related economic variations of Maasai pastoralism (Evangelou 1984, ILCA 1981). Though the three ranches lie within similar general eco-climatic zones Mbirikani's setting is more arid than that of Olkarkar and Merueshi. Differences in size and population also distinguish Mbirikani from the other two ranches (see Table 3.1). The transhumance of Mbirikani's households in contrast to the less mobile production patterns found on Olkarkar and Merueshi reflect distinct eco-climatic differences. On the latter two, Maasai households may live at one site for years at a time while those of Mbirikani frequently move with changing grazing and watering conditions (King *et al.* 1982).

Mean household size and composition and mean livestock holdings per household for the three group ranches are given in Tables 3.1 and 3.2. These data are based on ILCA's survey of all the households of Olkarkar and Merueshi and approximately a half of the households in the latter are on average larger than those of Olkarkar and Merueshi, as are the cattle holdings per household. Expectedly, however, mean values tend to hide possible substantial variability among households' livestock holdings.

In a detailed presentation of these data (see Table 3.2) a distinction is made between 3 categories (Strata) of household holdings. The three categories of households are delimited according to natural breaks in the distribution: poorer,

Table 3.1. Kajiado District: Area, number of households and livestock population in three Maasai group ranches (source King *et al.* 1982)

Ranch	Area(ha)	Households	Cattle	Small stock
Olkarkar	10.2	40	3,600	2,300
Merueshi	18.3	36	5,600	3,300
Mbirikani	135.0	206	41,500	19,500

middle, and wealthier denoted as Stratum I, Stratum II and Stratum III respectively.

In a total herd of 10,166 animals enumerated from the three ranches, 5133 (50.5%) were cattle, 2732 (26.9%) were sheep while 2,301 (22.6%) were goats. This shows that the relative proportions of cattle and small stock is about the same. The 10,166 animals were enumerated from a total of 41 households on the three ranches. This means that the mean livestock holding per household is 248. The mean number of cattle per household will be 125 (50.4%), sheep will be 67 (27.0%) and goats 56 (22.6%).

Differences seem to exist in livestock holdings per household between the three ranches. In Olkarkar, the mean livestock holding per household is 244 (34.7%). On the Chi-square test, the difference between expected and observed frequencies is quite significant. This may be explained in terms of possible differences in socio-climatic conditions and the extent of development. Since Mbirikani is more arid than either Olkarkar and Merueshi, we would expect that more animals are required to support one household. In less arid areas of than upon Mbirikani producers. And since most development projects have been geared towards destocking (through selling off part of the stock) we would expect on the Olkarkar and Merueshi ranches higher rates of destocking and therefore reduced stock sizes have been more in operation than on Mbirikani.

In terms of species composition, relative proportions of cattle and small stock are about equal on the three ranches. One also notices that on all the ranches, sheep are more numerous than goats and that cattle is kept in larger numbers than either sheep or goats. However, in Stratum I, goats are more numerous than sheep.

Cattle being kept in larger numbers than either sheep or goats reflects subsistence and economic preference to have more of these animals in the herd. Cows are particularly relied on for milk production and for herd growth. Despite the fact that small stock have higher growth rates than cattle, they are sold or slaughtered in greater numbers and this may partly affect their relative proportion in the herd.

King *et al.* 1982, ILCA (1981), Evangelou (1984), consider that the size of the stock and the species structure of the herds of the three pastoral Maasai ranches in Kajiado district reflect and are maintained more for purposes of subsistence than for commercial ventures.

3.3. Age and sex distribution

Cattle

Information on age and sex distribution in cattle is contained in Table 3.3. This is data collected on the structure of herds and documented by Meadows and White (1979, 1981). The limitation of this data is that it is not possible to know the distribution (in age and sex) of animals older than three years since further categorization was not done. This limitation does not dwell in our attempt to make comparisons with faunal data which is in most cases stretched up to the maximum age of cattle lifespan (about 19 years).

On the basis of the data available in Table 3.3. and 3.4 we observe that 50.8% of the herd are more than three years old. This reflects a case of deliberate animal husbandry and subsistence to have as many reproductive and productive animals in the herd as possible. It less reflects the long span of age in this category.

Table 3.3. Kajiado District: Pastoral herd structure (age and sex composition) from 1974 records (source Meadows and White 1979:3)

Age in years	Female(%)	Male (%)	Total
0 - 1 yrs	10.4	10.5	20.9
1 - 2 yrs	9.0	6.3	15.3
2 - 3 yrs	8.0	5.0	13.0
3 + yrs	45.2	5.6	50.8
Total	72.6	27.4	100.0

Table 3.4. Kajiado District: Cattle herd structure (age and sex composition) (source Meadows and White 1979:3)

Age and sex cohorts	1970 %	1971 %	1972 %	1973 %	1974 %
Females 3 yrs +	44.1	43.8	44.7	44.5	45.2
Heifers 2-3 yrs	7.7	7.9	8.2	8.3	8.0
Heifers 1-2 yrs	9.4	9.5	9.7	8.8	9.0
Female calves	11.3	11.3	10.3	10.5	10.4
Working bulls	1.5	1.5	1.6	1.5	1.5
Other males 3 yrs +	3.8	3.8	4.0	4.1	4.2
Males 2-3 yrs	4.6	4.6	4.8	4.9	5.0
Males 1-2 yrs	6.3	6.3	6.4	5.9	6.3
Male calves	11.3	11.3	10.4	10.5	10.5
Total	100.0	100.0	100.0	100.0	100.0

The rest of the age distribution shows that animals of 12 months old and less make up 20.9% of the herd. Given that this pattern has remained more or less the same for 5 years, overall age distribution is likely reflective of selective culling practices.

In terms of sex composition, data shows that female animals are favoured and kept in larger numbers. Meadows and White give a figure of 72.6% for female animals based on the 1974 records. This bias in favour of female animals is particularly pronounced in the age category of 3 or more years, where female animals make up 45.2%. This reflects the importance attached to female animals for purposes of milk production and for herd growth. It may also be observed in Table 3.3 that the proportion of female to male animals in the age category 0-1 year is almost equal (10.4%:10.5%) *contra* 3+ category which is 45.2%:56% in favour of female cohorts. This means that relatively very high offtake rates occur for male cohorts aged 2 or more years after birth. Offtake is largely in terms of sale and slaughter.

Sheep and goats

Information on the age/sex composition of small stock is contained in Table 3.5. Reference is made to data collected by ILCA and documented by Wilson (1978) on the Elangata Wuas group ranch. The ranch is situated between Kajiado and Magadi in Lodokalani section of Kajiado District. Data was collected separately for sheep and goats but two species are considered and presented as one (Table 3.5).

On the basis of the data available in Table 3.3. and 3.4 we observe that 50.8% of the herd are more than three years old. This reflects a case of deliberate animal husbandry and subsistence to have as many reproductive and productive animals in the herd as possible. It less reflects the long span of age in this category.

Table 3.5. Kajiado District: Sheep and goats herd structure (age sex composition). (Source Wilson 1978:194-195)

Age in months	Female	%	Male	%	Total	%
0 - 5 months	166	10.1	166	9.8	327	19.8
6 - 15 months	230	14.0	203	13.3	433	26.3
16 - 21 months	103	6.3	80	4.9	183	11.1
22 - 27 months	89	5.4	27	1.6	116	7.0
28 - 33 months	131	8.0	35	2.1	166	10.1
34 + months	385	23.4	38	2.3	423	25.7
Total	1104	67	544	33	1648	100.0

Data contained in Table 3.5 show that a considerable proportion of the herd is composed of young animals. Animals between 15 and 16 months are relatively few implying that much higher culling and offtake rates affect animals in this category. At the age of 33 months, animals increase in number. Animals aged 34 months and above make up 25.7% of the stock. On the assumption that the ratio of animals in the age category of 34 months and over correspond to that of 3 years and over in cattle, we note that there are relatively few small stock in this category (in cattle the ratio is 50.8% compared to the 25.7% in small stock). This may be explained in terms of different offtake rates between small stock and cattle. This difference is significant on small stock are therefore slaughtered in larger numbers than cattle. Cattle are rarely slaughtered except on important ceremonies. The herd responds to this by having relatively fewer small stock and more of cattle. Since high rates of slaughter and partly sale affect small stock of the older age categories, so as not to endanger herd growth, relatively more animals are kept in the older age classes with seemingly high calving rates.

In terms of sex composition data from Elangata Wuas ranch show that of the 1648 sheep and goats enumerated, 1104 (67%) were female whereas 544 (33%) were male. The ratio of female to male animals is almost equal in the first age category. However, the proportion of female animals becomes larger with increasing age categories. So that in animals older than 33 months the ratio of female to male animals is 23.4% to 2.3% in favour of the females.

In the foregoing, data has been presented on the structure of herds in Kajiado District. These data was drawn from

Pastoral Maasai group ranches where the size of the stock, species composition, age and sex distribution were aspects addressed. In the next section information on age and sex mortality patterns will be presented.

3.4. Age Mortality Structures and Inferences on Kill-Off patterns

Offtake is considered here as comprising sales, subsistence consumption and mortality. Information on offtake patterns in cattle from Kajiado District is contained in Tables 3.6 and 3.7. So far, no reports and documentation have been made on small stock in the district. This section addresses data provided by Meadows and White (1979) for cattle.

Data referred to in this section and provided in Tables 3.6 and 3.7 is based on hypothetical model offtake assumptions. The offtake rate varies according to whether the herd is increasing, decreasing or in a relatively stable position. At the beginning of the period under reference (1962-1977) when the herd is recovering rapidly from a two year drought disaster (1960-1961), the offtake rate is low, only 9%, but rises to 13% and finally to 19%. This period of recovering lasted for 6 years. The following 6 years were a period of relative stability with the herd growth rate slowing down from 8% to 5% a year. The offtake rates stay constant at 17% over the whole of this period, except the last year when it rises to 22%. Drought hit Kajiado District again in 1974 and lasted until the end of 1976. The offtake rate averaged 31% over the drought period, and was almost 40% in 1975/76. In 1977/78 the offtake rate falls to 13% with increasing herd growth. Meadows and White (1979) consider the drought plays a significant role in determining long term rates while seasonal rates are largely determined by rainfall diseases, and market conditions.

Meadows and White (1979) take 1968 as a time of herd stability after the 1960-61 drought. The model in 1968 gives an offtake of 16-17% with an accompanying growth rate of 7-8%. What is immediately apparent from the model is that in times of disaster caused by drought a greater percentage of females of all ages survive than do males (see Table 3.7). In normal times, the female component of the herd is accorded better care and attention, in times of stress preferential management assumes even greater importance. This is so with the consideration that in most pastoral societies (such as the

Table 3.6. Kajiado District: Estimated offtake of cattle, 1962-1977 (Meadows and White 1979: 11)

Year	Cattle	Calves	Total	Offtake	%
1962/3	16,230	4,725	20,955	206,300	10.0
1963/4	15,324	25,650	40,974	298,800	13.7
1964/5	23,688	25,605	49,293	373,100	13.2
1965/6	27,135	23,670	50,805	428,700	11.8
1966/7	48,826	25,200	74,026	493,500	15.0
1967/8	56,793	26,550	83,343	533,300	15.6
1968/9	59,596	31,800	91,396	572,800	16.0
1969/70	73,930	37,900	111,830	669,500	16.6
1970/1	79,387	40,500	119,887	719,600	16.7
1971/2	88,080	39,050	127,130	757,200	16.8
1973/4	129,586	46,145	175,731	798,700	22.0
1974/5	201,050	74,070	275,120	793,500	34.7
1975/6	168,331	81,535	249,866	651,100	38.4
1976/7	65,909	38,560	104,469	503,400	20.8
1977/8	40,326	33,435	73,761	547,700	13.5

Based on hypothetical model offtake assumptions.

Maasai), the primary motive of herd management is milk production and herd-growth.

From the model we observe a high rate of mortality among male calves (mortality in this case is identical to offtake). Male calf mortality is shown as running at 40% in most years, while that for heifer calves is only 5%, giving an overall

Table 3.7. Kajiado District: estimated offtake of cattle (1962-1977) within different age/sex cohorts (Meadows and White 1979:4)

Cows	5.0	6.0	7.0	8.0	9.0	10.0	10.0	10.0
	10.0	10.0	20.0	30.0	30.0	30.0	10.0	8.0
Heifers 3-4 years	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
	2.5	2.5	5.0	5.0	15.0	15.0	10.0	2.5
Heifers 2-3 years	2.5	2.5	2.5	2.5	2.5	2.5	2.5	10.0
	10.0	10.0	10.0	10.0	25.0	25.0	15.0	2.5
Heifers 1-2 years	2.5	2.5	2.5	2.5	2.5	2.5	10.0	10.0
	10.0	10.0	10.0	15.0	30.0	30.0	20.0	2.5
Heifer calves	5.0	5.0	5.0	5.0	5.0	5.0	10.0	10.0
	10.0	10.0	10.0	15.0	30.0	40.0	20.0	5.0
Males 2*3 years +	93.0	91.0	90.0	65.0	93.0	94.0	92.0	92.0
	93.0	92.0	95.0	93.0	95.0	94.0	94.0	93.0
Males 2-3 years	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
	10.0	10.0	10.0	15.0	25.0	40.0	20.0	10.0
Males 1-2 years	10.0	10.0	20.0	20.0	20.0	20.0	20.0	20.0
	20.0	20.0	20.0	20.0	40.0	40.0	20.0	10.0
Male calves	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0
	40.0	40.0	40.0	40.0	60.0	75.0	60.0	40.0
Bulls	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
	10.0	10.0	10.0	20.0	30.0	30.0	10.0	10.0
%Herd Offtake	10.0	13.7	13.2	11.8	15.0	15.6	16.0	16.6
	16.7	16.6	16.8	22.0	34.7	38.4	20.8	13.5

Notes: "Males' include steers, males not yet castrated and bulls which will be needed to replenish the bull herd. Offtake comprises sales for slaughter, subsistence consumption and mortality figure of 22.5% for calves. It is suspected that a substantial number of calves are slaughtered. Meadows and White (1979) observed one instance in one field trip. It makes sense to slaughter male calves for two reasons: more milk becomes available to meet human needs, and fresh meat is available for consumption in manageable quantities.

In other age and sex cohorts, it is also apparent that offtake rates are higher in males than females. The lowest offtake rates are recorded in heifers aged 1 to 4 years. In 1977 a figure of 2.5% was recorded in each of the three heifer age categories (1-2, 2-3, and 3-4 years). In males within these three age categories, 10% was recorded for 1-2 years, 10% for 2-3 years and 93% for 3 years+. Going by this distribution, it appears that higher offtake rates affect male animals. This is in agreement with the assumptions documented on pastoral societies where female animals are rarely slaughtered. This is because herd growth and milk production is dependent on a larger component of female animals in the herd. It is also worth noting that the difference between bulls and cows is only 2% (8% for cows and 10% for bulls). This shows that relatively low offtake rates affect old individuals, while the rates in females increase. The relatively high rates in cows (contra heifers) may imply that their (cows) productive returns have began to diminish calling for increased kill-off or offtake rates.

The general distribution shows that female offtake is significantly lower compared to that of males. Since herd management among Maasai pastoralists in Kajiado is geared for subsistence more than it is for sale or commercial exchange (Meadows and White 1979; King *et al.* 1982; Evangelou 1984), preference is placed on a larger component of productive female animals in the herd for purposes of herd growth and milk production. Meat is provided by largely male, and ageing female animals and, to a larger extent, by small stock.

3.5. Summary

This chapter reviewed data on the structure of herds in Kajiado district, largely inhabited by the pastoral Maasai. In terms of livestock holdings per household, local variations were observed and explained by differences in eco-climatic conditions and the level of development between certain regions. From three group ranches, cattle are kept in larger numbers than small stock reflecting subsistence and economic preference to have more of these animals in the herd. This was also seen as reflecting a long-term and well established pastoral system. Long-term offtake rates vary with changing eco-climatic conditions. The herd model referred to showed that in a stable position, offtake rates will be higher in male cohorts aged 3 and above years. In the next chapter, ethnoarchaeological data collected from Kuku Plain in south eastern Kajiado is presented.

CHAPTER FOUR

ASPECTS OF ETHNOARCHAEOLOGY AMONG THE KUKU PLAIN PASTORAL MAASAI

4.1. Introduction

This chapter presents the ethnoarchaeological data that was collected from Pastoral Maasai households and settlements in the Kuku Plain of Kajiado District in southern Kenya. Two kinds of data were collected. Firstly, information on the structure of herds belonging to three households, including stock size, species composition, age distribution, and mortality/stock reduction profiles. The second category comprises data obtained from the analysis of faunal remains collected from nine settlements. Three of these nine sites are households from which information on herd structure was obtained. A comparison of these two categories of data is made.

4.2. The structure of herds and Aspects of Management.

Information on the structure of herds includes the total number of animals that are kept and managed by each of the three households. In each of the three households, records were taken on the total number of animals of a given species (either, cattle, sheep or goats), the total number of animals of a given age category (either neonate, juvenile, adult or aged) and whether the individual animal was female or male.

4.2.1. Stock size and species composition

Table 4.1 shows the structure of herds from three households investigated. The three households keep and manage a total of 472 animals, excluding donkeys or any other type of livestock. Of these, cattle comprise 38.8% (N=183), sheep 29.2% (N=138) and goats 32% (N=151). The mean livestock holdings per household is 157.3 animals. The mean total number of cattle kept is 61, the mean number of sheep is 46, whilst a mean of 50.3 goats are kept. A comparison of the data from these three households with that from three ranches to the north of Kajiado District (ILCA 1981) shows some differences in terms of stock size and species composition (see Table 4.2 and Figures 4.1 and 4.2).

The livestock holding per household based on the ILCA data (1981) shows an average of 242 animals per household. That collected from the three investigated households is 157.3. This difference is statistically significant. It would appear that the households investigated are less livestock subsistence oriented than those investigated by ILCA. There is an ecological difference between the location of the ranches and the Kuku Plain. The latter areas receive higher rainfall and are less

arid than the former which receive less rainfall and experience higher evaporation rates, hence are more arid. It may also be argued that since the Kuku Plain Pastoral Maasai live in an area with higher agricultural potential than other areas of Maasailand the number of animals required to support a household on the Kuku Plain would be greater

From another point of view, it could also be noted that the closer proximity of the Kuku Maasai to livestock extension

Table 4.1. Kuku Plain: Structure of herds from three Maasai households categorised in 4 age classes.

	Total	CATTLE	SHEEP	GOATS
Enkang 1	211	82	66	63
Enkang 2a	100	52	11	37
Enkang 2b	161	49	61	51
Total	473	183	138	151

services at Loitokitok has influenced people in this area to run lower numbers of stock on the rangeland. Pastoralists in the northern regions could be said to be more traditional, and the keeping of large numbers of livestock is more important in their social and economic settings.

In order to determine the relationship between the ILCA and the Kuku Plain samples a chi-square (x^2) was computed. A calculated chi-square value of 10.2 was established. The critical value of this value with two degrees of freedom at 0.05 significance level is 5.99. The calculated valve of x^2 being greater than the critical value, an alternative hypothesis that the difference between these two samples is significant was adopted.

The relative proportions of cattle to small stock differ between the ILCA and Kuku Plain data sets. The percentage ratio of cattle to small stock in the Kuku Plain is 38%:61.2%. In the ILCA sample, the proportion is 54.4% for cattle and 45.6% for small stock. There are a number of possible reasons for this difference. In literature (Rigby 1985, Evangelou 1984) richer

Table 4.2 Mean livestock holdings per household (herd) (ILCA 1981)

	Total	Cattle	%1	Sheep	%2	Goats	%3
Olkarkar	197.6	98.9	50.1	55.0	27.8	43.7	22.1
Merueshi	238.8	120.7	50.5	61.8	25.9	56.3	23.6
Mbirikani	289.6	182.4	63.0	56.3	19.4	50.9	17.6
TOTAL	726	402	55.4	173.1	23.8	190.9	20.8
GRAND MEAN	242	134	55.4	57.7	23.8	50.3	20.8

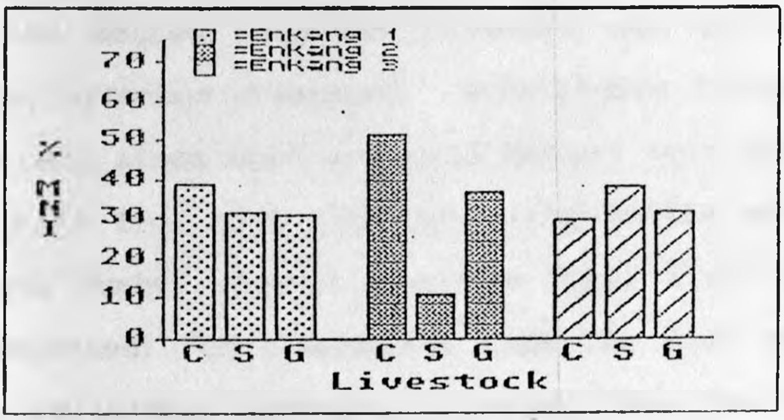


Figure 4.1. Kuku Plain: Herd Structure from three Maasai households (Enkang)

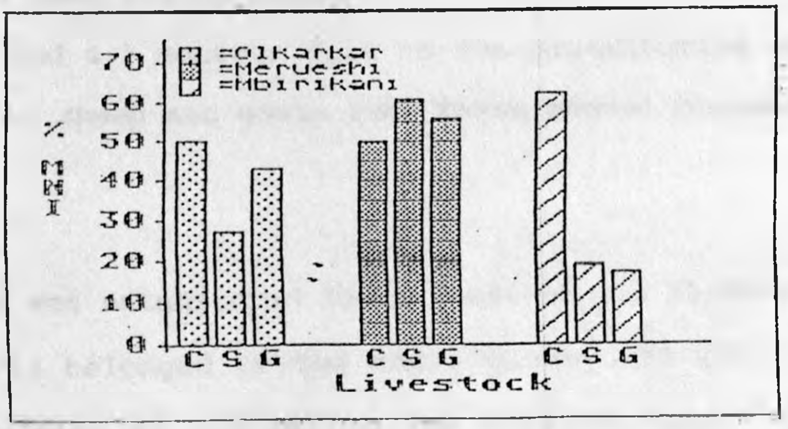


Figure 4.2.
Mean livestock holdings per household (ILEA).

Maasai tend to keep more cattle than poorer familes do. This is because small stock are often used to build up large stock herds (in which cattle may predominate) after drought or an epidemic disease, or when a young person is starting out. If the data from the three Kuku Plain households can be considered as representative, we would note that they are relatively poorer. This is supported by the data where in the ILCA sample, livestock holdings per household is 242 whereas that of the Kuku Plain is 157. The three Kuku Plain households do not belong to persons who are starting out and it is not possible to determine with accuracy the degree to which diseases and the recent drought (1983/84) affected livestock. Subsistence factors may also be considered; since most pastoral Maasai rely more for subsistence on milk from cows than meat from cattle or small stock, the larger number of cattle contra small stock in the ILCA data is expected. This suggests that the diet of Kuku Plain Maasai is relatively more meat oriented than that of the areas investigated by ILCA.

4.2.2. **Age and Sex Distribution**

Tables 4.1 and 4.3 contain data on the distribution of age and sex in cattle, sheep and goats from three Maasai households investigated.

Age and sex was established for a total of 472 animals. Of these 225 (34.7%) belonged to the adult class, 164 (34.7%) to the juvenile class, 67 (14.2%) to the neonate class, and 16 (3.4%) to the aged class (see Figure 4.3). This pattern and order (adult, juvenile, neonate and aged) is true of the three households investigated. This pattern, more than anything else, reflects the relative economic and subsistence importance of these different age classes. The adult age class takes up such a large proportion of the herd because it is relied on heavily for milk production and for herd growth. The small proportion of animals in the aged class is due to the fact that animals in this class are economically less viable. Through interviews, it was established that the reason why there are so few aged animals is because when the animals attain the terminal adult age class, they provide little milk returns and are therefore sold or slaughtered. The age distribution observed therefore reflects the relative economic and subsistence importance of these different age classes, and to a smaller extent the mortality/stock reduction patterns. The age distribution does not to any significant level reflect varying age mortality rates affecting the herd. Indeed, mortality data (see succeeding sections) does not show that more aged animals die or are slaughtered than other age groups.

Table 4.3 and Figure 4.4 show the ratio of female to male animals. In total the percentage ratio of female to male animals is 63.14% (n=298) to 36.86% (n=174). In the cattle sample, the ratio of female to male is 64.4% (n=118) to 35.52% (n=65). In sheep the ratio is 63.04% (n=87) to 36.96% (n=51) whilst in goats the ratio is 61.58% (n=93) to 38.42% (n=38). This proportion very likely reflects an economic and subsistence preference for keeping female animals for purposes of milk production and herd growth. The proportion appear not to reflect long term response of the herd to mortality or stock

Table 4.3 Kuku Plain: proportion of female to male animals

Enkang	Total	Female	%	Male	%	Female/Male
Enkang 1						
Cattle	82	55	67.07	27	32.93	2.0
Sheep	66	47	71.21	19	28.79	2.3
Goats	63	42	66.67	21	33.33	2.0
Total	211	144	68.25	67	31.75	2.1
Enkang 2a						
Cattle	52	27	51.92	25	58.08	1.1
Sheep	11	6	54.55	5	45.45	1.2
Goats	37	24	64.86	13	35.14	1.8
Total	100	57	57.0	43	43.0	1.3
Enkang 3						
Cattle	49	36	73.47	13	26.53	
Sheep	61	34	55.74	27	44.26	2.8
Goats	51	27	52.94	24	47.06	1.3
Total	161	97	60.25	64	39.75	1.5
G.TOTAL						
CATTLE	183	118	64.48	65	35.52	1.8
SHEEP	138	87	63.04	51	36.96	1.7
GOATS	151	93	61.58	58	38.42	1.6
TOTAL	472	298	63.14	174	36.86	1.7

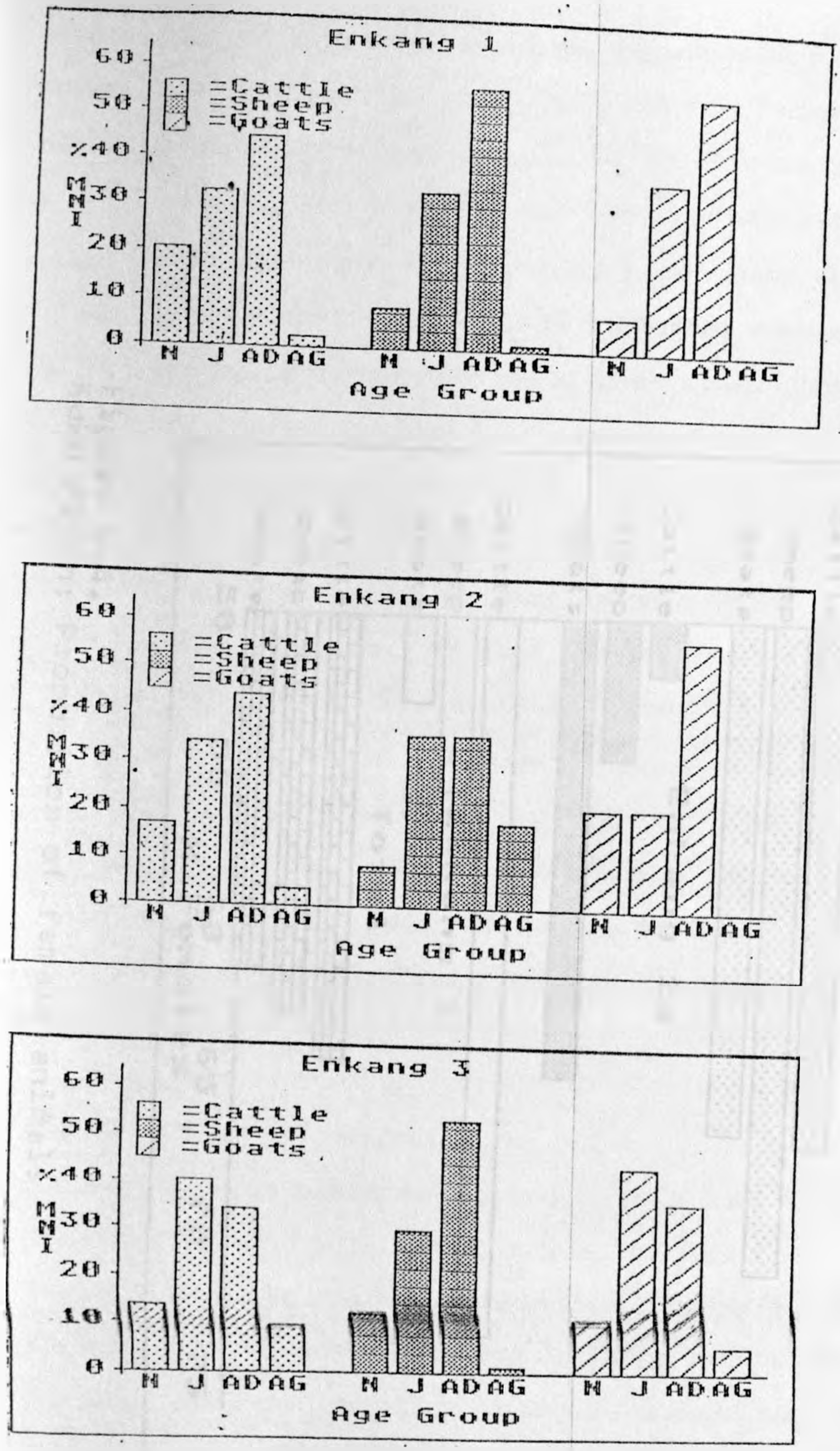


Figure 4.3.
Kuku Plain: Age Distribution in Current Herds

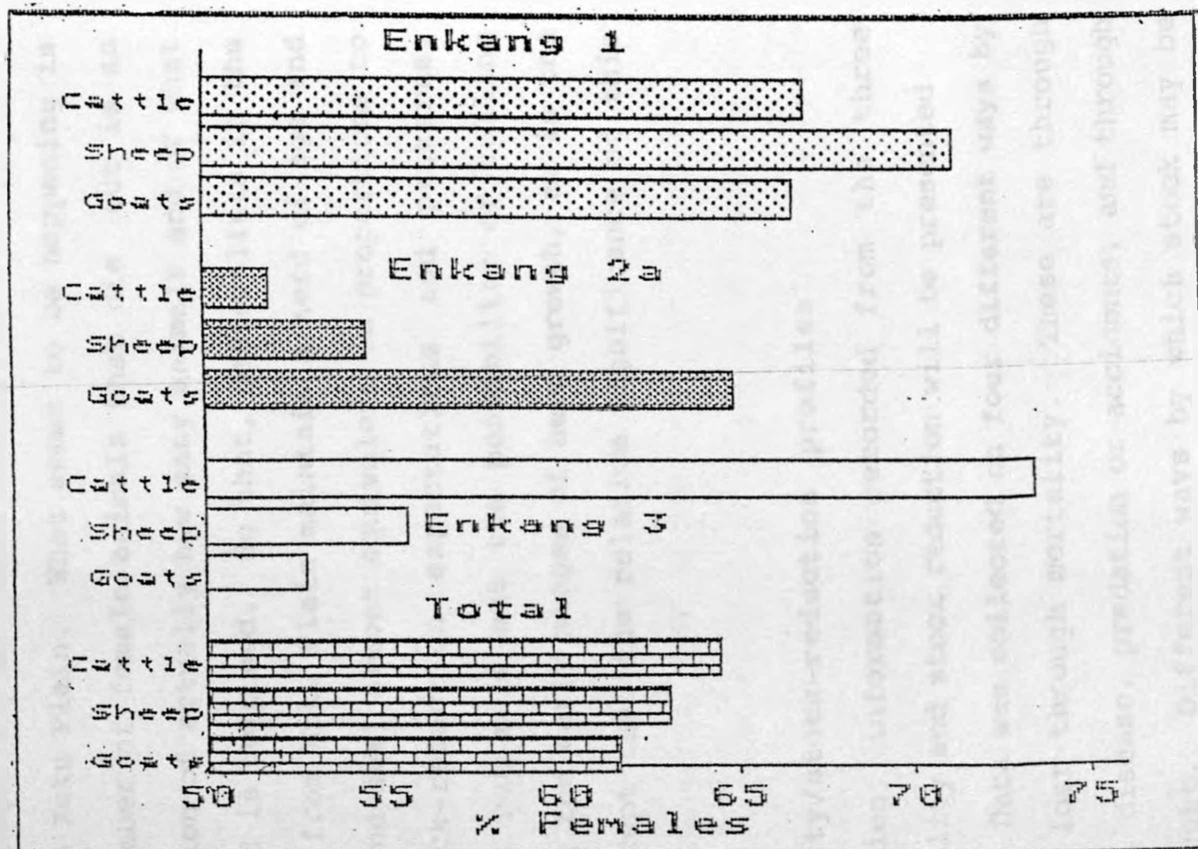


Figure 4.4.
Kuku Plain: Proportion of female animals

reduction proportions because even in these (stock reduction) the proportion of female to male animals is higher. Mortality/stock reduction ratio of female to male animals is 57.73% for the former and 42.27% for the latter (n=112:82). This means that if mortality/stock reduction was a factor to go by, we would expect the number of females to be higher than that of males. The assumption frequently made that fewer female animals are "lost" (naturally or intentionally) does not seem to agree with data from Kuku Plain. What seems to be happening is that the greater number of female animals that die out is an approximate reflection of actually how many animals and of what age and sex the herd is composed. So that, pastoralists in the example of these from Kuku Plain maintain a herd of age and structure (in age and sex) almost equivalent in proportions to mortality and stock-reduction expectations and patterns. However, this does not rule out the possibility of culling particularly during the early stages of herd growth, as is the usual practice. Except that the relative significance of this seems minimal.

4.3. Age mortality/stock-reduction profiles

In this section, information recorded from the three households on mortality and stock reduction will be presented and comments made. Data was collected on four different ways by which animals are lost through mortality. These are through slaughter for food, disease, predation or accidents, and through starvation or drought. Different ways by which stock may be reduced other than mortality were also considered. These are through sale, bridewealth, loan, and through gifts. Information recorded included the number of animals that are 'lost' (in the above different ways) and in which age and sex categories they occurred. For discussions and comparisons with ethnographic faunal and Pastoral Neolithic data, the sexes have been considered together and also sheep and goats have been considered as one sample, with numbers for each of these summed. This is because in the faunal and in the Pastoral Neolithic data, the sex of the animal was not determined whilst sheep and goats were not separated. This is due to the difficulty in distinguishig between female and male animals and between sheep and goats when dealing with faunal remains.

4.3.1. **Cattle**

Tables 4.4 and 4.5 show age mortality and stock reduction distribution in cattle from the three households. For a period of 12 months (approximately from August 1988 to August 1989) when these data was collected, the three households had their total herd size reduced by 109 animals (through intentional and unintentional processes). The highest 'loss' affected the juvenile class with a proportion of 36.7% (n=40) followed by the juvenile class with a proportion of 36.7% (n=40) followed by the adult class 29.4% (n=32), neonate 22.9% (n=25) and lastly the aged class with 11% (n=12). This pattern is quite similar at the three households (also referred to here as Enkang I, Enkang 2A or Enkang 2B). There are, however, minor exceptions to the rule (see Table 4.4). The aged class is the least affected at all the three households while the juvenile and adult classes (in this order) predominate in both mortality and stock reduction structures.

Table 4.4 Kuku Plain: cattle mortality/stock reduction age distribution

Enkang	Total	Neonate	%	Juvenile	%	Adult	%	Aged	%
Enkang1									
slaughter	3	-	-	2	66.7	1	33.3	-	-
diseases	15	6	40	6	40	2	13.3	1	6.7
predation/ accidents	0	-	-	-	-	-	-	-	-
drought	15	7	46.7	2	13.3	5	33.3	1	6.7
Total	33	13	39.4	10	30.3	8	24.2	2	6.1
sale	4	-	-	2	50	1	25	1	25
b/wealth	3	-	-	3	100	-	-	-	-
loan	0	-	-	-	-	-	-	-	-
gift	1	-	-	-	-	1	100	-	-
Total	8	-	-	5	62.5	2	25	1	12.5
GRAND TOTAL	41	13	31.7	15	36.6	10	24.4	3	7.3
Enkang 2A									
slaughter	1	-	-	-	-	1	100	-	-
diseases	4	-	-	-	100	-	-	-	-
predation/ accidents	0	-	-	-	-	-	-	-	-
drought	7	3	42.5	-	-	2	28.6	2	28.6
Total	12	3	25	4	33.3	3	25	2	16.7
sale	1	-	-	-	-	1	100	-	-
b/wealth	0	-	-	-	-	-	-	-	-
loan	8	2	25	4	50	2	25	-	-
gift	4	-	-	3	75	-	-	1	25
Total	13	2	15.4	7	53.8	3	23.1	1	7.7
GRAND TOTAL	25	5	20	11	44	6	24	3	12
Enkang 2B									
slaughter	4	-	-	1	25	3	75	-	-
disease	4	-	-	2	50	-	-	2	20
predation/ accident	0	-	-	-	-	-	-	-	-
drought	14	7	50	-	-	7	50	-	-
Total	22	7	31.8	3	13.6	10	45.5	2	50
sale	10	-	-	4	40	3	30	3	30
b/wealth	5	-	-	3	.60	2	40	-	-
loan	4	-	-	2	50	1	25	1	25
gift	2	-	-	2	100	-	-	-	-
Total	21	-	-	11	52.4	6	28.6	4	19
GRAND TOTAL	43	7	16.3	14	32.6	16	37.2	6	13.9
SLAUGHTER	8	1	12.5	3	37.5	5	62.5	-	-
DISEASE	23	6	26.1	12	52.2	2	8.7	3	13
PREDATION/ ACCIDENTS	0	-	-	-	-	-	-	-	-
DROUGHT	36	17	47.2	2	5.6	14	38.9	3	8.3
Total	67	23	34.3	17	25.4	21	31.3	6	9.0
SALE	15	-	-	6	40	5	33.3	4	26.7
BRIDEWEALTH	8	-	-	6	75	2	25	-	-
LOAN	12	2	16.7	6	50	3	25	1	8.3
GIFT	7	-	-	5	71.4	1	14.3	1	14.3
Total	42	2	4.7	23	54.8	11	26.2	6	14.3
GRAND TOTAL	109	25	22.9	40	36.7	32	29.4	12	11.0
INTENTIONAL	49	2	4.1	26	53.1	15	30.6	6	12.2
UNINTENTIONAL	60	23	38.3	14	23.3	17	28.3	6	10.0

Table 4.5. Kuku Plain: percentage proportions of cattle `lost' through different ways

	N	%
slaughter	8	12.9
disease	23	34.3
drought	36	53.7
Total	67	100.0
sale	15	35.7
loan	12	28.6
gift	7	16.7
Total	42	100.0
GRAND TOTAL	109	

All the processes by which the animals can be lost have been divided into two categories: those that are intended are referred to here as 'intentional', whereas those processes that are not intended are referred to as 'unintentional'. The 'intentional' or 'desired' loss include sale, bridewealth, loan, gift and slaughter (see Figure 4.5). The 'unintentional' or 'undesired' loss comprises all other mortality processes other than slaughter (i.e., diseases, predation/accident and drought). The percentage ratio of `desired loss' to `undesired loss' is 44% (n=49) to 56% (n=60). It would appear that more animals are lost through undesired (natural mortality) means than through desired means.

The distribution of age in the desired category is highest in the juvenile class making up 53.1% (n=26), followed by the adult class with 30.6% (n=15) then the aged class with 12.2% (n=6) and, lastly, the neonate class with 4.1% (n=2). Such a profile is expectable. It is reasonable that no household sells, slaughters or gives out a neonate animal as bridewealth

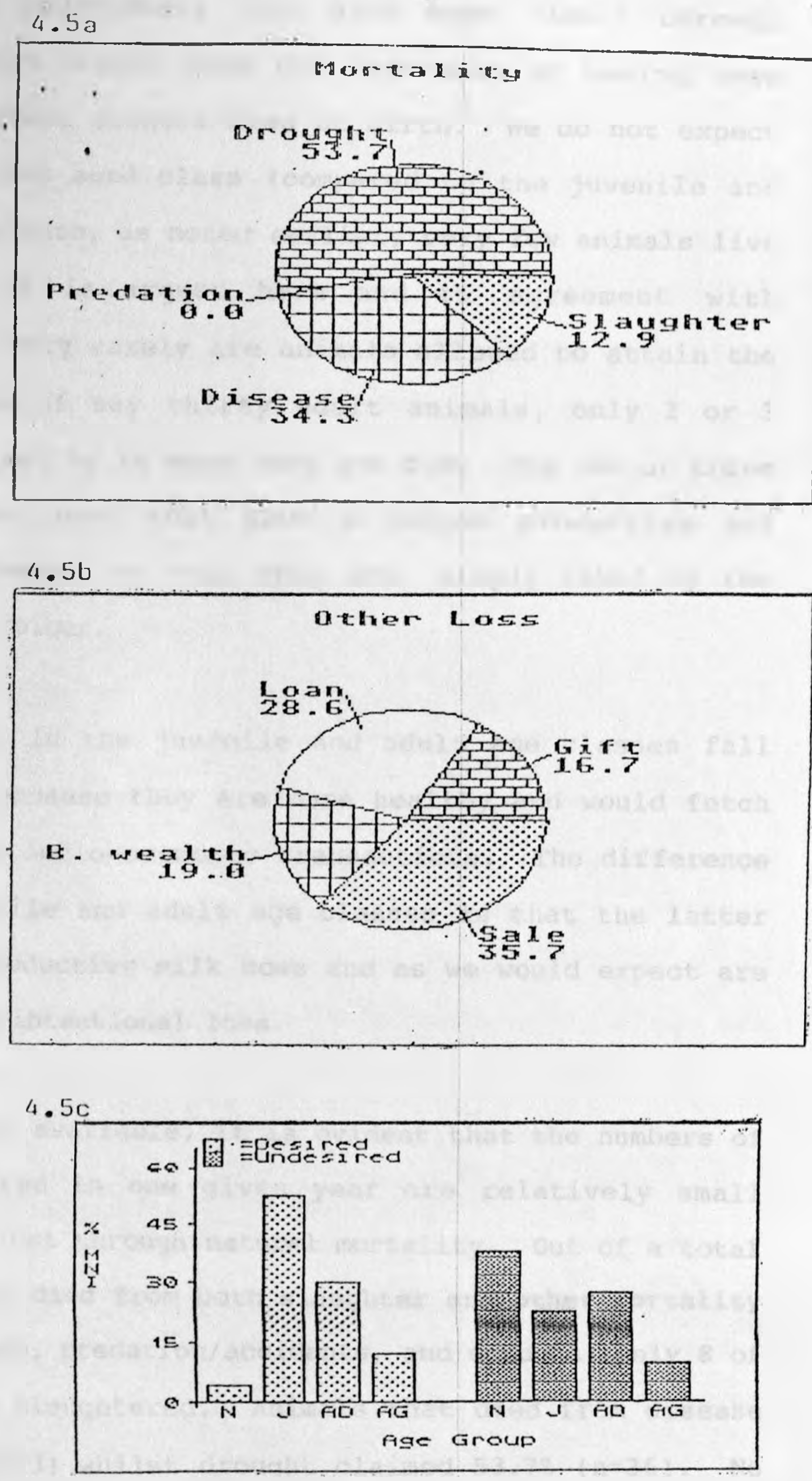


Figure 4.5.
Kuku Plain: proportions of cattle'loss'

The two neonate individuals that have been 'lost' through desired means were learnt from the informant as having been loaned out when their mothers died at birth. We do not expect more animals in the aged class (compared to the juvenile and adult classes) because, as noted earlier, very few animals live to this age. It is argued here and in agreement with informants, that very rarely are animals allowed to attain the aged class. Out of say thirty adult animals, only 2 or 3 animals will be kept up to when they are old. The two or three animals could be those that have a longer productive and reproductive lifespan, or that they are simply liked by the owner because of colour.

More animals in the juvenile and adult age classes fall victims of loss because they are more healthy and would fetch higher returns in socio-economic transactions. The difference between the juvenile and adult age classes is that the latter comprises more productive milk cows and as we would expect are less affected by intentional loss.

From the data available, it is evident that the numbers of animals slaughtered in one given year are relatively small compared to that lost through natural mortality. Out of a total of 67 animals that died from both slaughter and other mortality means (i.e. disease, predation/accidents, and drought) only 8 of these (12%) were slaughtered. Animals that died from disease made up 34.3% (n=23) whilst drought claimed 53.7% (n=36). No animal was reported to have died from predation or accidents (see Table 4.5). Of the 8 animals slaughtered, 3 of them were juvenile (37.5%) while 5 (62.5%) were adult. The neonate and aged classes are unrepresented.

Twenty-three (23) animals were reported to have died from disease. The juvenile class had the highest rates, with 52.2% (n=12) followed by the neonate class (26.1%), aged 3 (13%) and lastly the adult class with 2(8.7%). Animals that died from drought starvation totalled 36. Of these neonates were 17 (47.2%), adult 14 (38.9%), 3 (8.3%) were aged whilst the juvenile class were the least represented, with 2 individuals (5.6%).

Victims of drought were 36 (53.7%) of total mortality. The highest represented age class was neonate with 17(47.2%) animals. In a decreasing order, adult animals were 14(38.9%), aged were 3(8.3%) whilst juveniles were 2 (5.6%). Such a big proportion of animals (53.7%) dying of drought is unlikely since there has not been a shortage of rain during the past two years. It is most likely that those animals died during dry seasons but from disease that informants mistook for the effects of starvation or drought.

We would also expect lower mortality rates in the juvenile and adult classes because animals at this age are well taken care of and are more resistant to diseases and starvation. Data collected from the three households does not seem to support this assumption. The distribution of age in the animals that die is fairly similar to the distribution in the live population. For instance, if the live population has a distribution of 5 neonate animals, 35 juvenile, 45 adult and 10 aged animals, the mortality distribution is most likely to be 10% for neonates, 35% for juveniles, 45% for adults and 10% for aged class. This is based on the assumption that mortality factors affect the different age classes at equal levels and rates. This however, is not possible to ascertain from the data available.

From the three households the total herd was reduced by 42 animals through ways other than mortality. Of these, 15(35.7%) were sold, 12(28.6%) were loaned out, 8(19%) were given out as bridewealth while 7(16.7%) were given out as gifts. This is similar to other patterns in the general data. Juvenile animals predominate with 23(54.8%) animals, adult 11 (26.2%) aged 6(14.3%) and lastly the neonate class with two animals (4.7%). As expected, neonate animals are unlikely to be sold or given out as bridewealth. Because very few animals get to the aged class, we also expect lower rates of sale or offer for brideprice. A greater proportion of the animals are sold (or exchanged) or used to pay bridewealth, loaned out, or given out as gifts in the juvenile and adult age class. Animals at this age have attained maximum weight and are more productive and therefore fetch higher returns in socio-economic transactions.

The proportion of female to male animals was also analysed. Of the 8 animals that were slaughtered by the three households, 7 of them were male (87,5%) while one female (12.5%) was slaughtered (see Table 4.6). This is in agreement with normal pastoral subsistence practices where female animals are rarely slaughtered.

Table 4.6 Kuku Plain.proportion of female to male cattle.

	Total	Female	%	Male	%	Female/Male
slaughter	8	1	12.5	7	87.5	0.1
disease	23	12	52.2	11	47.8	1.1
predation/ accidents	0	-	-	-	-	-
drought	36	26	72.2	10	27.8	2.6
Total	67	39	58.2	28	41.8	2.1
sale	15	4	26.7	11	73.3	0.04
b/wealth	8	3	37.5	5	62.5	0.6
loan	12	9	75	3	25	3.0
gift	7	7	100	-	-	7.0
Total	42	23	54.8	18	45.2	1.2
GRAND TOTAL	109	62	56.9	47	43.1	1.3

The adult animals affected by slaughter were all male. This is the case because female cows are relied on for milk production and for herd growth.

However, this is not true in all other cases except in sale and bridewealth where the percentage ratio of female to male animals is 26.7% to 73.3% and 37.5% to 62.5% respectively. In animals which were lost through diseases and drought the ratio of female to male animals is 52.2%:47.8% and 72.2%:27.8% respectively. Similarly within the animals that were given out as gifts or loaned out, the percentage ratio of female to male is higher in the former (75%:25% in loaned out animals and 100% :0%) in animals given out as gifts.

Why we have more female animals as victims of natural mortality may be explained at one level by the fact that natural causes of mortality are likely to affect female and male animals in similar proportions. However, since there are more female animals in the live population (64.48%), chances are that more female animals will be victims of mortality than male animals, as it is the case here. It may also be that female animals are more susceptible to diseases during birth and lactation.

From the foregoing discussion of data on age and sex distribution in animals that are slaughtered, those that die of natural causes and those that are sold, loaned out, or given out as bridewealth or gifts, it could be said that this distribution is as a result of a number of factors. One overriding factor is that more animals are slaughtered or affected by natural mortality and other processes of stock reduction within the juvenile and adult classes because these animals in these classes are more common in the live population. Another reason is that they fetch higher returns when transacted in sale and other socio- economic exchanges. It could be argued that the Kuku Plain pastoralists maintain a herd structure and size that reflects potential subsistence and herd management practices. And that the structure in the live population is not a reflection of the way mortality and stock reduction patterns affect the herd.

4.3.2. Sheep and Goats

A total of 165 sheep and goats were recorded to have been `lost' through mortality and through other processes of socio-economic transactions discussed in the section on cattle. As was the case with cattle this `loss' was categorised into `desired' and `undesired' categories. Animals `lost' through desired means (slaughter, sale, bridewealth, loan and gifts) totalled 71 (43%). The undesired loss category (disease, predation/accidents, and drought) made up 57% (n=94). Of all mortality cases recorded (128) animals that died from drought (highest representation) made up 42.2% (n=54). Following this 28.1% of all mortality (n=36) represent animals that died from disease. Animals that were slaughtered totaled 34 (26.6%) while predation/accidents claimed 4 animals (3.1%). This information is contained and shown in Tables 4.7 and 4.8 and Figure 4.6.

The intentional `loss' incurred through means other than mortality (i.e., sale, bridewealth, loan and gift) totals to 37 (22.4%). The animals given out as gifts were 14 (37.8%). those that were sold make up 35.2% (n=13), bridewealth 6 (16.2%) while four animals (10.8%) were loaned out.

Table 4.7. Kuku Plain: Proportion of sheep/goats `lost' through different ways.

	N	%
slaughter	34	26.6
disease	36	28.1
predation/accidents	4	3.1
drought	54	42.2
Total	128	100.0
sale	13	35.2
b/wealth	6	16.2
loan	4	10.8
gift	14	37.8
Total	37	100.0
GRAND TOTAL	165	

The age distribution in sheep and goats is quite similar to that in cattle. However, the total number of animals lost (through either desired or undesired means) is higher in sheep and goats than cattle. This is particular so in the number of animals that were slaughtered, where only 8 were recorded in cattle while 34 sheep and goats were slaughtered. This is expected because among most pastoralists of similar animal husbandry practices, cattle are rarely slaughtered except on important ceremonies. The age distribution is, however, quite similar.

Table 4.8 shows the age distribution in the sheep/goats that were lost through different ways. Of the 34 animals that were slaughtered 19 (55.9%) were adult, 13 (38.2%) were juvenile while 2 (5.9%) aged animals are represented. Expectedly, no neonate was slaughtered.

A total of 94 animals died from disease, predation/accidents and drought. The highest rates affected the adult and neonate classes each being represented by 34 (36.2%) individuals. The juvenile followed with 16 (17%) individuals, and least represented was the aged class with 10 (10.6%) individuals.

The mortality pattern is quite similar to that observed in cattle. The adult and juvenile classes predominate in the sample of animals that were slaughtered. As argued in the case of cattle, the fact that these age classes are the basis of the productive stability of the herd may imply that they are

Table 4.8 Kuku Plain: sheep and goats mortality/stock reduction age distribution

Enkang	Total	Neonate	%	Juvenile	%	Adult	%	Aged	%
Enkang 1									
slaughter	17	-	-	3	17.6	14	82.4	-	-
diseases	19	9	47.4	3	15.8	7	36.8	-	-
predation/ accidents	0	-	-	-	-	-	-	-	-
drought	12	5	41.7	-	-	4	33.3	3	25
Total	48	14	29.2	6	12.5	25	52.1	3	6.2
sale	5	-	-	1	20	4	80	-	-
b/wealth	3	-	-	2	66.	1	33.3	-	-
loan	0	-	-	-	-	-	-	-	-
gift	2	-	-	2	100	-	-	-	-
Total	10	-	-	5	50	2	50	-	-
GRAND TOTAL	58	14	24.1	11	19	30	51.7	3	5.2
Enkang 2A									
slaughter	7	-	-	1	14.3	5	71.4	1	14.3
diseases	10	70	-	-		3	30	-	-
predation/ accidents	1	-	-	1	100	-	-	-	-
drought	0	-	-	-	-	-	-	-	-
Total	18	7	38.9	2	1.1	8	44.4		5.6
sale	1	-	-	-	-	1	100	-	-
b/wealth	0	-	-	-	-	-	-	-	-
loan	0	-	-	-	-	-	-	-	-
gift	6	-	-	5	83.3	1	16.7	-	-
Total	7	-	-	5	71.4	2	28.6	-	-
GRAND TOTAL	25	7	28.0	7	28.0	10	40.0	1	4.0
Enkang 2B									
slaughter	10	-	-	9	90.0	-	-	1	10.0
disease	7	-	-	-	-	3	42.9	4	57.1
predation/ acident	3	1	33.3	1	33.3	1	33.3	-	-
drought	42	12	28.6	11	28.6	16	38.1	3	7.1
Total	62	13	21.0	21	33.9	20	32.2	8	12.9
sale	7	-	-	6	85.7	1	14.3	-	-
b/wealth	3	-	-	1	33.3	-	-	2	66.7
loan	4	-	-	3	75	1	25	-	-
gift	6	-	-	6	100	-	-	-	-
Total	20	-	-	16	80	2	10	2	10
GRAND TOTAL	105	13	12.5	41	39	41	39	10	9.5
Enkang?									
slaughter	34	-	-	13	38.2	19	55.9	2	5.9
disease	36	16	44.4	3	8.3	13	36.2	4	11.1
predation/ accidents	4	1	25	2	50	1	25	-	-
drought	54	17	31.5	11	20.4	20	37	6	11.1
Total	128	34	26.6	29	22.6	53	41.4	12	9.4
sale	13	-	-	7	53.8	6	46.2	-	-
b/wealth	6	-	-	3	50	1	16.7	2	33.3
loan	4	-	-	3	75	1	25	-	-
gift	14	-	-	13	92.9	1	7.1	-	-
Total	37	-	-	26	70.3	9	24.3	2	5.4
GRAND TOTAL	165	34	20.6	55	33.3	62	37.6	14	8.5
DESIRED	71	-	-	39	55.0	28	39	4	5.6
UNDESIRED	94	34	36.2	16	17	34	36.2	10	10.6

slaughtered in fewer numbers or that the aged animals (which are not many) are slaughtered more frequently. In effect, this distribution tells us that the Kuku Plain Pastoral Maasai keep and maintain a high proportion of animals in the adult age class so that these animals fulfill the dual role of providing milk and for herd growth. They also provide an abundant reserve from which animals for slaughter can be drawn. In the live population, animals in the neonate and aged classes are significantly fewer and do not contribute significantly to mortality.

However, data shows that a reasonable number of neonate animals died from natural causes (34 out of 94). Here is one case that we could argue for less resistance to natural mortality in neonate animals. But this again is not supported by the fact that adult animals are more resistant and therefore few should be represented.

The age distribution of animals that were `lost' through sale, bridewealth, loan and gift transactions is also closely similar to that for mortality. Of the 37 animals recorded to have been 'lost' through all these processes, 26 (70.3%) were juvenile 9 (24.3%) were adult while 2 (5.4%) were aged. The neonate class was not affected. Similarly juvenile and adult animals are the likely victims of this `loss'.

It is argued here that the pastoralists in question can only afford to lose (through desired means) more animals in the juvenile and adult age classes by keeping more animals in these

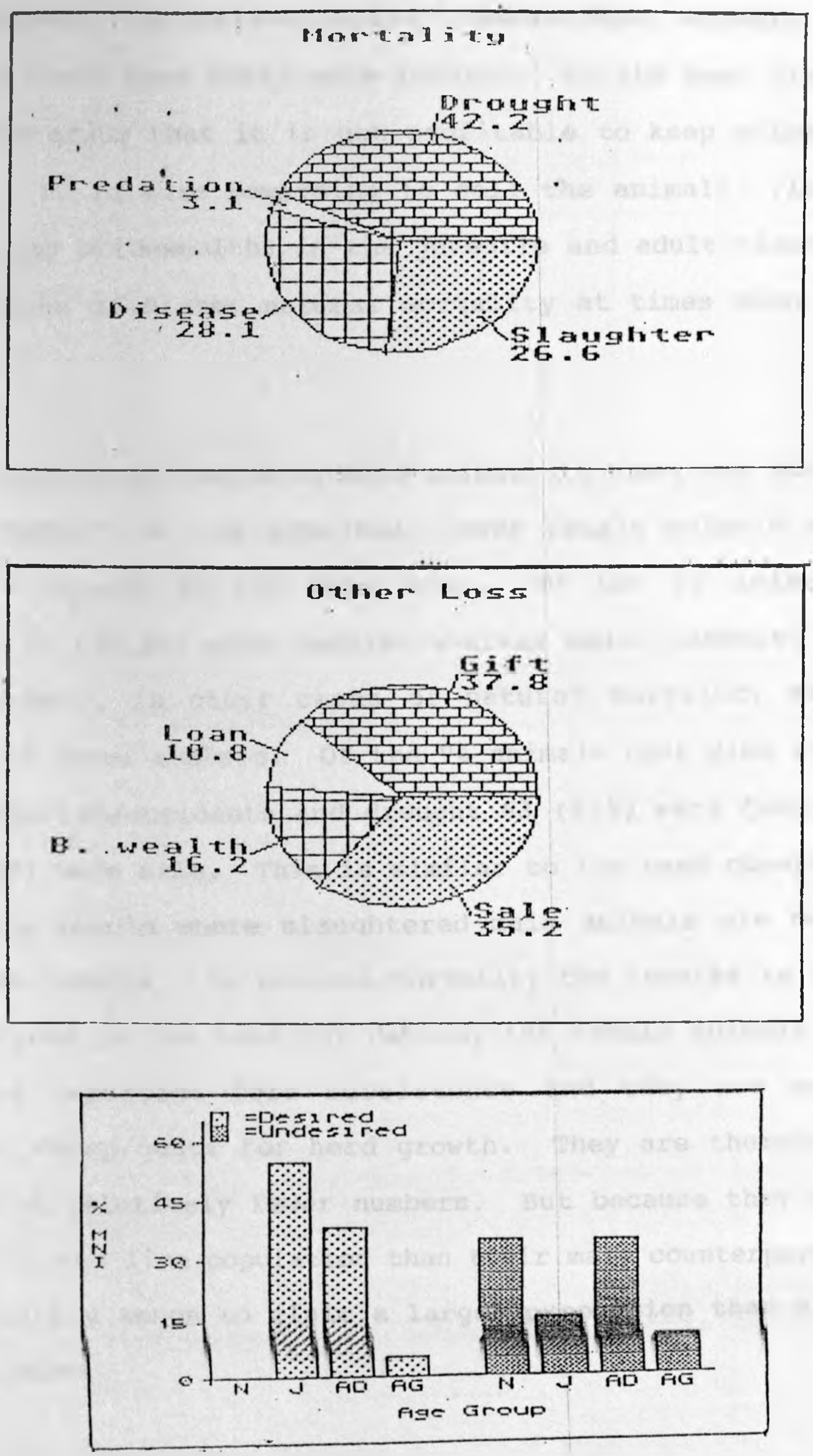


Figure 4.6.
Kuku Plain: Proportions of Sheep/goats 'loss'

classes. Moreover, in socio-economic transactions, animals at this age will fetch more profitable returns. At the same time, the households argue that it is not profitable to keep animals to old age. It is more rewarding to sell the animals, (loan them out or pay bridewealth) in the juvenile and adult classes to reduce risks of higher natural mortality at times when it strikes.

The proportion of female to male animals in sheep and goats is shown in Table 4.9. As expected, fewer female animals are slaughtered compared to the male ones. Of the 34 animals slaughtered, 12 (32.4%) were females whereas males numbered 23 (67.6). However, in other cases of natural mortality male animals are in fewer numbers. Of the 94 animals that died from disease, predation/accidents and drought 63 (67%) were female, while 31 (33%) were male. This is similar to the case observed in the cattle sample where slaughtered male animals are more frequent than females. In natural mortality the reverse is the case. As argued in the case for cattle, the female animals in the herd are important fora subsistence and they are more important in sheep/goats for herd growth. They are therefore slaughtered in relatively fewer numbers. But because they are more common in the live population than their male counterparts, natural mortality tends to claim a larger proportion than that claimed for males.

This section provided data on the distribution of age and sex in both cattle and sheep/goats. In the section that follows, data obtained from the analysis of dental faunal specimens collected from the 9 sites is discussed here and comparisons are made in the last section of this chapter.

Table 4.9. Kuku Plain: proportion of female to male sheep and goats.

Enkang	Total	Female	%	Male	%	Female/Male
slaughter	34	11	32.4	23	67.6	0.5
disease	36	24	66.7	12	33.3	2.0
predation/ accidents	4	2	50.0	2	50.0	1.0
draught	54	37	68.5	17	31.5	2.2
Total	128	74	57.8	54	42.2	1.4
sale	13	6	46.2	7	53.8	0.9
b/wealth	6	4	66.7	2	33.3	2.0
loan	4	4	100.0	-	-	4.0
gift	14	8	57.1	6	42.9	1.3
Total	37	22	59.5	15	40.5	1.4
GRAND TOTAL	165	96	58.2	69	41.8	1.4

4.4. Faunal Age Distribution

Information on the age distribution in the animals represented in the faunal samples collected is provided in Tables 4.10, 4.11, 4.12, 4.13, 4.14, and 4.15. The original data was recorded in 7 age categories of neonate, juvenile, old juvenile, young adult, adult, aged, and very old. These categories are compressed into 4 age categories of neonate, juvenile (juvenile and old juvenile), adult (young adult and adult), and aged (aged and very old). These 4 age categories will be used in comparisons with other data in this chapter. For further analysis and comparisons, the original 7 age categories are compressed into three broad reproductive phases of an animal's lifespan. In cattle, the neonate, juvenile, old juvenile, and young adult classes are combined to make the first third of the cattle's lifespan, the pre-reproductive phase (corresponding to 1-4 years). The adult age class corresponds to the reproductive phase (approximately 4-9 years). The last third of lifespan corresponds to the post-reproductive phase (approximately 9-14 years of age). These three categories will be used for further comparisons in Chapter Six.

In sheep/goats, the neonate, juvenile and old juvenile correspond to the first third of the animals lifespan, the pre-reproductive phase (approximately 0 to 12 months). Young adult and adult classes correspond to the second third of the lifespan, the reproductive phase (approximately 12 to 48 months). The aged and very old classes make up the last third of the lifespan, the post-reproductive phase (approximately 48 to 60 months of age). As in cattle, discussions in this chapter will focus on the four age categories of neonate, juvenile, adult and aged. This is because it was difficult to record the age distribution of the herds in 7 categories. It is however possible to code all the types of data (age structure in the live population, contemporary faunal and Pastoral Neolithic) into 4 age categories that can be comparable. It is also possible to code the 7 age classes into the 3 categories in both contemporary faunal data and in the Pastoral Neolithic data.

In this section faunal age distribution estimates from nine contemporary pastoral Maasai sites will be presented. Three are the households whose herd structures and mortality/stock reduction age profiles have been discussed in the preceding sections. Dental faunal remains have also been analysed for these three households. These households have been designated as Enkang 1, Enkang 2A and Enkang 2B (Enkang 2B is an autonomous site or household but having 'broken off' from Enkang 2A). Three meat eating sites (Orpejet) were also investigated and have been designated as Enkang 1 Orpejet (used by Enkang 1, Enkang 2A) and 2B Orpejet (used by both Enkang 2A and 2B), and the Manyatta Orpejet (used by the manyatta). One other meal eating site distinctively used by Maasai *Moran* was also investigated, and is referred to here as Orpuli. Lastly, faunal remains were also collected and analysed from an encampment used to graze sick or weak animals. It is referred to here as 'Olopololi'. It was learnt from informants that the olopololi bones represented animals that died from starvation and diseases which while they were still alive could not be moved far away from the homestead in search of pastures or water.

4.4.1. **Cattle**

Information on Number of Identifiable Specimens (NISP) and Minimum Number of Individuals (MNI) in cattle is contained in Table 4.10. In a cattle sample from 9 different sites, 157 dental specimens were analysed and are considered in this study. The specimens were well preserved (largely whole maxilla and mandibles).

A total of 157 NISP was therefore recorded. Estimation of MNI gave a value of 110. The highest representation was recorded at Enkang 2B with 25 individual (22.7%). This is followed by olopololi with 22 individuals (20.0%). In the decreasing order Enkang 2A and 2B Orpejet 18 (16.4%) Manyatta Orpejet with 17 (15.5%) Enkang 2A with 6(5.5%), Enkang I Orpejet and Orpul each with 5 individuals (4.5%) and lastly Enkang 1 with 3 individuals 2.7%.

Table 4.10. Kuku Plain: Cattle NISP and MNI representation

	NISP	%	MNI	%	NISP/MNI
Enkang 1	4	2.5	3	2.7	1.4
Enkang 1 orpejet	6	3.8	5	4.5	1.2
Enkang 2A	6	3.8	6	5.5	1.0
Enkang 2B	35	22.3	25	22.7	1.4
Enkang 2A & 2B orpejet	29	18.5	18	16.4	1.6
Manyatta	15	9.6	9	8.2	1.7
Manyatta	27	17.2	17	15.5	1.6
Orpul	5	3.2	5	4.5	1.0
Olopololi	30	19.1	22	20.0	1.4
Total	157	100.0	110	100.0	1.4

Information on age distribution in cattle is contained in Table 4.11a & b and Figure 4.7. A total MNI of 110 was estimated. The highest representation is the juvenile age class with a total of 49 (44.6%) individuals. Closely following this is the adult age class with 48 (43.6%) aged 12 (10.9%) and least represented is the neonate class with one individual (0.9%). There is no significant difference between the sites in terms of the age of the animals represented. At all the sites, it is either juvenile or adult class that predominates the samples and these are followed with the aged class. It is suggested that this age distribution has more to do with the distribution of

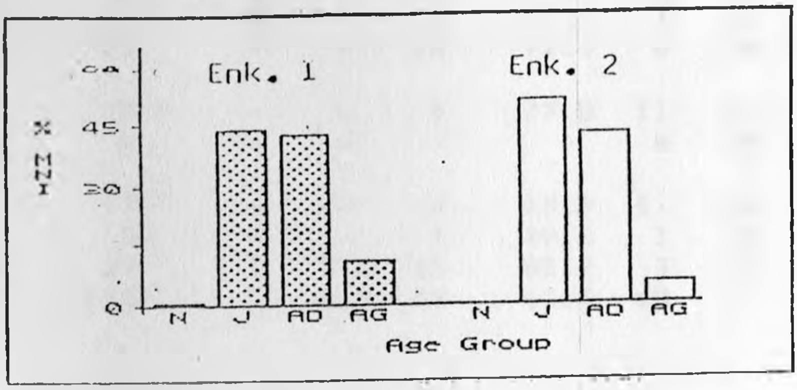


Figure 4.7. Kuku Plain:
Faunal Age Distribution in Cattle

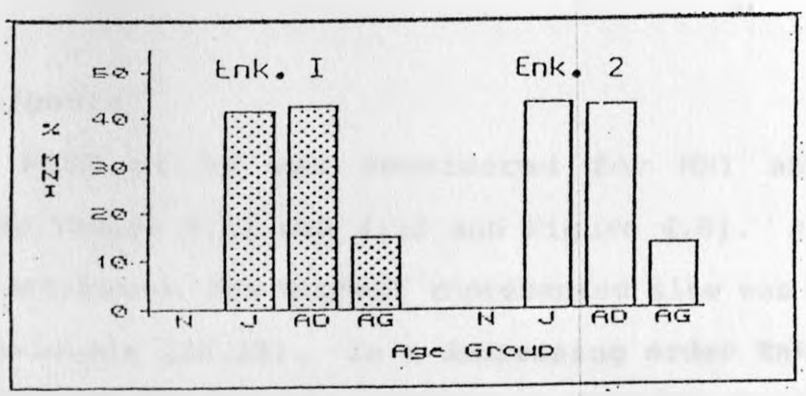


Figure 4.8. Kuku Plain:
Faunal Age Distribution in sheep/goats

Table 4.11. Kuku Plain: cattle MNI age distribution coded in 4 age categories.

Sites	NISP	Total	NEONATE	%	JUVE-NILE	%	ADULT	%	AGED	%
Enkang 1	4	3	-	-	3	100.0	-	-	-	-
Enkang 1 orpejet	6	5	-	-	1	20.0	4	80	-	-
Enkang 2A	6	6	-	-	2	33.3	4	66	-	-
Enkang 2B	35	25	-	-	18	72.0	6	24	1	4.0
Enkang 2A & 2B orpejet	29	18	-	-	5	27.8	11	61	2	11.1
Manyatta	15	9	-	-	-	-	8	88	1	11.1
Manyatta orpejet	27	17	-	-	4	23.5	11	64	2	11.8
Orpul	5	5	-	-	1	20.0	1	20	3	60.0
Olopololi	30	22	1	4.6	15	68.2	3	13	3	13.6
Total	157	110	1	0.9	49	44.6	48	43	12	10.9
Enkang 1 & Enkang 1 orpejet	10	8	-	-	4	50.0	4	50	-	-
Enkang 2A & 2B & Orpejet 2A & 2B	70	49	-	-	25	51.0	21	42	3	6.1
Total	80	57	-	-	29	50.9	25	43	3	5.2

animals that die than has to do with differential taphonomic processes affecting the samples.

4.4.2. **Sheep/goats**

A total NISP of 89 was considered for MNI and age estimation (see Tables 4.12 and 4.13 and Figure 4.8). A total MNI of 60 was estimated. The highest represented site was Enkang 1 with 17 individuals (28.3%). In a decreasing order Enkang 2B was represented by 16 (26.7%), Enkang 1 orpejet 8 (13.3%), Enkang 2A 7 (11.7%), Manyatta Orpejet 6 (10.0%), Enkang 2A and 2B Orpejet 3(5%), whilst Manyatta Orpul and Olopololi were represented by 1 (1.7%) individual each.

Information on the distribution of age in sheep/goats is contained in Table 4.13 and Figure 4.6. The adult class was the highest represented (26(43.3%). Almost an equal proportion of

Table 4.12. Kuku Plain: Sheep/goats NISP and MNI representation.

	NISP	%	MNI	%	NISP/MNI
Enkang 1	26	29.9	17	28.3	1.5
Enkang 1 orpejet	13	14.6	8	13.3	1.6
Enkang 2A	8	9.0	7	11.7	1.0
Enkang 2B	23	25.8	16	26.7	1.4
Enkang 2A & 2B orpejet	4	4.5	3	5.0	1.3
Manyatta	1	1.1	1	1.7	1.0
Manyatta	12	13.5	6	10.0	2.0
Orpejet	1	1.1	1	1.7	1.0
Olopololi	1	1.1	1	1.7	1.0
Total	98	100.0	60	100.0	1.5

juvenile animals 25 (41.7%) follows the adult class. The aged class was represented by 9 individuals (15%). Neonate animals were not represented. Significant differences between sites in terms of age distribution are not evident. At all the sites (except Manyatta Orpejet) it is either the juvenile or adult class that have the highest representation. This is followed at almost all the sites by the aged class. This pattern is similar to that observed in the cattle sample (except for differences between sites).

In the succeeding section the relationship between the data recorded in the live population and that from the faunal data collection will be discussed.

Table 4.13 Kuku Plain: sheep/goats age distribution coded in 4 age categories

Sites	NISP	Total MNI	Neonate MNI	%	Juvenile MNI	%	Adult MNI	%	Aged MNI	%
Table 4.13a										
Enkang 1	26	17	-	-	6	35.3	10	58	1	5.9
Enkang 1 orpejet	13	8	-	-	3	37.5	5	62	-	-
Enkang 2A	8	7	-	-	3	42.9	4	57	-	-
Enkang 2B	23	16	-	-	8	50.0	2	12	6	37.5
Enkang 2A&2B orpejet	4	3	-	-	2	66.7	1	33	-	-
Manyatta	1	1	-	-	1	100.0	-	-	-	-
Manyatta orpeject	12	6	-	-	-	-	4	66	2	33.3
Orpul	1	1	-	-	1	100.0	-	-	-	-
Olopololi	1	1	-	-	1	100.0	-	-	-	-
Total	89	60	-	-	25	41.7	26	43	9	15.0
Table 4.13b										
Enkang 1 & Enkang 1 orpejet	39	25	-	-	9	36.0	15	60	1	4
Enkang 2A&2B & Orpejet 2A&2B	35	26	-	-	13	50.0	7	26	6	23.1
Total	74	51	-	-	22	43.1	22	43	7	13.7

4.5. Comparison of Current Herd Structures, Mortality and Faunal Patterns.

This section compares the data recorded and described in the preceding sections. These data falls into three sections. The data that were collected on the structure of herds is referred to as "current herd". The second category comprises data recorded on mortality (to the exclusion of stock reduction). The third category comprises data obtained through the analysis of dental specimens. Due to analytical problems arising from certain differences in the data (i.e. as data were collected in different categories and at different sites), regrouping and adjustments have been done to allow acceptable comparisons.

These adjustments are:

1. Because a distinction was not made between male and female animals in the faunal data, distinction of sex in the live population and mortality data is ignored.

2. No distinction is also made between sheep and goats in the faunal data. In the current herd and mortality data, sheep and goat will be considered together.

3. Since data on the current herd and mortality was not collected at the manyatta and its orpejet, orpul and olopololi these sites have been excluded from the comparison.

4. Enkang I and Enkang I Orpejet will be considered as one

(Enkang 1) because of the Orpejet they share.

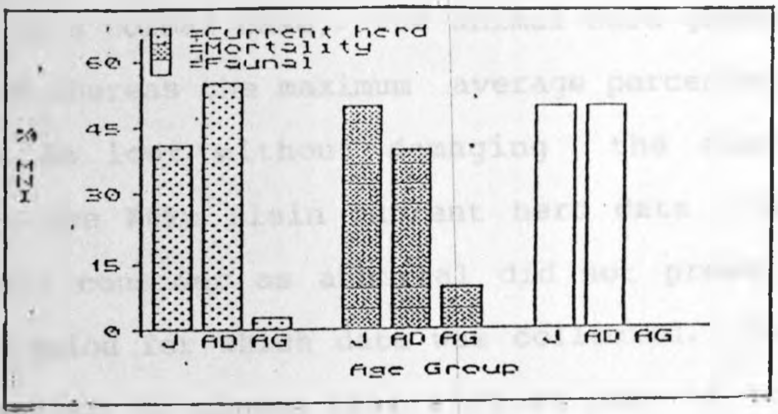
5. In the faunal data it can be observed that no neonate animal was represented at any of the two Enkang sites. In making comparisons inclusion of the neonate class tends to distort the percentage relationships and proportions. For this reason
the neonate age class is excluded in two comparisons. This means that in the live population and mortality data the number of neonate animals has been subtracted in the respective data categories. The lack of neonate representation will, however, be commented on at the end of this section.

4.5.1. **Cattle**

Information on the proportions of cattle in the current herd, on mortality and the faunal data is contained in Table 4.14 and Figure 4.9. From the two Enkang the number of cattle in the live population excluding the neonate class is 150. Those that died (through both slaughter and natural causes) are 44, those that are represented in the faunal sample are 57.

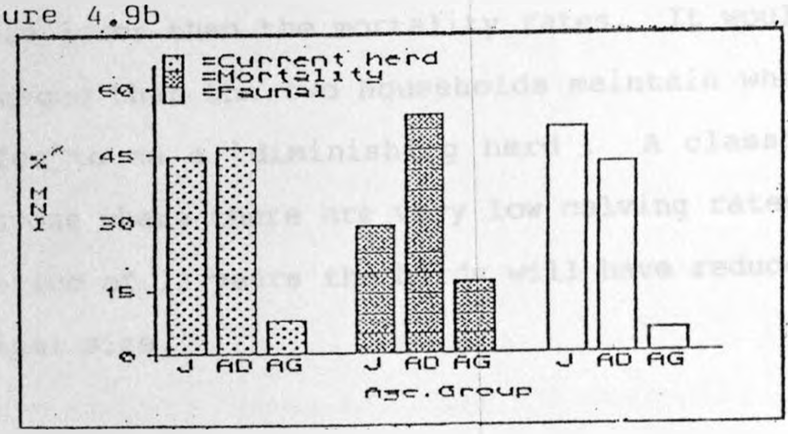
If we can go by this, it would mean that in the current herd of 150 animals it is expected that under normal circumstances (i.e. in the absence of say an epidemic) the cattle herd size will reduce by 44 (29.3%) within a period of one year. It is not easy in these circumstances to estimate the annual herd growth in disregard of certain ecological/environmental factors, for growth rates are likely

Figure 4.9a



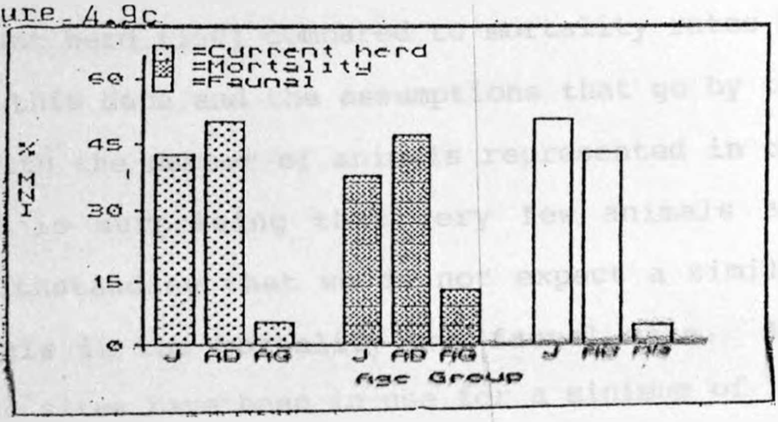
Enkang I

Figure 4.9b



Enkang 2

Figure 4.9c



Total

Figure 4.9.
Kuku Plain: Cattle age distribution in the current herd, mortality and faunal record.

to change with changing conditions. However, Dahl and Hjort (1976) consider that in a normal case, the animal herd growth rate in cattle is 3.4% whereas the maximum average percentage of animals that can be lost without damaging the stock stability is 8%. In the Kuku Plain current herd data the conditions that we may consider as abnormal did not prevail during the one year period for which data was collected. For this reason it is correct to assume that a 29.3% loss of the herd was lost. This means that at the two Enkang sites, the herd growth rates are lower than the mortality rates. It would then appear as to argue that the two households maintain what Dhal and Hjort refer to as `diminishing herd'. A classic diminishing herd is one where there are very low calving rates. So that within a period of 12 years the herds will have reduced by 50% of the original size.

On the basis of the fact that a considerable number of animals are lost in one year, the relatively small number of animals in the current herd (150) compared to mortality rates is expected. But when this data and the assumptions that go by the data are compared with the number of animals represented in the faunal samples, it is surprising that very few animals are represented, not withstanding that we do not expect a similar proportion of animals in the mortality and faunal data. But since the two Enkang sites have been in use for a minimum of 10 years and assuming that an average of 44 animals die in one given year, then a figure close to 400 animals should be represented in the faunal samples. Quoting a figure of 400 ble 4.14. Kuku Plain: cattle age distribution in current herd, mortality and faunal record.

	TOTAL	JUVENILE N	JUVENILE %	ADULT N	ADULT %	AGED N	AGED %
ang1							
urrent herd	65	27	41.5	36	55.4	2	3.1
ortality	20	20	50.0	8	40.0	2	10.3
aunal	8	4	50.0	4	50.0	-	-
ang2							
current herd	85	38	44.7	40	47.1	7	8.2
mortality	24	7	29.2	13	54.2	4	16.6
faunal	49	25	51.0	21	42.9	3	6.1
ND TOTAL							
current herd	150	65	43.3	76	50.7	9	6.0
mortality	44	17	38.6	21	47.7	6	13.6
faunal	57	29	50.9	25	43.9	3	5.2

ars and assuming that an average of 44 animals die in one ven year, then a figure close to 400 animals should be presented in the faunal samples. Quoting a figure of 400 imals in the faunal samples means that one is down-playing e discard and post-discard loss and other taphonomic ocesses. The interesting question that remains unanswered is hy so few animals are represented in the faunal record (13% =57). Speculation could be made on a number of factors. irstly, that taphonomic processes of bone discard and post iscard loss significantly reduce the number of expected animals in the faunal record. These may also include scavenging animals (dogs and hyaenas) that tend to drag meaty or fresh bones far away from habitation and archaeologically investigatable areas. Secondly, the fact that post-cranial material was not analysed may likely contribute to the relatively few animals represented in the faunal sample. Lastly, it may also be possible that informants gave rather exaggerated figures on the number of animals that die in one year. The level of literacy not being absolutely dependable, these figures may have included animals that died in a period of more than one year. Which of the three possibilities is most credible is a question of conjecture, and likely a combination of them could be the case.

In terms of age distribution, the data collected in the three categories demonstrate a fairly consistent pattern. The age distribution in the three data categories is similar at both Enkang I and Enkang 2.

In most cases the age distribution in animals within the live population reflects well (or is relatively similar) to the distribution in mortality and faunal records. Consistently, the aged class has the lowest representation. At Enkang I the age distribution in the live population is 27 (41.5%) for juvenile, 35 (55.5%) for adult, and only 2(3.1%) for aged. In the mortality record 10 (50%) are juvenile 8 (40%) are adult, whilst 2(10%) are aged.

In the faunal data both juvenile and adult class are represented by 4 (50%) animals whilst the aged class is unrepresented. At Enkang 2, of the 85 animals in the live population, 38 (44.7%) are juvenile, 40 (47.1%) are adult, and 7 (8.2%) are aged. In the mortality record, of the 24 animals, 7 (29.2%) are juvenile, 13 (54.2%) are adult, and 4 (16.6%) are aged. In the faunal record out of 49 animals, 25 (51.0%) are juvenile and 21 (42.9%) are adult and 3(6.1%) are aged. The differences in the live population reflect well the differences observed in the mortality and faunal data.

A more detailed comparison will be made between the adult and aged classes and between mortality and faunal data.

At both sites the number of animals represented in the faunal record decreases in almost equal proportions. At Enkang I the percentage decrease in the adult class is 10% while the percentage decrease in the aged class is also 10%. At Enkang 2, the percentage decreases in the adult class is 11.3%, while that in the aged class is 10.5% (note that this decrease is from mortality to faunal data). This pattern would demonstrate that at the two sites the aged animals' dentitions have almost equal chances of survival with the adult age class and that taphonomic factors do not differentially act and favour the adult age class, which as per our data is more represented.

4.5.2. Sheep and Goats

Information on the proportion of sheep and goats in the live population, in the mortality and faunal record is contained in Table 4.15 and Figure 4.10. At the two Enkang sites, the total number of sheep/goats in the live population excluding the neonate class is 255. Those that died are 94, while those represented in the faunal record are 51. On the basis of the fact that the two Enkang sites have been in existence for a minimum of 10 years and on the assumption that 94 animals die in a given year, then a total of 940 animals have been lost. Disregarding taphonomic loss we would expect

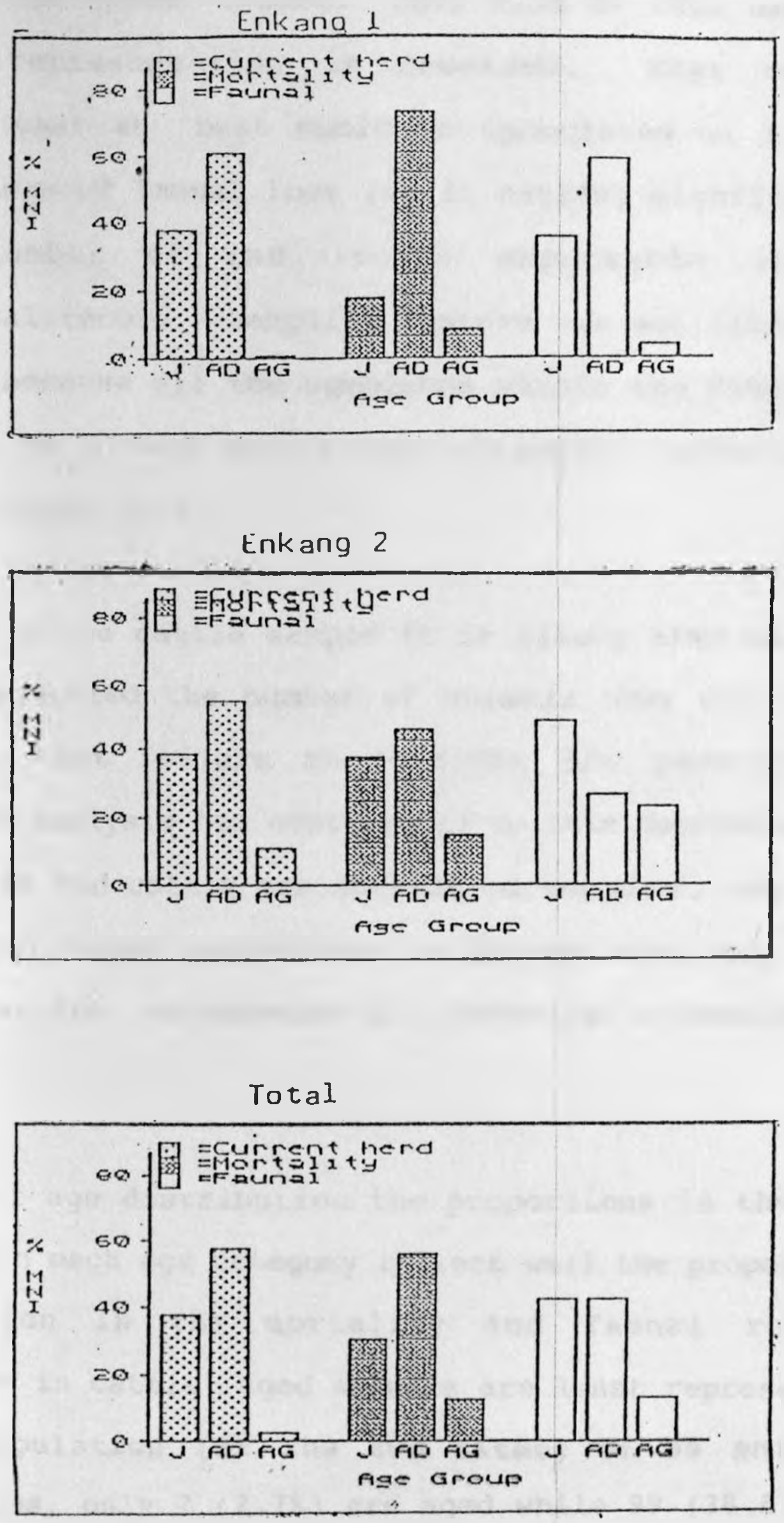


Figure 4.10.
Kuku Plain: Sheep/goats Age Distribution in the current herd, mortality and faunal record

940 animals in the faunal record. Only 5.4% of this expected recovery and representation is recorded. What remains unanswered and what at best could be speculated on is that taphonomic factors of faunal loss (as in cattle) significantly reduce the number of individuals expectable in the zooarchaeological record. Sampling factors are not likely to be significant because all the specimens within the Enkang and within a radius of 3 to 4 meters were collected including the excavation of rubbish pits.

As argued in the cattle sample it is likely also that the informants exaggerated the number of animals that die in one single year or that failure to consider the post-cranial material in the analysis has contributed to this decreased MNI. When sheep/goats and cattle are considered together, the ratio of unrepresented faunal individuals is 92% and that only 8% of the animals that are represented in a potential archaeological sample.

In terms of age distribution the proportions in the live population within each age category reflect well the proportions and distribution in the mortality and faunal record. Consistently (as in cattle) aged animals are least represented. In the live population (at the two sites) of 55 animals, exluding neonates, only 7 (2.7%) are aged while 99 (38.8%) are juvenile and 149 (58.4%) are adult. Similarly in mortality data, only 12 (12.8%) of the 94 recorded are aged while 29 (30.9%) are juvenile and 53 (56.4%) are adult. In the faunal record (N=51) only 7 (13.7%) are aged, while the juvenile and adult age classes are each represented by 22 (43.1%) individuals. Faunal representation in each age class shows similar proportions to those found in the mortality and live populations. As was the case for cattle, why there are so few old animals in the faunal record, may not be explained by differential those found in the mortality and live populations. as was the case for cattle, why there are so few old animals in the faunal record, may not be explained by differential taphonomic processes *vis-a-vis* the different age classes but rather by the fact that so few old animals die and also so few animals exist in the live population.

Table 4.15. Kuku Plain: sheep/goats age distribution in the current herd, mortality and faunal record.

Cattle	Total	N	%	N	%	N	%
Enkang 1							
current herd	118	45	38.1	72	61.1	1	0.8
mortality	34	6	17.6	25	73.5	3	8.8
faunal	25	9	36.0	15	60.0	1	4.0
Enkang 2							
current herd	137	54	39.4	77	56.2	6	11.1
mortality	60	23	38.3	28	46.7	9	15.0
faunal	25	13	50.0	7	27.0	6	23.0
GRAND TOTAL							
current herd	255	99	38.8	149	58.4	7	2.7
mortality	94	29	30.9	53	56.4	12	12.8
faunal	51	22	43.1	22	43.1	7	13.7

taphonomic processes vis-a-vis the different age classes but rather by the fact that so few old animals die and also so few animals exist in the live population.

In both cattle and sheep/goats no neonate animals are represented in the faunal record at both sites, notwithstanding that of all cattle mortality 23 (34.3%) were neonate while in the sheep/goats 34 (26.6%) are recorded to have died in one year.

Since the two sites have been in use for the past 10 years we expect even higher mortality and therefore some representation in the faunal record. This occurrence is extremely suspect. Whether this can be explained by taphonomic factors is a matter of conjecture. Assuming so, then we could remark that; bones of neonate animals are soft, fragile and light and are vulnerable to destruction and loss. And since neonate animals are not slaughtered for food, and from mortality data all the cases of mortality were caused by either disease, predation/accidents or drought they were likely dragged out of homestead (as it is the usual practice) exposed and attractive to scavenging animals.

4.6. Summary

This chapter presents data that were collected among the Kuku Plain pastoral Maasai south of Kajiado District. These data include the structure of current herds, mortality rates, stock reduction profiles and faunal age structures. In terms of herd size and species composition, some differences were observed between herds in the Kuku Plain and those in the more arid regions to the north. These differences were explained by certain ecological and environmental differences between the two regions. Like most other pastoral groups, the number of female animals in the herd was noted to be higher than the number of male animals, The number of juvenile and adult animals was also higher than the neonate and age classes. This distribution was noted to be reflective of the relative importance of these animals to a pastoral subsistence and economy. The number of animals that are slaughtered or socially economically transacted (within different age/sex categories) was seen as almost proportionate to those in the current herd. It was noted that transacting more animals in those categories is done to fetch more profitable returns. And why animals in the juvenile and adult classes have a higher mortality rate is because there are more animals in these age classes in the herd. Faunal age proportions showed a similar distribution to the mortality and live population structures. Few aged animals are zooethnoarchaeologically represented because very few animals are kept to this age. Taphonomic factors were seen as not significantly affecting the faunal age distribution. In the next chapter, information and inferences made from Kuku Plain will be compared with that of the Pastoral Neolithic in Kenya.

CHAPTER FIVE

THE PASTORAL NEOLITHIC IN KENYA: ASPECTS OF HERD MANAGEMENT

5.1. Introduction

This chapter is exclusively concerned with the Pastoral Neolithic in Kenya. Specific reference is made to selected sites in the central Rift Valley and south-western Kenya. To begin with, some general remarks on the Pastoral Neolithic in Kenya are made. A brief survey of the sites that this study deals with is then given. Presented also in this chapter is information from the sites that concerns the age composition of domestic faunal remains and possible inferences on kill-off patterns.

5.2. The Pastoral Neolithic in Kenya: Some General Remarks

The term `Pastoral Neolithic' first came into Kenya's archaeological literature in the 1970's and has since been widely used to specify and describe a cultural and economic phase in the prehistory of East Africa falling between the Later Stone Age and the Iron Age. Bower and Nelson first used the term `Pastoral Neolithic' to describe

> cultures of Eastern Africa which 1. relied on domestic stock for livelihood. 2. Used pottery, and 3. employed typical Later Stone Age technology in the manufacture of edged tools (Bower and Nelson 1978:562).

Regardless of the limitations that this definition poses (e.g., `reliance on domestic stock for livelihood' may not be easy to infer from an archaeological faunal sample) it has gained acceptance. Most researchers have taken the occurrence of domestic stock regardless of proportion, in association with pottery, and a Later Stone Age tool kit to define and describe Pastoral Neolithic settlements (e.g. Onyango-Abuje 1978, 1980; Wandibba 1977: 1980).

Regarding the beginnings of the food production, and pastoralism in East Africa, at least four hypotheses have been put forward. 1) Bower and Nelson (1978) and Onyango-Abuje (1978, 1980) based their interpretations upon finds of potsherds from early and mid-Holocene occurrences and equated this to the use of domestic stock accruing from the domestication of local wild species. 2) J.D. Clark (1972) has hypothesised the diffusion of the materials and techniques associated with pastoralism to the indigenous hunter-gatherer populations. 3) D. Phillipson (1976) has suggested small-scale movement of populations with food producing economies merging with the local hunter-gatherer groups who gradually abandoned their old lifestyle. 4) Large scale movements of food producing peoples into East Africa which absorbed the hunter-gatherer groups has been suggested by Sutton (1966).

Chronologically, ceramic traditions in Kenya dating back to 9,000 B.P. in the Lake Turkana region could imply a very early potential date for the advent of animal domestication, at least in that region (Bower *et al.* 1977; Robbins 1984). At about 4,800 B.P. Lacustrine adaptations of fishing, keeping domestic stock, and hunting are documented in the Lake Turkana region (Robbins 1984). Ceramic occurrences of Nderit pottery (see Wandibba 1977, 1980) are reported in association with omestic stock north-east of Lake Turkana at about 4,800 B.P.- ,500 B.P. (Barthelme 1985). Pottery from the Pastoral eolithic sites in this region exhibit the Nderit pottery design ound on contemporaneous sites in central Kenya.

In northern Kenya, Phillipson (1984) documents the earliest ppearance of pottery to coincide with the advent of food roduction in this region in about the 3rd millennium BC. The eginnings of pastoralism as observed at North Horr and Elbor are contemporaneous with Pastoral Neolithic sites in the Lake Turkana region (Phillipson 1984; Bartheleme 1981).

In central Kenya, early pastoral adaptations are attested from Mt. Suswa and Lukenya Hill (Nelson and Kimengich 1984). Pastoral beginnings here are placed between 7,000 B.P. and 3,500 B.P. when domestic stock were kept as a supplement to hunting and gathering. Domestic stock at these sites, however, become a significant economic resource around and after 3,500 B.P.

On the basis of distinct cultural traditions, late Pastoral Neolithic adaptations become complex with regard to geographic location, elevation, and ecological association. Basing on these, Ambrose (1984b) has identified the Eburran, Elmenteitan, and Highland Pastoral Neolithic variants.

The Eburran Phase 5A began before 2,900 B.P. and ended after 2,000 B.P. when pottery and domestic animals are reported from the Naivasha Railway site. Phase 5B of the Eburran is known from Hyrax Hill (M.D. Leakey 1945) and the Causeway Site

(Bower *et al*. 1977). The industry is distinctive in that it has significant proportions of outils ecailles (M.D. Leakey 1945:37) and stone bowls, with several pottery wares also occurring (Ambrose 1984b:223).

The Elmenteitan is restricted to the western side of the Kenya Rift Valley and the higher reaches of the Mau Escarpment (Ambrose 1984b:223), to the higher reaches of Kisii District and South Nyanza as well as some sites in the Lemek-Mara region (Bower 1973b; Marshall and Robertshaw 1982). The industry is characterised by the production of long, broad, punch-struck blades and flakes, many of which were systematically broken down into small rectangular segments on an anvil by direct percussion on the dorsal face (Nelson 1980). The Elmenteitan flourishes between 3,000 B.P. and 1,300 B.P. (Ambrose 1984a).

No acceptable name is readily available to describe the highland Savanna Pastoral Neolithic industries. The industries in these regions exhibit variability in lithic and ceramic types. The geographic distribution of this tradition is more extensive than other industries. Sites are found in open and lightly wooded savanna grasslands throughout Kenya and Tanzania. Most of the sites date between 3,300 B.P. to 1,300 B.P. (Ambrose 1984b).

Considerable vigour has characterised studies of the Pastoral Neolithic in Kenya since Louis Leakey's pioneering work in the 1920's and 1930's. The archaeological research done and the amount of data collected has been primarily from the Rift alley and adjacent areas. The Lake Nakuru and Naivasha basins ave the longest history of research (e.g., Brown 1966; Bower *et l.* 1977; Bower and Nelson 1978, Leakey L.S.B. 1931, 1935; eakey M.D. 1945; Onyango-Abuje 1977 a,b). Other fairly well tudied regions include the Lake Turkana basin (e.g. Barthelme 981; Robbins 1984), Western Kenya (Chapman 1967; Marshall and obertshaw 1982), Central Kenya (Ambrose 1984a; Odner 1972; iiriainen 1977), and Southern regions (Gramly 1975; Marshall 986; Wandibba 1977).

Issues that have attracted researchers' interests have ranged from the inception of food production to the geographical and ecological distribution of multiple cultural adaptations and now these have evolved and developed. This has been accompanied by the excavation of new sites and re-interpretation of the cultural sequences with a view towards understanding regional and local adaptations. This trend has been supported by interests in the application of specialised studies such as obsidian sourcing (e.g., Merrick and Brown 1984), and faunal analysis (e.g., Gifford *et al.* 1980; Marshall 1986). Much of the 1990's studies on Kenya's Pastoral Neolithic are likely to concentrate on the more vigorous use of specialised disciplines with the objective of understanding the intricate subsistence and herd-management practices.

5.3. **Background to the sites**

In this section, background information on the Pastoral Neolithic sites that this study will refer to is provided. The sites are Ngamuriak (GuJf1), Lemek North-East (GuJf13), Gogo alls (GtJbi), Prolonged Drift (GrJiI), and Maasai Gorge ockshelter (GsJi25) (see Figure 5.1 and 5.2).

The choice of these sites was based on three factors. irstly they are seen as culturally contemporaneous and rchaeologically in agreement with Bower and Nelson's (1978) efinition of Pastoral Neolithic. Pottery, a Later Stone Age ool-kit, and domestic animals are represented at the sites. econdly, the sites are among the most well described Pastoral eolithic sites in Kenya. Thirdly, analysis of the faunal emains was done largely by the same researchers, using similar nalytical methods. Hence, discrepancies that may have arisen rom varying analytical methods have been minimised.

a) Ngamuriak (GuJf6)

Igamuriak is located at an elevation of 1,900 metres above sea-level on a gently sloping hillside in the Lemek River Valley, Narok District (see Figure 5.2). The site was found by Robertshaw during an archaeological survey of the Lemek area. Excavation was done by Marshall and Robertshaw (1982). The faunal remains were analysed by Marshall (1986). The site yielded a Later Stone Age tool assemblage, pottery, as well as one of the largest faunal assemblages (62,508 specimens) studied from this time period in East Africa.

The Loita-Mara area in which the site is located is drained by the Lemek and Mara Rivers. The area supports abundant flora and fauna due to favourable climatic conditions. A large part of the area is now Maasai Mara Game Reserve and is also

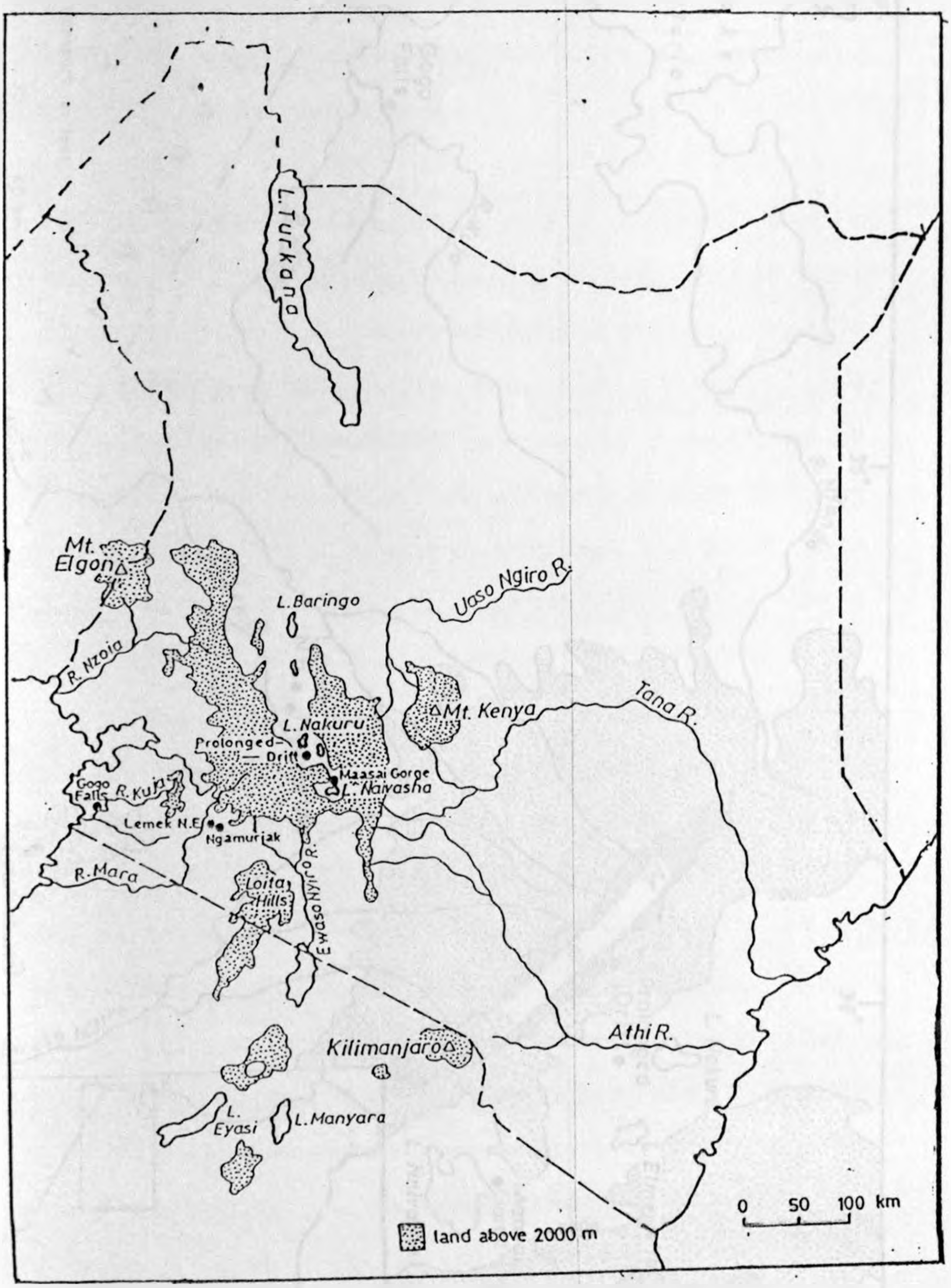


Figure 5.1. Pastoral Neolithic Sites Studied.

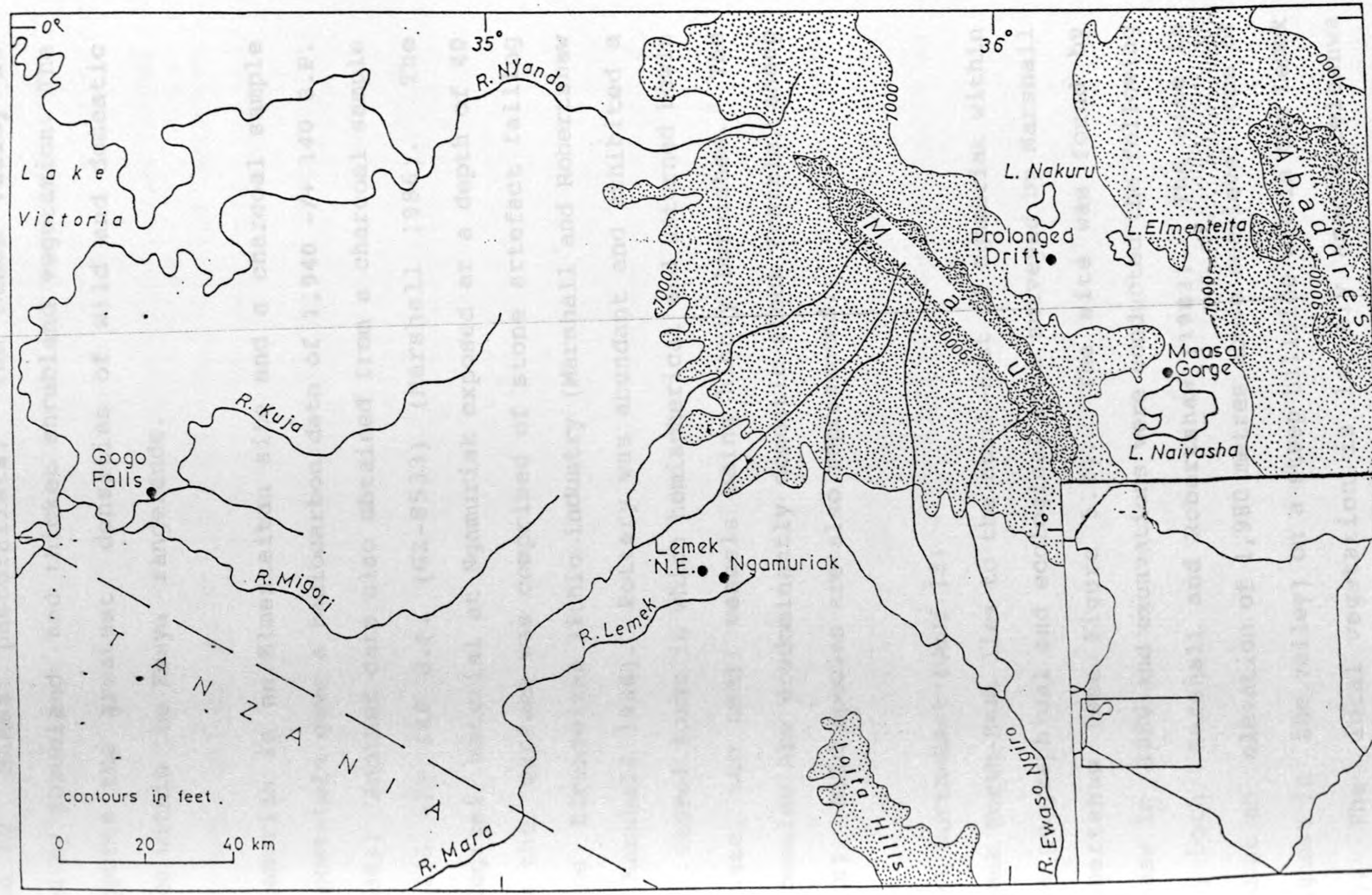


Figure 5.2. Locales of Pastoral Neolithic Sites Studied

nhabited by Maasai pastoralists. The Lemek valley is ominated by shrubland and thicket shrubland vegetation. The rea supports the greatest densities of wild and domestic erbivores within the Kenya rangelands.

Ngamuriak is an Elmenteitan site and a charcoal sample rom a post-hole gave a radiocarbon date of 1,940 -/+ 140 B.P. GX- 8534). Another date also obtained from a charcoal sample vas 2,135 -/+ 140 B.P. (GX-8533) (Marshall 1986). The archaeological material at Ngamuriak exposed at a depth of 40 cm below the surface was comprised of stone artefact falling within the Elmenteitan lithic industry (Marshall and Robertshaw 1982; Marshall 1986). Pottery was abundant and exhibited a range of vessel forms in which hemispherical and unturned bowls predominate, the small vessels being highly burnished. The faunal remains are predominantly domestic stock (cattle, sheep and goats). Wild species are also represented.

(b) Lemek North-East (GuJf 13)

Lemek North-East lies to the north-east of Ngamuriak within the same geographical and ecological zone surveyed by Marshall and Robertshaw (see Figure 5.2). The site was found by Robertshaw in 1980 and excavations were conducted the following year by both Marshall and Robertshaw (1982). The site is located at an elevation of 1,980 metres above sea-level (one of the highest in the valley) on a steep hillside within the Lemek Valley. The local vegetation is largely acacia/leleshwa woodland. Wild fauna is abundant and the area also supports Maasai pastoralists.

Lemek North-East has been culturally described as a Narosuran site (see Wandibba 1977, 1980) with a date of 2,225 -+ 140 B.P. (GX-8532). The site's archaeological record shows relatively small quantities of LSA lithic material and Narosuran ceramic ware. About 3,700 bone specimens per m^2 were recovered. The cultural sequence at the site is up to 20 cm deep and is largely made up of dark brown sand and clay silts (Marshall 1986).

(c) Gogo Falls (GtJb1)

The Gogo Falls archaeological site was discovered in 1967 and first studied by Collett and Robertshaw (1980). The site is located on the west bank of Kuja (Gucha) River in South Nyanza District, western Kenya (see Figure 5.2). The site lies at an altitude of about 1,220 metres and is situated west of Kanyamkago Hills, about 19kms from the eastern shore of Lake Victoria. Its geographical and ecological location is distinct from other contemporaneous Neolithic sites in the region as is subsistence at the site (Karega-Munene 1986, pers. comm.).

Gogo Falls site lies in a zone which can be described as scattered tree grassland consisting of high grass and thorn bush and trees, which are characteristic of the Lake shore environment. Such an environment would support a varied fauna in the absence of apparent human activities like cultivation and grazing of domestic stock.

Through surface collections and through excavations, Gogo lls has yielded associated pottery, a LSA lithic assemblage, d faunal remains representing domestic stock, wild species, d fish. The faunal sample referred to in this study (Karega-nene 1986; Marshall 1986) was derived from Elmenteitan vels. The site has yielded dates that agree with other menteitan sites such as Remnant, Ngamuriak, Maasai Gorge ckshelter, and Njoro River Cave (Bower *et al*. 1977; Marshall d Robertshaw 1982; Bower and Nelson 1978. At Gogo Falls, e Elmenteitan sequence in trench III has been radio-carbon ted from a charcoal sample to 1,770 +/- 80 B.P. (HAR-6252) d 1,990 +/- 80 B.P. (HAR-6254) (Karega-Munene 1986; Marshall 986). Trench III has been formally identified as Elmenteitan the basis of vessel shapes in pottery and lithic aracteristics, though the latter aspect shows, in comparison o other Elmenteitan sites, an under-representation of egmentary blades. A total of 612 dental specimens were ecovered and analysed by Marshall (1986). The post-cranial aterial (35,670 specimens) was analysed by Karega-Munene (1986).

(d) Prolonged Drift (FrJil)

Prolonged Drift is located on the flood plain of the Nderit River about 20 km south of Lake Nakuru (see Figure 5.2). The site was located in 1969 by the University of California Archaeological Group in Kenya during a search for the site of Long's Drift which was described by L.S.B. Leakey (1931) and Nelson (1973) and Wandibba (1977). On the basis of location, stratigraphy, and tool assemblage correlations, it is assumed that the two sites are one and the same. The site's archaeological wealth is attested by the recovery of over a half a million lithic specimens, pottery and stone bowl specimens (Nelson 1973; Wandibba 1977) as well as the largest faunal sample to be analysed from such a site in East Africa (Gifford *et al.* 1980).

The Nderit Valley flood plain where the site is located has vegetation which ranges from wide expanses of open grass to grasslands densely studded with bushy accacia and leleshwa trees. In this environment, wild fauna is supported but also cattle are kept in the open plains.

The age of Prolonged Drift was derived from a sample of elephant tusk which gave a date of 2530 $\pm$ 160 (GX-5735G) while an appetite fraction gave a date of 3,540 $\pm$ 120 which sets a maximum age for the occurrence.

The characteristics of the material have been interpreted as Pastoral Neolithic. Like other sites described as such, the Prolonged Drift cultural assemblage is characterised by a combination of pottery, stone bowls and other ground stone forms, microlithic flaked stone implements, and domestic faunal remains. A few pottery sherds resemble the decorative pattern of Narosura Ware (see Wandibba 1977, 1980). A considerable amount of faunal material (165, 426 specimens) was recovered, representing both wild and domestic species. However, the vast majority of the material (152, 229) was unidentifiable and only

,705 pieces were sufficiently preserved to permit some level of taxonomic identification (Gifford *et al.* 1980).

e) Maasai Gorge Rockshelter (GsJj25)

Maasai Gorge Rockshelter was located in December 1975 during a site survey programme by the University of Massachussettes/Boston Group under Bower and Nelson (Bower et al. 1977). The site is located at the eastern flank of Mt. Eburru, overlooking the western side of modern Lake Naivasha at an elevation of 2,010 metres above sea level (see Figure 5.2). The site is important for dating of the Elmenteitan sequence in the region. The site also provides a long sequence where its utilization patterns can be discerned through time. The site was excavated by Ambrose (1985) and the faunal material analysed by Gifford-Gonzalez (1985).

The site is composed of numerous small linked shelters separated by massive rock falls from the roof of what once must have been a very massive shelter (Bower and Nelson 1978). At the time of occupation, it would have been near the margin of the montane forest, with a forest-savanna ecotone and lacustrine biomass available for exploitation. The location of the site is ideal for access to a wide variety of resources. These resources shifted in elevation and composition with changes in climate. The local vegetation is made up of bush, forest and open grassland with trees. The vegetation supports a wide range of wild species and cattle, sheep and goats.

There are at least four major cultural horizons at Maasai orge Rockshelter (Ambrose 1984a; Bower and Nelson 1978). The arliest occupation is attributed to the Eburran and by omparative correlation dates to between 9,000 B.P. and 11,000 .P. The Eburran levels end with the collapse of the shelter. nother shelter gradually developed over 1,000 (6,000 to 7,000 .P.) year period. Occupation resumed during the Pastoral eolithic approximately 3,300 B.P. A stable lithic industry and eramic ware are represented at the shelter until about 2,050 .P. An increase in cultural activities is observed at 2,050 .P while the lithic and ceramic assemblages change to those haracteristic of an Elmenteitan occupation. Continued ccupation is recorded until 1,650 B.P. when the shelter ollapsed again. From 1,400 B.P. to the present day only the ost ephermal utilization of the shelter occurred, probably by kiek hunters or others having similar adaptations.

.4. Domestic Stock Age Spectra

This study restricts itself to the faunal remains of omestic animals from the sites described above. Date on other spects of the sites faunal assemblages are summarised in atundu (1988). In this section, relevant data on age profiles nd possible kill-off patterns during the Pastoral Neolithic in enya are provided. These data will then, in the succeeding chapter, be compared with data from the Kuku Plain Pastoral Maasai settlements.

(a) Ngamuriak

Of the 62,508 mammalian specimens recovered at Ngamuriak (Marshall 1986), 48,206 (77.1%) were non-identifiable fragments. Maximally identifiable elements to levels of both body part and taxon formed 7.5% of the assemblage. The rest of the assemblage is comprised of minimally identifiable fragments (identifiable to general element class). Most bovid taxa were readily identifiable by teeth, carpals and tarsals. Minimum number of individuals (MNI) and number of identified specimens (NISP) were used in the estimation of taxonomic abundance. In determining age estimates, stages of tooth wear, eruption, and epiphysial union were used. Age data was grouped into 7 classes (neonate, juvenile, young adult, adult, and very old) by Marshall (1986).

In terms of NISP, sheep/goats were slightly more prevalent (51.6%) than cattle. On the basis of MNI calculations, sheep/goats made up 69.38% of the assemblage whilst cattle accounted for 26.53%). Wild taxa were represented by a NISP calculation of 29 (0.59 %) (see Figure 5.3).

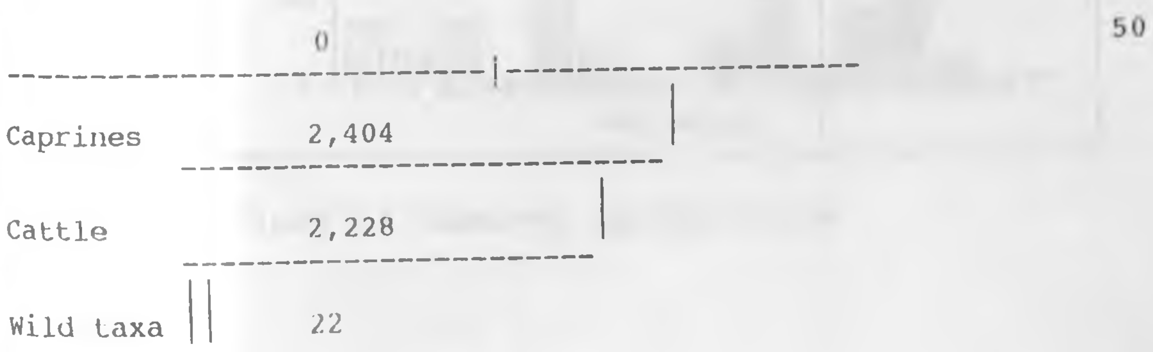


Figure 5.3 Ngamuriak: Taxonomic abundance

Table 5.1. Ngamuriak: Age Distributuion

	Tot. MNI	N	J	OJ	YA	AD	AG	VO
Cattle	26	4	2	4	-	14	2	-
Sheep/goats	69	8	16	2	12	27	4	-

N=Neonate; J=Juvenile; OJ=Old Juvenile; YA=Young Adult

AD=Adult; AG=Aged; VO=Very Old

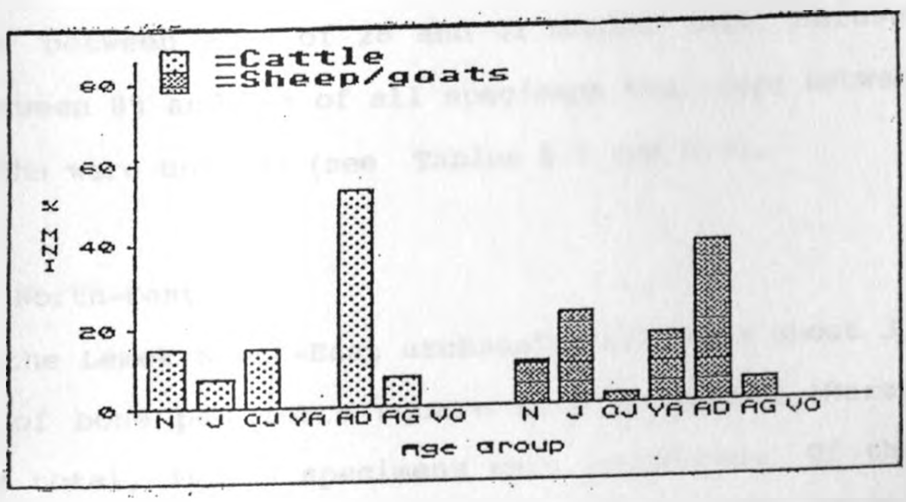


Figure 5.4. Ngamuriak: Age Distribution

Table 5.1 and Figure 5.4 show the distribution of age of cattle and caprines (sheep/goats). The cattle sample was dominated by the adult age class. Sheep/goats are more widely spread in the age spectra but like cattle, neonate and old classes are scarcely represented.

Epiphysial fusion sequences were observed and provided further insights into the age structure of the assemblages (see Tables 5.2 and 5.3). This also showed an under-representation of young animals where few animals younger than 36 months were identified. About a half of the animals represented were between the ages of 36 and 48 months and the remaining animals older than 48 months. In the cattle sample, of all the specimens that fuse between the age of 7 and 38 months, only 5.65% were unfused. In sheep/goats 58.87% of all the specimens 'that fuse' between ages of 28 and 42 months were 'unfused', whereas between 8% and 24% of all specimens that fuse between 0 and 28 months were unfused (see Tables 5.2 and 5.3).

(b) Lemek North-East

From the Lemek North-East archaeological site about 3,700 specimens of bone per metre square were recovered (Marshall 1986). In total, 16,733 specimens were recovered. Of these, 12,499 (74.7%) specimens were un-identifiable. The minimally identifiable specimens to the level of general element accounted for 21.1% (2,955). Only 4.2% (703) specimens were maximally identifiable to the tribal or generic level.

The assemblage was dominated by caprines which were dominated by caprines which were represented by a MNI of 21 and a NISP of 515. Cattle accounted for a MNI of 4 (NISP - 71).

Table 5.2. Ngamuriak: Cattle mortality data from long bone fusion.

TIME SCALE OF ELEMENT FUSION	NF	F	N	%NF
7 - 18 months				
humerus DF	00	38	38	00.0
radius PF	00	23	23	00.0
1st phalange PF	05	57	62	08.0
2nd phalange PF	03	65	68	64.41
24 - 35 months				
metacarpal DF	00	01	01	00.0
tibia DF	08	79	84	09.5
metatarcal DF	00	07	07	00.0
36 - 42 months				
calcaneum F	16	12	28	57.1
42 - 48 months				
humerus PF	04	09	13	30.7
radius DF	06	11	17	35.3
ulna F	02	02	04	50.0
femur PF	11	02	13	84.6
femur DF	03	07	10	30.0
tibia PF	09	15	24	37.5

NF = NOT FUSED, F = FUSED, PF = PROXIMAL EPIPHYSES FUSED, DF = DIST EPIPHYSIS FUSED.
(source: Marshall 1986:109)

Table 5.4 and Figure 5.6 show the age distribution of cattle and sheep/goats. As was the case at Ngamuriak age estimates were based on stages of tooth wear, eruption, and epiphysial union (Marshall 1986). In the cattle sample, except for the young adult adult classes which were represented by 1 and 3 individuals respectively, the rest of the age classes were not represented. In the sheep/goats sample, out of 21 individuals represented, 14 of them fall into the adult age category. Four neonates, two juveniles, one old juvenile, and no aged nor very old animals were represented. In both the Ngamuriak and Lemek North-East samples, it is shown that adult individuals are relatively more represented than other age classes.

Table 5.3. Ngamuriak: Sheep/goats mortality data from long bone fusion. (For abreviations see Table 5.2)

TIME SCALE OF ELEMENT FUSION	NF	F	N	%NF
6 - 10 months				
humerous DF	16	52	68	30.8
radius PF	08	60	68	13.3
13 - 24 months				
1st phalange PF	15	19	34	55.8
2nd phalange PF	07	13	20	53.8
metacarpal DF	00	02	02	00.0
18 - 24 months tibia	09	22	31	40.9
20 - 28 months				
metatarsal DF	00	00	00	00.0
metapodial DF	33	09	42	78.5
30 - 36 months				
ulna F	14	09	19	73.6
femur PF	24	27	51	88.8
calcaneum F	07	07	14	50.0
36 - 42 months				
radius DF	25	11	36	69.4
humerus PF	18	68	26	69.2
femur DF	20	10	30	66.6
tibia PF	13	03	16	81

(source: Marshall 1986:110)

Table 5.4. Lemek North-East: Age Distributuion

	Tot. MNI	N	J	OJ	YA	AD	AG	VO
Cattle	21	4	2	1	–	14	–	–
Sheep/goats	4	–	–	–	1	3	–	–

N=Neonate: J=Juvenile: OJ=Old Juvenile: YA=Young Adult

AD=Adult; AG=Aged: VO=Very Old

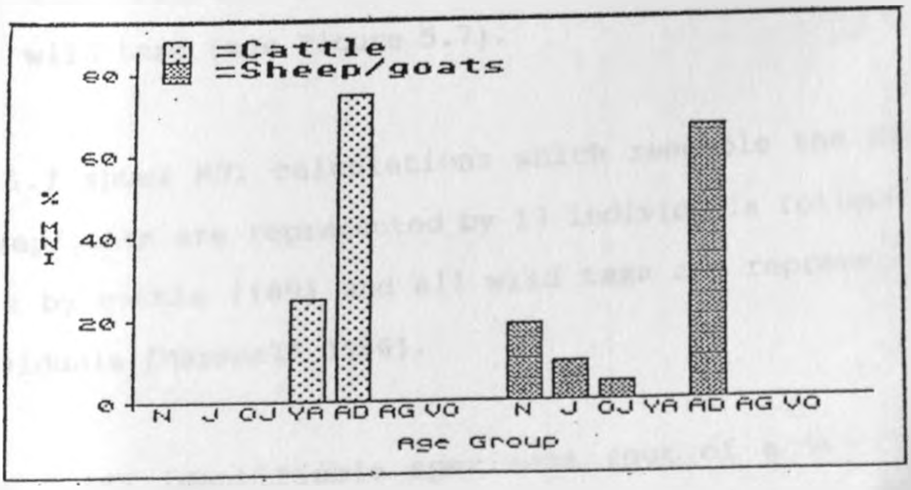


Figure 5.6.
Lemek North-East: age distribution

igure 5.5: Lemek North East: Taxonomic abundance (source Marshall 1986)

	0 ... 5 ... 10
aprines	515
attle	71
ild axa	117

Gogo Falls

At Gogo Falls archaeological site, the analysed faunal m erial was recovered from an Elmenteitan horizon in Trench 1 . The post cranial material was analysed by Karega-Munene (19 6), and the dental sample by Marshall (1986). Age estimations from teeth were categorised into seven age classes. The post-cranial age estimates were categorised into 3 classes (neonate, juvenile, and adult).

In total, 612 teeth were analysed. A NISP value of 223 (36.47%) represented sheep/goats. Cattle were represented by an NISP of 105 (17.1%), and the remainder, 284 (46.43%) represented wild taxa (see Figure 5.7).

Table 5.7 shows MNI calculations which resemble the NISP values. Sheep/goats are represented by 17 individuals followed in abundance by cattle (109) and all wild taxa are represented by 37 individuals (Marshall 1986).

Of the 2,885 identifiable specimens (out of a total of 36,282), 2,223 of these were post-cranial. Table 5.6 shows the total number of identifiable elements (E) in each age class

Figure 5.7. Gogo Falls: taxonomic abundance from dental sample (source Marshall 1986:160)

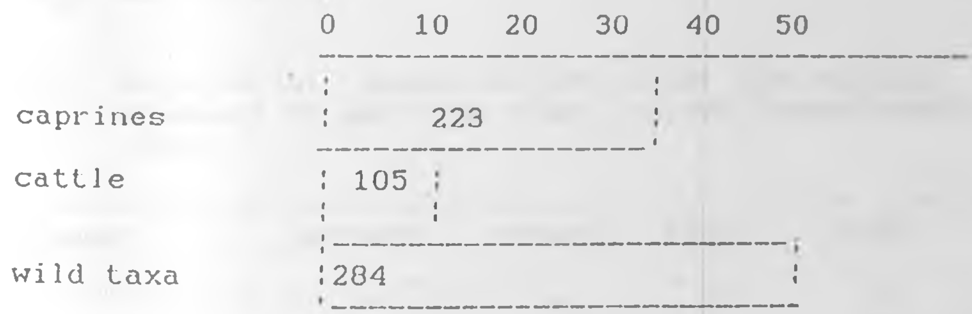


Table 5.5. Gogo Falls. Taxonomic abundance with MNI, NISP, and age estimates of the dental sample (source Marshal 1986:161). For abbreviations, see Figure 5.6.

TAXON	MNI	NISP	N	J	OJ	YA	AD	AG	VO
caprines	17	223	–	7	2	4	4	–	–
cattle	10	105	1	1	1	3	2	1	1
wild taxa	37	284	3	8	3	1	17	3	1

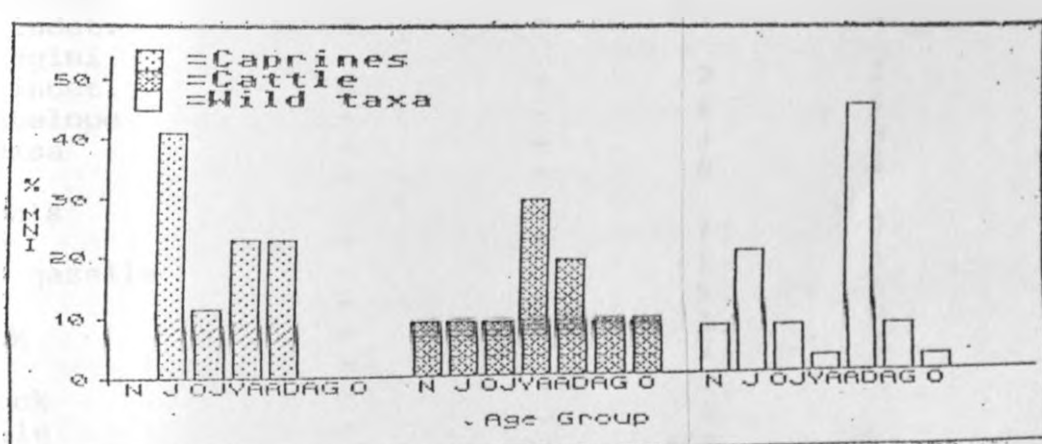


Figure 5.8
Gogo Falls; Age Distribution

Taxonomic abundance was culculated using MNI and E (Total Number of Identifiable pieces NISP). The age structure was estimated on the basis of tooth wear and eruption stages. Four categories of age were used (neonate, juvenile, adult, and aged) (Gifford et al 1980:67).

Table 5.6. Gogo Falls: number of identified post-cranial elements in each age class (source Karega-Munene 1986)

TAXON	NEONATE	JUVENILE	ADULT	TOTAL
Cattle	-	-	70	70
Caprini indet.	1	4	84	89
Goat	-	-	2	2
Alcelaphini indet.	-	-	22	22
Hartebeest	1	-	5	5
Wildbeest	-	-	30	30
Topi	-	-	23	23
Common zebra			89	95
Fish indet.	-	-	159	159
Cat fish	-	-	1	1
Bovini indet.	-	1	1	2
Buffalo	-	-	7	7
Suid indet.	-	-	4	4
Warthog	-	-	4	4
Rhino indet.	-	-	5	5
White Rhino	-	-	1	1
Rodent indet.	-	-	2	3
Hippo	-	-	6	6
Cephalophini indet.	-	-	1	1
Hippotragini indet.	-	-	2	2
Roan antelope	-	-	6	6
Oryx beisa	-	-	3	3
Impala	-	-	6	6
Thompson's gazelle	-	-	7	7
Grant's gazelle	-	-	1	1
Oribi	-	-	5	5
Reedbuck	-	-	2	2
Eland	-	-	2	2
Waterbuck	-	-	1	1
Crocodile	-	-	1	1
Bovid(S)	6	127	658	791
Bovid(M)	2	19	292	313
Bovid(L)	1	63	541	605

(Karega-Munene 1986). A different analytical approach was used by Karega-Munene. Instead of NISP, MNI, and seven age classes used by Marshall, Karega-Munene used `E' (number of identifiable specimens) and three age classes. Because of these differences, Karega-Munene's data (Table 5.6) will be used for reference and not for comparison with data from other sites.

Information on age spectra is provided in Table 5.5 and Figure 5.8 as they were estimated from the dental sample. In the cattle sample, the highest represented age class is young adult (MNI=3), followed by the adult class (MNI=2). All other classes are represented by one individual. In sheep/goats, the sample fairly represented the juvenile class (MNI=7) followed by both adult classes, each representing 4 individuals (Marshall 1986). The rest of the classes were unrepresented. The postcranial sample likewise showed a dominance of the adult class in both caprines and cattle (see Table 5.8).

(d) Prolonged Drift

The faunal material from Prolonged Drift (165, 426 specimens) could represent 75% of the original midden from the site (Gifford *et al.* 1980). Such a large percentage of recovery should be a fair representation of the overall faunal composition of the site. Nonetheless, only 3,705 specimens were sufficiently identifiable to permissible anatomical and taxonomical levels. The majority of specimens (152,229) were unidentifiable.

Table 5.7 shows taxanomic representation at Prolonged Drift. Ungulate species (cattle, wildebeest, kongoni and Burchell's zebra) comprise 63% of the faunal assemblage. Thomson's gazelle and sheep/goats represent 16% of the collection. Ungulates the size of Grant's gazelle form a

Table 5.7 Prolonged Drift: Taxanomic representation expressed as MNI and E (Gifford *et al.* 1980:69)

TAXON	MNI	E	MNI/E
Cattle	22	250	.088
Caprines	5	50	.100
Kongoni	18	232	.077
Wildebeeste	17	241	.070
Zebra	16	340	.047
Thomson's gazelle	15	165	.090
Grant's gazelle	11	106	.103
Impala	7	35	.200
Eland	4	37	.108
Buffalo	2	11	.181
Warthog	1	14	.071
White Rhino	1	4	.250
Giraffe	1	6	.166

Table 5.8. Prolonged Drift: Age Distribution (Gifford *et al.* 1980:72)

	TOTAL MNI	NEONATE	JUVENILE	ADULT	AGED
Cattle	22	I	5	10	6
Sheep/Goats	5	-	2	3	-

considerably smaller proportion of the assemblage.

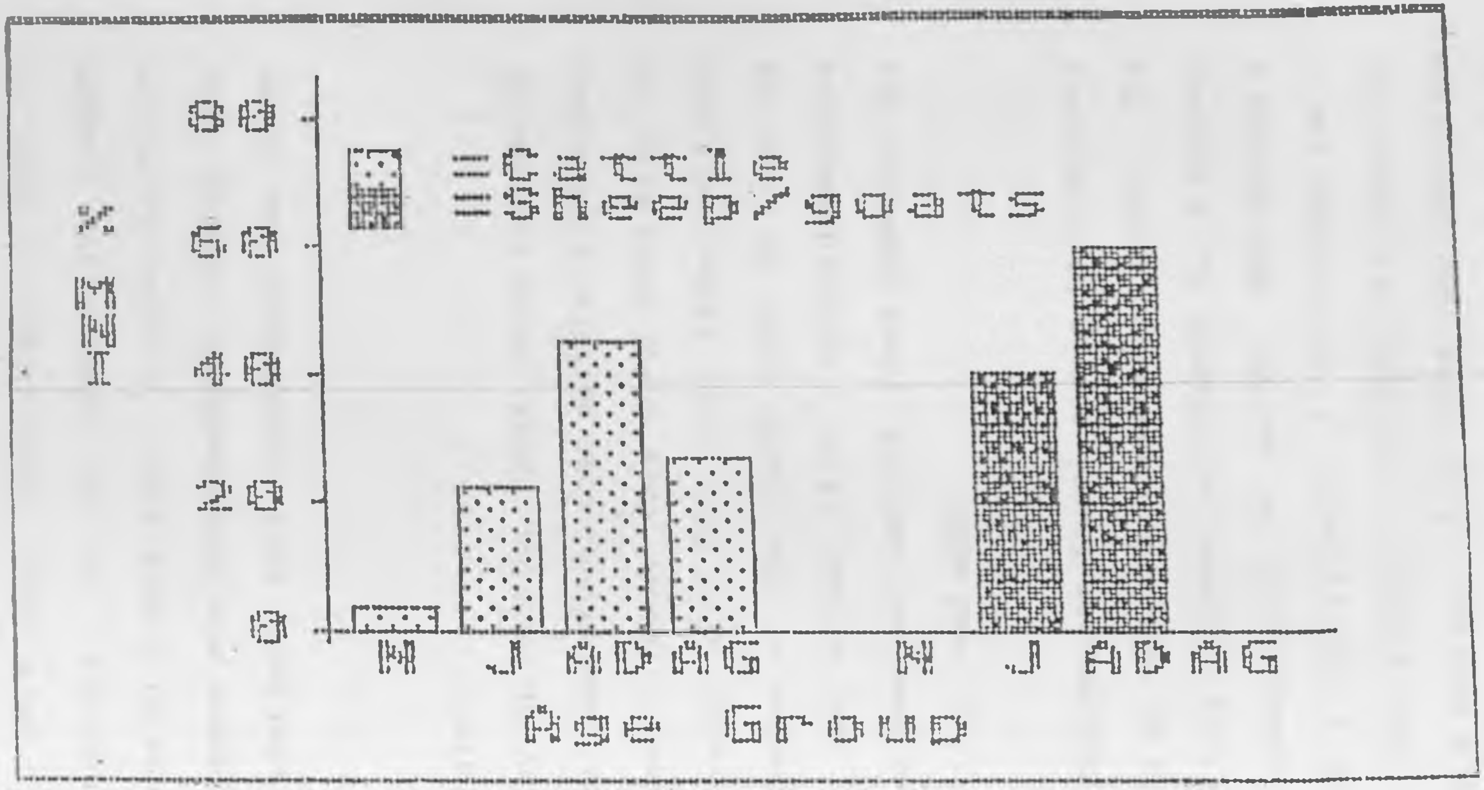


Figure 5.9.
Prolonged Drift: Age Distribution

Table 5.8 and Figure 5.9 show the age structure from the Prolonged Drift faunal assemblage. Of the 111 identifiable MNI, 63 were adults, 24 juveniles, 13 aged, and 11 were neonates. In the cattle (NMI=22) 10 were adult individuals, 6 aged, 5 juvenile, and 1 was neonate. In the sheep/goats sample (representing 5 individuals) 3 were adult, 2, juvenile whilst the neonate and aged classes were unrepresented. In both cases the adult class is relatively more represented than other classes.

(e) Maasai Gorge Rockshelter

As noted in the previous section, Maasai Gorge Rockshelter provides a long sequence comprised of four cultural traditions, all associated with domestic fauna. This study deals with the faunal material associated with the first three cultural traditions to the exclusion of the fourth which is Iron Age (Ambrose 1984a; Bower and Nelson 1978; Gifford-Gonzalez 1985a). The age classes used were neonate, young juvenile, old juvenile, young adult, adult, and aged.

The Maasai Gorge Rockshelter faunal sample is relatively small with the exception of that from Elmenteitan levels. The Eburran 2 level yielded only 7 pieces and Eburran 5, 14 pieces. The Elmenteitan sample consisted of 342 pieces. The Eburran 2 sample is comprised of 2 individuals, 1 sheep/goat and 2 Arvicantis niloticus individuals. Of the 14 identified specimens from Eburran 5 horizon, 11 of these were identified to species level. Domestic cattle were represented by a MNI of 3 and sheep/goats were represented by 3 individuals. The

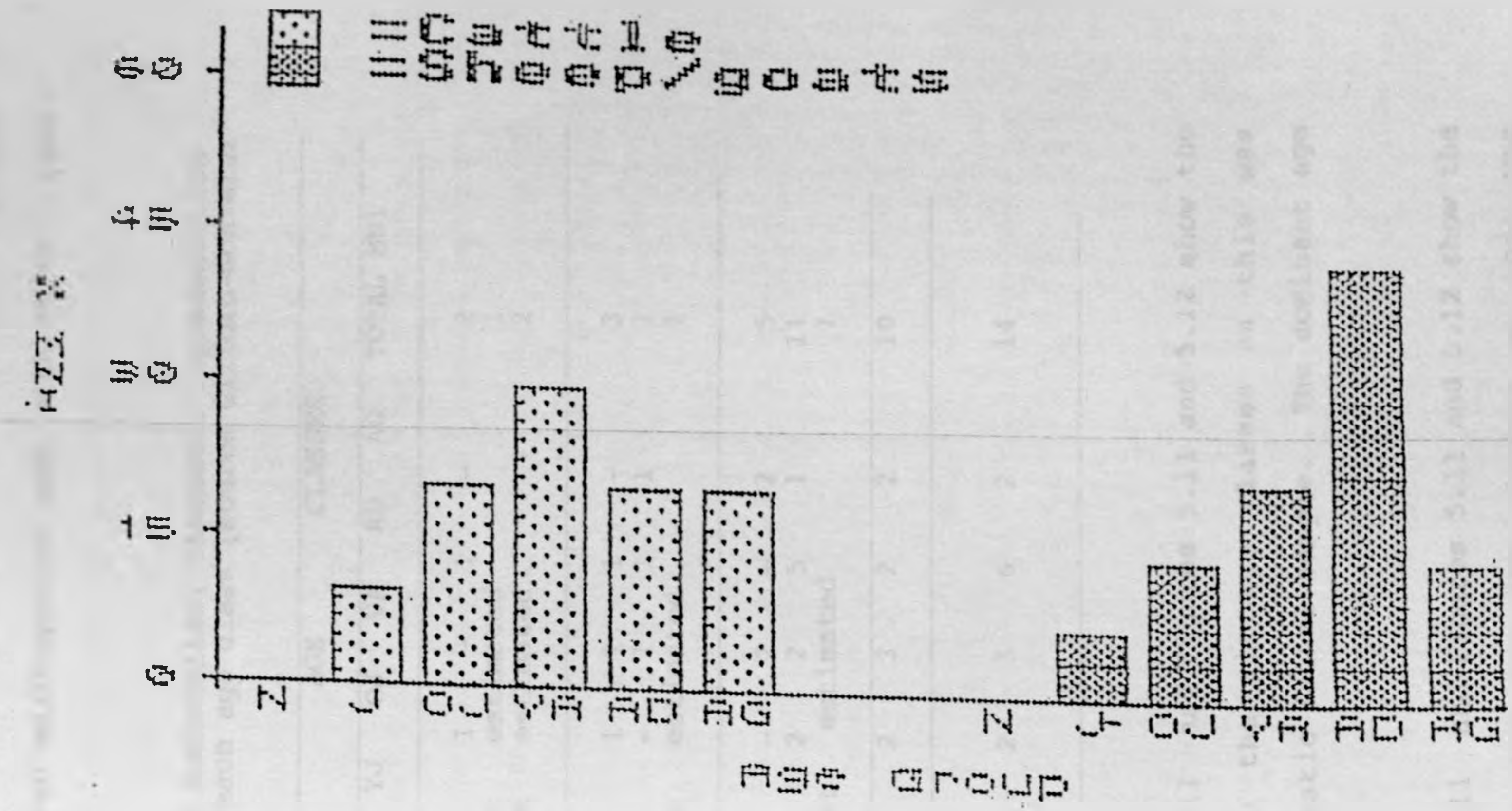


Figure 5.10.
Maasai Gorge Rockshelter: age distribution

Elmenteitan sample from Maasai Gorge Rockshelter was dominated by domestic stock. Cattle was represented by an MNI of 5 whereas sheep/goats were represented by an MNI of 11. The rest of the fauna represented wild species each with MNI=1 (see Table 5.9)

Table 5.9. Maasai Gorge Rockshelter: Taxonomic representation with MNI in each age class (source Gifford-Gonzalez 1985a:71).

TAXON	AGE			CLASSES			
	N	YJ	OJ	VA	AD	AG	TOTAL MNI
Eburran 2							
cattle	–	–	1	–	1	–	2
aprine		not	estimated				1
wild taxa		not	estimated				2
Eburran 5							
cattle			1	1	1	–	3
caprine		–	–	1	1	1	3
wild taxa		not	estimated				1
Elmenteitan							
cattle	–	1	–	2	–	2	5
caprine	–	1	2	2	5	1	11
wild taxa		not	estimated				7
TOTAL-cattle	0	1	2	3	2	2	10
caprine excluding 1 individual Age not timated	0	1	2	3	6	2	14

Tables 5.10 and 5.11 and Figures 5.11 and 5.12 show the distribution of age in the six age classes as this was represented in the domestic faunal sample. The dominant age class in cattle

Tables 5.10 and 5.11 and Figures 5.11 and 5.12 show the distribution of age in the six age classes as this was

represented in the domestic faunal sample. The dominant age class in cattle is the young adult class (MNI=3) followed by the aged, old juvenile (MNI=1), and MNI=2 each) young juvenile (MNI=1), and MNI=0) for the neonate class. In the sheep/goats sample an almost similar pattern emerges. The adult class is the dominant age class (MNI=6), young adult (MNI=3), aged and old juvenile (MNI=2 each), young juvenile (MNI=1), whilst the neonate class is not represented.

In Tables 5.10 and 5.11 an attempt has been made to compress and regroup the original classes into four classes: (i) neonate, (ii) juvenile; (young juvenile, juvenile, and old juvenile), (iii) adult; (young adult and adult), and (iv) aged (aged and very old).

Table 5.10. Cattle (PN) Age distribution with MNI estimates at all the sites.

		Neonate		Juvenile		Adult		Aged	
	Total MNI	MNI	%	MNI	%	MNI	%	MNI	%
Ngamuriak	26	4	15.38	6	23.07	14	53.38	2	7.69
Lemek North-East	21	4	19.04	3	14.28	14	66.66	-	-
Gogo Falls	10	1	10	2	20	5	50	2	20
Prolonged Drift	22	1	4.54	5	22.72	10	45.45	6	27.27
Maasai Gorge R.	10	-	-	3	30	5	50	2	20
Total	89	10	11.23	19	21.34	48	53.93	12	13.48

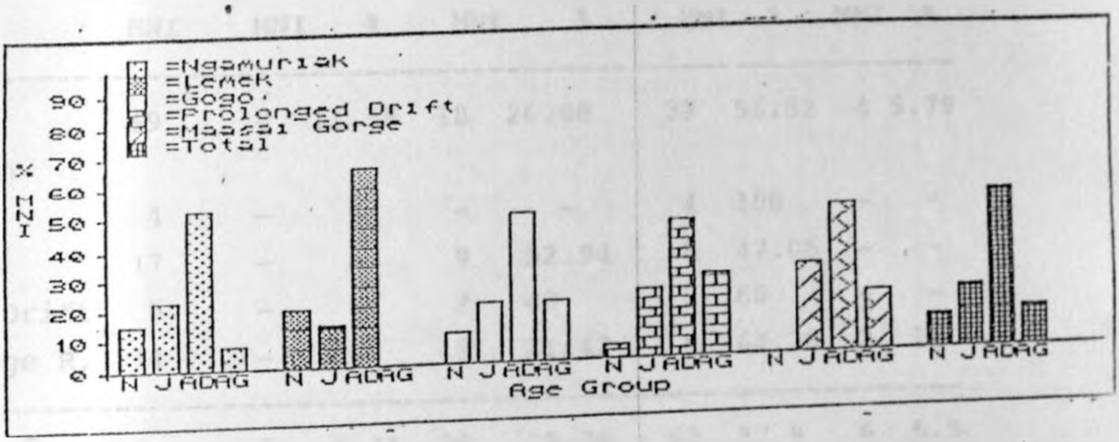


Figure 5.11.
Pastoral Neolithic: Cattle Age Distribution at all the Sites

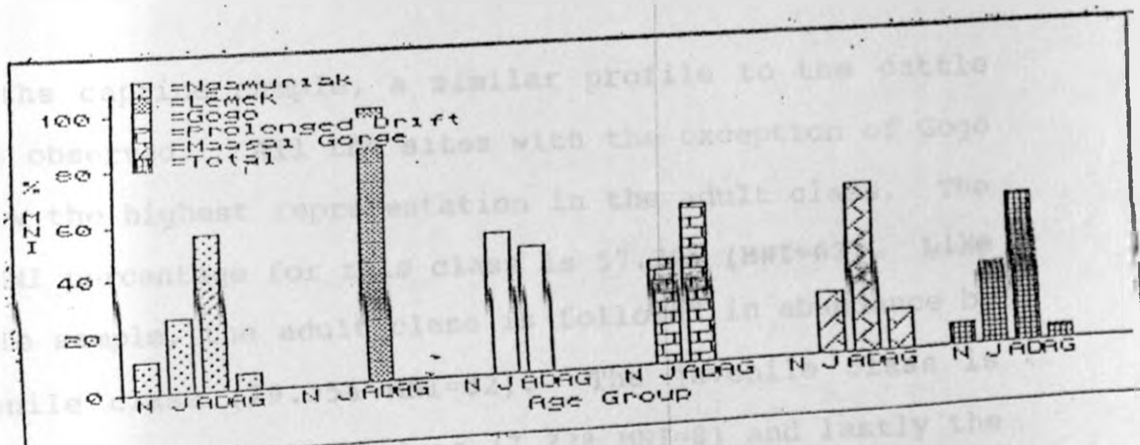


Figure 5.12.
Pastoral Neolithic: Sheep/goats Age Distribution at all the Sites

Table 5.11. Sheep/Goats (PN) Age distribution with MNI estimates at all the sites.

	Total	Neonate		Juvenile		Adult		Aged	
	MNI	MNI	%	MNI	%	MNI	%	MNI	%
Ngamuriak	69	8	11.59	18	26.08	39	56.52	4	5.79
Lemek North-East	4	-	-	-	-	4	100	-	-
Gogo Falls	17	-	-	9	52.94	8	47.06	-	-
Prolonged Drift	5	-	-	2	40	3	60	-	-
Maasai Gorge R.	14	-	-	3	21.42	9	64.28	2	14
Total	109	8	7.34	32	29.36	63	57.8	6	5.5

Table 5.10 shows the age spectra within the cattle sample at all the sites under study. It is clearly observable that at all the sites, the adult age class represents the highest MNI percentage (53.93%, MNI= 48). When all sites are considered in one single sample. The adult class is followed in abundance by the juvenile class (21.34%, MNI=19), aged class (13.43%, MNI=12), and then neonate (11.23%, MNI=10).

In the caprine sample, a similar profile to the cattle sample is observed. All the sites with the exception of Gogo Falls show the highest representation in the adult class. The average MNI percentage for this class is 57.79% (MNI=63). Like the cattle sample, the adult class is followed in abundance by the juvenile class (29.35% MNI=32). The juvenile class is followed by the neonate age class (7.33% MNI=8) and lastly the aged class (5.50% MNI=6).

5.5. **Summary**

This chapter presented the age spectra of domestic animals' faunal samples from five Pastoral Neolithic sites. It was observed that relatively few old individuals are represented whereas adult individuals are numerous. This pattern is true for all the sites. This seems to suggest certain regular mortality patterns in the systemic context. Data reviewed in this chapter will be compared with that obtained from Kuku Plain.

CHAPTER SIX

CONTEMPORARY PASTORALISM AND THE PASTORAL NEOLITHIC IN KENYA: AN ETHNOARCHAEOLOGICAL SYNTHESIS

6.1 Introduction

In this chapter, a comparison of ethnoarchaeological data obtained from Kuku Plain, discussed in Chapter Four, is compared with data from five Pastoral Neolithic sites in Kenya discussed in Chapter Five. This is done with an aim of addressing questions raised in Chapter One on the objectives and hypotheses of this study.

6.2 A Comparison of Kuku Plain and Pastoral Neolithic Age Distributions

The comparison that is intended in this section will focus on the faunal data obtained from Kuku Plain and that documented on the Pastoral Neolithic sites in Kenya. Wherever necessary reference will be made to the data on mortality and current stocks from Kuku Plain. Since inter-site differences in both the Kuku Plain and Pastoral Neolithic data are minor, data from each of these cases will be summed and discussed as one sample. Discussion will be done at the level of the 4 age categories and the three broad reproductive phases.

6.2.1. General Comparison

Table 6.1 and Figure 6.1 show and illustrate cattle age distribution in the Kuku Plain and Pastoral Neolithic data. In a cattle sample of 110 individuals (NISP=157) from 9 Kuku Plain Pastoral Maasai sites, a total of 49 (44.6%) juvenile animals are represented, the highest representation. In decreasing order, the adult age class is represented by 48(43.6%) individuals, aged class by 12(10.9%), and one (0.9%) neonate individual is represented.

Table 6.1. Comparison of Kuku Plain and Pastoral Neolithic Cattle Age Distribution.

	TOTAL	NEONATE		JUVENILE		ADULT		AGED	
	MNI	MNI	%	MNI	%	MNI	%	MNI	%
Kuku Plain	110	1	0.9	49	44.6	48	43.6	12	10.9
Pastoral Neolithic	89	10	11.2	19	21.3	48	54.0	12	13.5
% DIFFERENCE	+10.00%	-10.3%		+23.3%		-10.4%		-2.6%	

Order: highest to lowest: Kuku Plain: Juvenile, Adult, Aged, Neonate.
Pastoral Neolithic: Adult, Juvenile, Aged, Neonate.

A total of 89 (MNI individuals were estimated from the Pastoral Neolithic sample of specimens. Of the 89 cattle individuals estimated, 48 (54%) were adult animals. There were 19 (21.3%) juvenile animals, while 12 (13.5%) were aged, and 10 (11.2%) were neonate.

Information on sheep/goats age distribution in the two samples is contained in Table 6.2 and 6.2. A total of 60 (MNI) individuals were estimated from 89 (NISP) specimens, representing nine Kuku Plain Pastoral Maasai sites. In descending order, 26 (43.3%) of these were adult, 25 (41.7%)

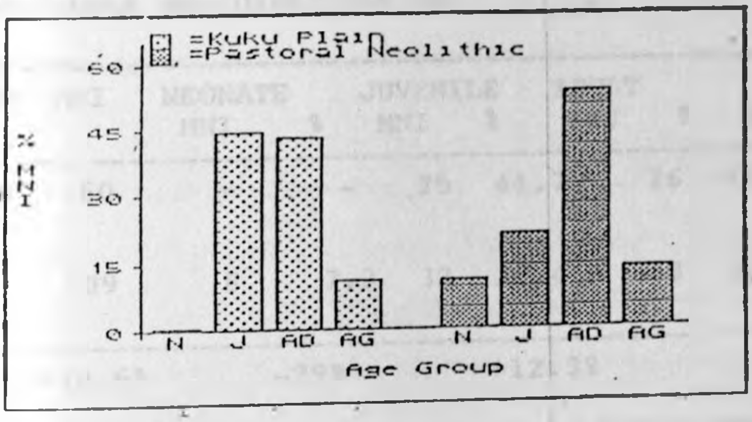


Figure 6.1.
Comparison of Kuku Plain and Pastoral Neolithic Cattle Age Distribution

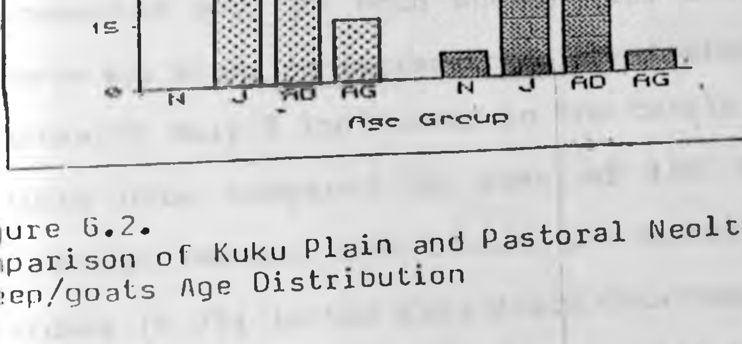


Figure 6.2.
Comparison of Kuku Plain and Pastoral Neolthic Sheep/goats Age Distribution

were juvenile, while 9 (15%) were aged. The neonate age class was not represented in the sample from Kuku Plain.

Table 6.2. Comparison of Kuku Plain and Pastoral neolithic sheep/goats age distribution.

	NISP	MNI	NEONATE MNI	%	JUVENILE MNI	%	ADULT MNI	%	AGED MNI	%
Kuku Plain	89	60	-	-	25	41.7	26	43.3	9	15.0
Pastoral Neolithic		109	8	7.3	32	29.4	63	57.8	6	5.6
% DIFFERENCE		+10.6%		-29%		+12.3%		-14.5%		+9.4%

Order: highest to lowest: Kuku Plain: Juvenile, Adult, Aged, Neonate.
Pastoral Noelithic: Adult, Juvenile, Aged, Neonate.

A total of 109 (MNI) individuals were estimated from a Pastoral Neolithic sheep/goats sample of (NISP) specimens. Adult animals were 63 (57.8%), juvenile were 32 (29.4%), while neonate age classes was represented by 8 (7.3%) individuals, and lastly aged with 6 (5.6%).

Before a discussion of the hypotheses set out in Chapter One are addressed, some features of the data in Tables 6.1 and 6.2 will be commented on. In both sheep/goats and cattle samples the neonate age class is represented in relatively very few numbers (actually only 1 individual in the cattle sample) in the Kuku Plain data compared to that of the Pastoral Neolithic. In cattle, neonate individuals are represented by only one individual (0.9%) in the Kuku Plain data compared to 10 individuals (11.2%) represented in the Pastoral Neolithic data. Similarly, in the sheep/goats sample no neonate individual was represented in the Kuku Plain sample where 8 (7.3%) neonate individuals were represented on the Pastoral Neolithic sample. A Chi-square test for the two samples showed that the differences are quite significant.

Whereas one may argue a case for the relatively few neonate individuals represented in both the Kuku Plain and the Pastoral Neolithic being due to taphonomic factors, it is most unlikely that these same taphonomic factors can be used to explain the differences between the Kuku Plain and Pastoral Neolithic faunal material. Statistically (in the cattle sample) a higher MNI total in the Kuku Plain data (110) than the Pastoral Neolithic (89) should give the neonate age class higher probabilities of being represented. Why this is the case is a matter of speculation. The following possibilities could be contributing factors:

(a) Lower rates of neonate bone destruction and loss occurred with the Pastoral Neolithic samples. For example, dead neonate animals were not dragged out of the household enclosure to be disposed of by scavenging animals.

(b) The inclusion of post-cranial specimens in the analysis of faunal material at some of the Pastoral Neolithic sites may have increased the chances of neonate individuals being represented. This possibility is contradicted by the fact that not all the Kuku Plain age classes are represented by fewer animals. For example, in the Kuku Plain cattle sample there are 23.3% more juvenile individuals than in the Pastoral Neolithic sample.

(c) The inclusion of excavated material in the Pastoral Neolithic samples may have increased the chances of neonate representation. This means that broader archaeological investigation of Pastoral Neolithic sites increased the chances that all (if not most) of the existing faunal individuals were recovered and analysed. And that reliance on surface collections (as is the case with the Kuku Plain data) biases the relative representation of the age classes.

(d) More neonate animals died at the Pastoral Neolithic sites compared to those recorded in the Kuku Plain. This means that Pastoral Neolithic peoples took less care of neonate animals (consciously or unconsciously) leading to increased mortality in this very age class. Consciously, this would mean that relatively higher culling rates were carried with animals in the neonate age class.

(e) It is possible that the differences reflect differences in analytical methods and definition of age classes. But this is unlikely because similar methods were used in the analysis of Kuku Plain and the Pastoral Neolithic samples.

Which of these possibilities is more likely is a question of further investigation and may be reference to more ethnographic and Pastoral Neolithic samples.

There is also a difference in the number of juvenile animals represented between the two samples. A relationship also seems to exist between the representation of juvenile animals with neonate in each of the samples. This is true of both cattle and sheep/goats. In the Kuku Plain samples where we have more juvenile animals, the number of neonate animals represented is significantly small. Whereas in the Pastoral Neolithic sample the number of neonate animals is higher than juvenile animals. It is most unlikely that differential taphonomic factors affecting the age class in the two samples explain this difference. Whether an element of subjectivity given that our analytical methods are not absolute or that higher rates of mortality in the juvenile class affect contemporary herds contra Pastoral Neolithic is still elusive to ascertain.

One other puzzling feature of the data is the relationship between mortality and faunal profiles in the Kuku Plain vis-a-vis our attempt to use this in explaining the Pastoral Neolithic data. Table 6.3 shows a comparison between Kuku Plain mortality and faunal age distribution where cattle and sheep/goats are considered as one sample. The results of this comparison are not so much different between cattle and sheep/goats.

In Table 6.2, the percentage ratio of juvenile animals in the faunal record (43.5%) is greater than that in the mortality record (23.6%). In the adult age class the reverse is the case;

Table 6.3. Kuku Plain: comparison of mortality and faunal age distribution.

	TOTAL	NEONATE N	%	JUVENILE N	%	ADULT N	%	AGED N	%
Mortality	195	57	29.2	46	23.6	74	37.9	18	9.2
Faunal	170	1	0.6	74	43.5	74	43.5	21	12.4

where the percentage ratio is lower in the mortality data (37.9%) than in the faunal data (43.5%). Disregarding any taphonomic differences between the adult and juvenile classes, we would expect that since a lower percentage proportion of juvenile animals die, a lower percentage ratio of this class should be represented in the faunal record. And since a relatively lower percentage ratio of mortality affects the adult age class, a lower percentage ratio of this class should be reflected in the faunal record. Only one neonate individual is represented in the faunal sample compared to the 57 in the Kuku Plain sample that die. Could we then say that this small ratio of faunal neonate representation mathematically affects the distribution in other age classes, where juvenile representation increases while the adult one decreases. We may not automatically infer that a faunal age distribution represents a mortality age distribution.

A look at the Pastoral Neolithic data shows that the adult age class dominates the sample. In cattle, the adult age class is represented by 54% whereas in sheep/goats the proportion is 57.8% (see Tables 6.1 and 6.2). The question arising is can we say that the adult age class is a class more affected by mortality given the discrepancies noted above in the Kuku Plain Data? In the Kuku Plain data we have noted that mortality patterns are not in all cases the patterns that the faunal record shows. This calls to question the ethnographic analogy that we use in estimating archaeological patterns. However as it has been argued all along, there is a definite relationship between mortality and faunal records particularly with regard to old animals which die in few numbers and are represented by few numbers in the faunal record. And when we disregard the differences between juvenile and adult age classes, the general pattern is that more animals in these age classes die and as expected more animals are represented in the faunal record.

A comparison between the Kuku Plain and Pastoral Neolithic faunal data could also be made on the basis of 3 broad categories of pre-reproductive, reproductive, and post-reproductive phases of the animals' life span. Since the distribution of these three phases is quite similar in cattle and sheep/goats, hence the two can be considered as one sample. This information is contained in Table 6.4 and Figures 6.3 and 6.4.

Table 6.4: Comparison of Kuku Plain and pastoral neolithic faunal age distribution coded in three 'reproductive' categories.

	TOTAL	PRE-REPRODUCTIVE		REPRODUCTIVE		POST PRODUCTIVE	
	MNI	MNI	%	MNI	%	MNI	%
Kuku Plain	170	88	51.8	61	35.9	21	12.3
Pastoral Neolithic	198	75	37.9	105	53.0	18	9.1

A difference exists between the Kuku Plain and Pastoral Neolithic data that is statistically significant (chi-square test). Major differences can be observed in the pre-reproductive and reproductive categories. The difference is 13.9% in the pre-reproductive class, 17.1% for reproductive, and 13.9% for the post-reproductive class. This difference presents for us the problem that has been persistent in previous discussions. Whether the differences can be explained in taphonomic or mortality terms is a question. It is analytically not quite permissible to recode the 4 age codes in the Kuku Plain cattle mortality data into 3 because a distinction was not made between young adult and adult age classes. However, if we may ignore this and combine neonate and juvenile mortality to correspond to the pre-reproductive phase, a total of 40 (59.6%) results. The adult mortality age class will be taken to correspond to the pre- reproductive where a 31.1% mortality (n=21) is recorded (note however, in the faunal sample, the reproductive phase corresponds to the adult age class only). Post-reproductive is 6 individuals (9.0%). In the sheep/goats sample, it is analytically permissible to recode the 4 mortality age classes into 3 categories. Where both neonate and juvenile age classes will make up 63 (49.2%), reproductive 53(41.4%), and post-reproductive 12(9.4%). The cattle and sheep/goats data give the distribution shown in Table 6.5 and Figures 6.3 and 6.4.

In Table 6.5 it becomes clear that the distribution in the mortality data is very closel to that of the faunal data. Here is a case where it is demonstrated that the ratios and patterns that are represented in the faunal samples reflect well those that are recorded in the mortality data. There is a definite difference between the Kuku Plain samples and the Pastoral Neolithic one (see Table 6.4). The difference is that: more animals in the pre-reproductive phase (now known from Kuku Plain) die compared to those that could have died during the Pastoral Neolithic. This means that relatively more pre-reproductive animals are represented in the Kuku Plain faunal sample compared to the relatively fewer animals in this category in the Pastoral Neolithic sample. A look at the data further shows that relatively fewer animals in the reproductive phase died in the Kuku Plain sample. This is supported by relatively fewer animals of this category in the faunal sample. To the contrary, in the Pastoral Neolithic sample, more animals are represented in the reproductive category.

Whereas we can explain these differences in general mortality patterns, it remains unanswered, particularly for the Pastoral Neolithic case whether a lower pre-reproductive and a higher reproductive mortality was man-intended or not. Some reference can be made to the Kuku Plain data. Of the 103 pre-reproductive cases recorded in both cattle and sheep/goats, only 16 (15.5%) cases were intended (juvenile animals that were slaughtered for food). Yet 24 (32.4%) reproductive cases were man-intended. Our inference here is that, to a greater extent the patterns observed in the mortality and faunal records are not intended or desired by man. And we should not infer that more animals of any age/reproductive category in the faunal record implies that more of these animals were slaughtered for

Table 6.5. Kuku Plain: Comparison of Mortality and faunal data coded in 3 'reproductive' phases.

	TOTAL	PRE-REPRODUCTIVE		REPRODUCTIVE		POST REPRODUCTIVE	
Name	MNI	MNI	%	MNI	%	MNI	%
Mortality	195	103	52.8	74	37.9	18	9.2
Faunal	170	88	51.8	61	35.9	21	12.3

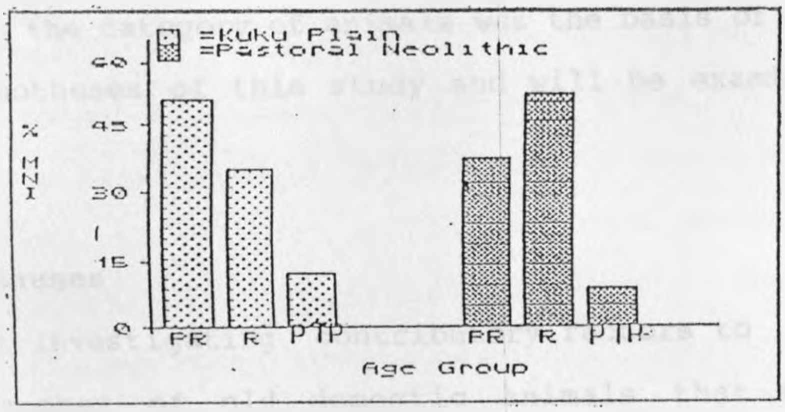


Figure 6.3.
Comparison of Kuku Plain and Pastoral Neolithic Age Distribution coded in three 'reproductive' phases

PR=PRE-REPRODUCTIVE

R=REPRODUCTIVE

PTP=POST-REPRODUCTIVE

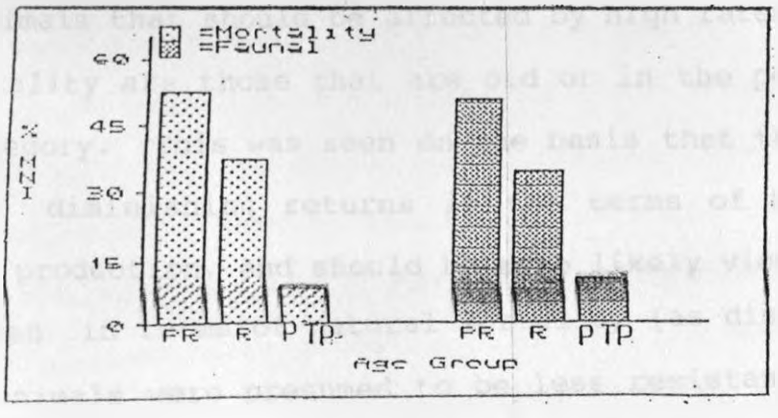


Figure 6.4.
Kuku Plain: Comparison of mortality and faunal Age Distribution coded in three 'reproductive' phases

food. Indeed a greater part of the patterns in the faunal record result from natural causes of mortality.

A discussion of the representation of old or post-reproductive animals has been sidelined. This is partly due to the fact that there is a strong element of consistency in this category in both the Kuku Plain and the Pastoral Neolithic data. For another reason, the category of animals was the basis of the objectives and hypotheses of this study and will be examined separately below.

6.2.2. The Hypotheses

This study aims at investigating contributory factors to the relatively few number of old domestic animals that are represented in faunal samples from Pastoral Neolithic sites in Kenya. A theoretical assumption was made in the first chapter that since adult reproductively active animals are the main economic resource of pastoral production, we should find these animals being slaughtered in fewer numbers. It was also presumed that animals that should be affected by high rates of man-induced mortality are those that are old or in the post-reproductive category. This was seen on the basis that these animals generate diminishing returns in the terms of herd growth, and milk production, and should be more likely victims of slaughter. Even in terms of natural mortality (as disease or drought) old animals were presumed to be less resistant to diseases, weaker and sometimes accorded little care compared to the more productive and more healthy juvenile or adult animals. These factors were hypothesised as contributory factors in the representation of fewer old animals in Pastoral Neolithic faunal assemblages. It is, however, also possible that taphonomic factors of bone discard and post-discard destruction and loss do play a role, in that bones of old animals are more affected by these factors than those of adult animals. In trying to explain this phenomenon, it was also the aim of this study to investigate why productive or potentially productive adult and juvenile animals are more represented in the faunal samples. Therefore two hypotheses were generated (a) that there are fewer old animals and more adult animals (a case that we do not expect but which seems true) in Pastoral Neolithic faunal samples is because Pastoral Neolithic subsistence and herd management practices are different from those known from contemporary pastoralists. (b) That taphonomic factors of bone-discard and post-discard destructions or loss could have worked differentially in the disfavour of the aged class.

It is quite clear that the difference between the two samples under comparison with regard to the representation of old animals is relatively small (see Tables 6.1 and 6.2). This is particularly so when the proportion of aged animals is compared to that of adult animals. In cattle, the difference in the Kuku Plain sample between the adult class and the aged is 32.7% in favour of the adult class. The difference in the Pastoral Neolithic sample is 40.5% in favour of the adult age class. In the sheep/goats the difference is 28.3% in the Kuku Plain sample whereas in the Pastoral Neolithic sample it is 52.2%. Except in cattle where the neonate age class is least represented, all other cases show at least representation in the aged class. This pattern is best demonstrated when the 4 age classes are compressed into 3. In this instance, the post-reproductive category (aged and very old classes in the 7 age codes) is least represented. In the Kuku Plain sample this category is represented by 12.3% whereas in the Pastoral Neolithic sample this category is represented by 9.1%.

In the comparison of mortality and faunal data from Kuku Plain (see Table 6.5) it is observed that only 9.2% of the sample is in the post-reproductive category (cf.,pre-repoductive 52.8%, reproductive 37.9%). In the faunal sample, the post reproductive category is represented by 12.3%. This could show that the proportions in the mortality record reflect well the proportions in the faunal record.

It is plausible therefore to infer that the reason why there are so few old animals in zooarchaeological samples is not due to high mortality rates affecting the aged class. Despite the fact the high mortality rates affect juvenile and adult age classes this does not seem to have a significant effect on the age distribution in the live population. Current herds are predominated by animals in the juvenile and adult classes, a structure that is maintained partly to safeguard against high relative mortality rates in these classes. Lower mortality rates affect the aged class because very few animals live up to this age. When an animal's production capacity starts to fall (which happens when an animal is at its terminal adult age), it is either slaughtered or sold. A factor that should not be overshadowed is that of mortality. Since most nimals are lost through natural mortality, it is most likely hat the ratio of animals lost in respective age classes will be roportional to the animals that exist in the live opulation.The faunal age distribution that results reflects the ge distribution in the mortality record, taphonomic factors laying an insignificant role.

It is therefore concluded that natural factors of mortality re primary in shaping the faunal age distribution. Even if elatively more old animals were present in the live population han those that the ethnographic data from Kuku Plain show, atural mortality would still affect the age classes that omprise the most animals (the juvenile and adult age classes). ven when it is the wish of a household not to slaughter adult nd reproductively active animals, chances are that natural ortality will still claim higher proportions of these because hey are simply abundant in the live population. Moreover, ince animals (especially cattle) are slaughtered on ceremonial ccasions, it is simply more socially rewarding and of higher esteem to slaughter a healthy and `meaty' adult animal, sometimes at the expense of herd growth and the stock's productive stability. Few old animals are zooarchaeologically represented because few of these animals die, and this is so because very few old animals exist in the live population.

6.3. **Summary**

This Chapter attempts to fulfill the objectives of this study by comparing the age distribution in domestic faunal remains from contemporary pastoral Maasai settlements with that of Pastoral Neolithic sites in Kenya. Using information and inferences from Kuku Plain on current herd structures and mortality patterns, it is possible to establish that differential taphonomic processes do not determine faunal age distribution. Instead, the mortality patterns that affect a herd are the similar patterns one would expect in a faunal and potential zooarchaeological sample. Higher rates of mortality affect the adult or reproductively active animals (rates which are mostly undesired) whilst lower rates of mortality affect old animals. The fewer or more the animals that die in a particular age category, the fewer or more they are represented in that given age category.

CHAPTER SEVEN

SUMMARY AND CONCLUSIONS

An interpretative problem in the study of faunal remains from Pastoral Neolithic (PN) sites in Kenya is addressed in this thesis. An attempt is made at answering why very few old domestic animals are represented in zooarchaeological remains at PN sites. Ethnographic literature on contemporary pastoral systems seem to imply that relatively more old animals are affected by high rates of both man-intended and natural mortality. Theoretically, it is expected that relatively more old animals should be represented in the resulting zooarchaeological record compared to those shown at Pastoral Neolithic sites in Kenya. Two working hypotheses were adopted: a) That PN herd management and subsistence patterns are essentially different from those known of contemporary pastoralists such as the Maasai of Kenya, b) that the patterns shown in PN faunal samples do not in essence represent different herd management nor subsistence patterns. Instead taphonomic processes of bone discard and post-discard destruction and loss affect and bias the zooarchaeological remains in the disfavour of old individuals.

In addressing these hypotheses, ethnoarchaeological data on the structure of pastoral herds in the Kuku Plain of Kajiado District was collected. These data comprised stock sizes, species composition, age and sex distribution, age/sex mortality profile and estimation of age in faunal remains from the pastoral settlements. A discussion of these data follows presentation of similar data on contemporary pastoralists in general and those of Kajiado District.

The following observations and inferences were made on the basis of data that was obtained.

a) Herd Structure:

From the enumeration conducted at three households, it was observed that pastoral herds in the Kuku Plain have a structure that is on the average similar to that documented among other pastoral herds in Kajiado District. However, a difference was observed on terms of livestock holdings per household. Kuku Plain pastoral Maasai keep and subsist on a relatively smaller number of animals compared to pastoralists inhabiting the more arid regions to the north and west of Kajiado District (Mbirikani and Magadi). This difference was explained by eco-climatic factors and the extent to which government intervention and development oriented projects have affected the areas. Kuku Plain pastoral Maasai inhabit areas which are less arid, they are in closer proximity to agricultural influences, they are less transhumant, and are more proximal to livestock development services. These factors in their combination enable them to subsist on relatively fewer animals hence development strategies of destocking affect them more than they affect other pastoral Maasai peoples in the region.

The age and sex composition of the herds was observed as not different from that recorded in other parts of Maasai habitation. Adult animals (the reproductively active) are more numerous as are females. Subsistence and herd growth dependence on adult and milch cows was seen as an overriding factor that determines the age and sex composition of the herd. It is unlikely that the structure is a response to long-term and variable age/sex mortality patterns of the herd.

b) Age Mortality Patterns

Ethnoarchaeological information was also collected on the age and sex of the animals that die from natural causes and those that are slaughtered for food. Other ways through which the size of the herd may reduce were also considered.

In terms of mortality, a considerable part of the herd is lost through natural causes. Very few animals are slaughtered. Small stock are, however, slaughtered in larger numbers than cattle, a case that agrees with data from other pastoral peoples of similar livestock husbandry systems where cattle are in most cases slaughtered on important ceremonies.

A difference was noted in the sex composition of animals that are slaughtered and those that die of natural causes. As documented in the literature, females are rarely slaughtered compared to the males. This is observed so as not to endanger subsistence and herd-growth bases. However, in cases of natural mortality the proportion of female animals that die is clearly higher than that of males. It was argued that since causes of natural mortality are not selective in terms of which sex of animal they affect. The fact that there are more female animals in the live population of the herd means that the rates of mortality in females are higher than that of males.

An age distribution of the animals, which seem contradictory to ethnographic data was observed. It was noted that in general mortality, the reproductively active animals are the ones affected most. Very few old animals are victims of either slaughter or natural mortality. It was presumed in the discussion of the problem that, theoretically, considering the importance and dependence of pastoral households on adult, reproductively and potentially reproductive animals, the rates of slaughter are expected to be lower in these animals. The most likely victims of the slaughter are the aged animals. A reverse of this was observed in the mortality data from Kuku Plain. This case of more productive and potentially productive animals being slaughtered, sold, paid for bridewealth and given out as gifts was explained by the fact that these animals are seen as more healthy, with more weight and it is more socially and economically rewarding to pick adult animals. But pastoralists do not simply do this without considering the productive stability of the herd. Attempting to fetch higher returns in socio-economic transactions and to keep a higher social status results in slaughtering more healthy adult animals. This is done in consideration of the fact that the subsistence and herd-growth remains unendangered. This is ensured by long-term and strategic consideration for future subsistence and socio-economic transactions.

In the case of very few old animals being slaughtered or being affected by natural mortality, it was noted that this is a consequence of very few animals being able to attain an old age. They are either slaughtered or sold. We would expect that the old animals in the herd are those at the terminal adult age when their returns start to diminish. Very few old animals are affected by mortality because there are simply very few of them in the live population. In the case of slaughter, preference is placed on animals in the juvenile or adult age classes. In cases of natural mortality, it is shown that the more of the animals of a particular age that exist in the live population, the higher the rates of mortality in that particular age category will be.

c) Faunal Age Distribution

Dental specimens from 9 contemporary Maasai sites were analysed and the age of the animals represented estimated. The age profiles were then compared with those in the mortality record and with those estimated from Pastoral Neolithic faunal samples.

It was observed that the age distribution in the faunal data was in most respects similar to that of the mortality data. Fewer old animals were represented in the adult and juvenile age classes. Neonate individuals were represented in relatively small numbers despite the high rates of mortality. The general age distribution, however, reflected that observed in the mortality record.

Comparison with Pastoral Neolithic data was done within 4 age classes and within 3 broad reproductive phases of the animals' lifespan, Differences and similarities were noticeable. In the Pastoral Neolithic data, the percentage ratio of adult individuals was greater than that recorded for Kuku Plain. Relatively more juvenile animals were recorded for Kuku Plain than for Pastoral Neolithic, while we had more neonate individuals in the latter than in the former. These differences were seen as reflecting possible differences in the live population and mortality patterns.

Very few old animals were represented in both the Kuku Plain and Pastoral Neolithic samples. With reference to the Kuku Plain mortality data, it was inferred that there were lower mortality rates affected old animals during the Pastoral Neolithic, hence their small proportion in the faunal record. The case of relatively few old animals being represented in the archaeological record is thus attributed to the structure of the herd where very few of these animals exist. This explains lower rates of mortality and consequently less representation in the archaeofaunal record. Taphonomic processes of bone destruction were concluded not to be a contributory factor for the representation of relatively few old animals. On the basis of the faunal information it is also unlikely that major differences in subsistence and herd management patterns exist between the Pastoral Neolithic and the contemporary pastoral Maasai production systems.

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