ACTIVITY AREAS AT GvJm 47, LUKENYA HILL
AN ASSEMBLAGE COMPOSITION AND SITE STRUCTURE ANALYSIS

BY

VERONICA NJOKI WAWERU

A Thesis submitted in partial fulfillment for the requirement of a degree of Master of Arts in Archaeology

University of Nairobi

August, 2001

DECLARATION

This thesis is my original work and has not been presented for any other degree at another University.

Veronica Waweru ____________________

Signature

This thesis has been submitted for examination with our approval as University Supervisors.

Dr. Ephraim Wahome ____________________ 17-8-2001

Signature

Mr. Mwanzia Kyule ____________________ 20/8/01

Signature

TABLE OF CONTENTS

DEDICATION

To Naomi,

mother, friend and kindred free spirit.

CHAPTERS

APPENDICES

ABSTRACT

Pastoral Neolithic (PN) sites in Eastern Africa represent the earliest settlements. Middens at such sites attest to prolonged occupation by social groups with a predominately lithic technology.

In the absence of architectural remains at such sites, little is known about the organisation of activities across PN sites. Researchers have been unable to ascribe tool kits to specific activities. This has largely been attributed to the fact that intensely used areas are cleaned and cultural material, including tool sets, have been removed and discarded in secondary refuse middens. Such material is thus found in secondary context.

This study, using micro-debitage and other utility debris left behind after cleaning, has been able to trace the larger artefact classes associated with the micro-debitage and utility debris left at the primary contexts after cleaning. The utility of reduction analysis as a typological tool has been demonstrated. Curation, use and modification of tools generate unique waste products. The location on the site and density of such products has also been used as an indicator of different activities.

This study is a departure from the traditional activity model and opens a new pathway for the identification of activity areas at PN sites.

ACKNOWLEDGEMENTS

I would like to thank the following people without whose help, this work would not have been realised: Mr. Josiah Wambua, Prof. Charles Nelson, Dr. David Sperling, Dr. Ephraim Wahome, Prof. Henry Mutoro, Dr. Karega-Munene, Mwanzia Kyule, Marrietta Ndunge, John Ochieng, Isaac Waweru, Vuruku Mandu,Eric Ondiege and Eusabius Makunda.

The National Museums and the University of Nairobi also kindly provided laboratory space and funding.

CHAPTER 1

1.0 INTRODUCTION

Human behaviour is patterned and the utilization of space for day to day activities is thus a result of this patterned behaviour. Spaces intensely and repetitively used for specific activities, are known as activity areas or activity area locations. An activity area is also called an activity set and comprises of all activities repetitively performed in a special unit of space. Locus refers to the location of an activity area (Schiffer, 1976).

In East Africa, this trend can be traced to the Pastoral Neolithic (PN) period. Among the most important characteristics of the PN was the beginning of semi-sedentary and permanent settlements when social groups stayed in one site for long periods. Prolonged use of settlements would be expected to yield cultural debris exhibiting patterned behaviour, thus activity areas.

Today as a result of more complex social organisation and highly specialized use of space, we have living, working and public utility areas. Even within these categories of modern activity areas, there is still a myriad of subdivisions such as living, kitchen, and bathrooms and in the wider context, parking lots, footpaths, roads, market places and hospitals.

However, in prehistory, there is not always structural evidence of space definition such as the one provided by modern and historical architecture (Nelson, n.d). This does not however mean that prehistoric societies did not have defined spaces for specific activities. This thesis, using cultural material remains, will attempt to find activity area locations at a prehistoric site where no architectural remains are found.

1.1 OBJECTIVES

The main objective of this study is to identify activity areas at a PN site and to determine to what extent the composition of stone tool assemblages reflect the different activities conducted in the site's spaces. This study attempts to find activity areas at settlements of prehistoric societies. An assemblage composition and site structure analysis based on obsidian tools will be used to demonstrate this. Tool assemblages from both cleaned spaced and secondary refuse dumps will be used. Also, the type, size or artefacts a well as food remains will be used to define different activity areas at site GvJm 47.

This thesis will also discuss, in the form of a literature review, the implications of taphonomy and cultural site modification processes on activity area research.

Activity area research reconstructs the processes that created the archaeological record as well as the interpretations of the resultant patterns found at sites. Kent (1987), argues that humans are creatures of pattern. She further contends that the interrelationship between culture, cultural material, and behaviour is also be patterned. Cultural material at sites should thus provide us with a glimpse of the culture and behaviour of the social groups that occupied the sites.

By comparing such patterned behaviour of different social groups, inferences can be made about the causes that produced the differences or similarities between them. Also, apart from providing the use of space by past social groups, activity area research may also be to show the size of a social group or length of occupation by looking at the volume of material remains at a site. The kind of material remains at a site also provide information on the subsistence patterns of the sites' occupants.

1.2 The traditional activity model

Pioneer activity area studies utilised a method today known as the Traditional Activity Area Model (after Schiffer, 1976). This model assumes that 'activity sets comprise of a few artefact classes that are spatially associated within a limited number of discrete material accumulations corresponding to their use location' (Schiffer, 1976). The basic premise in the identification of activity areas is that there is a correspondence between material items entering the archaeological record and the activities and tasks carried out in the spaces where artefacts and refuse were deposited (Binford, 1983). This model is also christened the "Pompeii premise (Binford, 1981), in which patterning of archaeological remains, like Pompeii, are treated as a mirror image of past activities.

The traditional activity model has come under criticism due to its failure to take into consideration the myriad of interacting factors that may combine to influence the character and location of assemblages. Schiffer, argues that the flaw in this model is that it assumes that activities are discrete local events within rigidly defined spaces (Schiffer, 1976).

The employment of this method, together with typology that does not focus on utility debris or use reduction analysis, has largely resulted either in the failure to locate activity areas or finding them using methods that cannot withstand scientific scrutiny.

1.3 Activity areas: a discussion

The context in which activity areas can be identified is a complex socio-economic organisation, which is associated with specific use of space for different activities. The Pastoral Neolithic period provides such a context. This is an important phase in human adaptation in East Africa as it marks the beginning of food production. Its hallmark is domestication of animals although wild game still accounted for a significant portion of the diet of pastoralists (Gifford *et al.* 1977:57-100). Attendant to domestication is the beginning of permanent and seasonal settlements hence the accumulation of cultural remains at the settlements of early pastoralists. Activity areas can be traced to this time period as their discernment depends to a greater degree on the settlement of social units for periods long enough to accumulate cultural debris adequate for analysis. It is expected that such settlements provide ideal conditions for the discriminate use of space for activities such as cooking and stock enclosures (*kraals*).

In East Africa, pastoral sites are well suited for the identification of activity areas. Gramly (1975), has contended that middens, a major focus in the study of activity areas, accumulate more rapidly at pastoral sites than at the sites of cultivators, which is one reason why a pastoral site was selected for this study.

From the 1970's the traditional activity model has increasingly come under criticism. The new studies, which also include ethnographic analogy, have pointed out that many other factors independent of use and disposal come into play in determining artefact configurations or assemblage heterogeneity. Such factors include taphonomic processes, sample sizes and ideological influences hence making inference of activity areas from heterogeneous assemblages difficult if not unrealistic (Binford 1981, Dunnell 1992, Mbae 1990, Schiffer 1976, Hietala 1984, Simek 1989).

The concept underlying activity areas is that tool kits used in performing specific tasks are unique or comprise a unique set and will be found in the location where the activity was performed. The range of assemblages on a site is expected to reflect the sum of activities performed there.

The problem of identifying activity areas has confounded many archaeologists (Nelson, Pers. Comm.). The problem of explaining assemblage variability is evident even from Palaeolithic

Studies. An example is that of the variation in Middle Palaeolithic Mousterian assemblages in France where archaeologists, Bordes & Bordes (1970) and Binford & Binford (1966) both encounter as well as differ in their explanation of assemblage variation. However, variation due to different activities has been put forth as one of the plausible causes (Binford & Binford, 1966).

Even within the PN context, it has been difficult to identify activity areas using assemblage variation. An example is Robertshaw's extensive study of the Loita region in Southwestern Kenya. Although principally not based upon the study of activity areas, Robertshaw's (1990) study fails to positively identify activity areas associated with the early pastoralists of this region. He cites the cause as the use of secondary refuse middens which results in distortion of primary context of artefacts (Robertshaw, 1990). Distortion is an inevitable consequence in intensely utilised spaces due to their regular cleaning. This is especially evident even today in work and living areas.

The presence of middens at PN sites is an indicator that certain spaces on a site are intensively used for activities hence necessitating cleaning. Cleaning whether done by sweeping or hand- picking mostly removes larger artefacts. In the case of stone artefacts, cleaning leaves behind small-sized waste by products. These categories of waste resulting from manufacture and use can to a greater degree be ascribed to specific tools since specific tools generate unique waste. Examples of such waste categories include scalene flakes and burin plan spalls. These can only result from *Outils ecailles* and burin manufacture respectively (Appendix 1). It can be reasonably argued that certain tools were made, used and (or) modified and discarded at the loci where these waste categories are found during excavation given that horizontal displacement has not been extensive.

Apart from living (use) and work (manufacture) areas, activity areas can be inferred from middens. At PN sites, these normally manifest themselves on the landscape as differentially sized mounds containing an assortment, in varying densities, of ash, bone, ceramics and stone tools. There are various types of refuse areas and these include;

Single primary or secondary refuse areas

Multiple secondary refuse areas.

Multiple primary refuse areas.

Single secondary refuse areas.

Multiple secondary refuse areas (Schiffer 1976:67-69).

While material in middens is in secondary context, Schiffer (1976) infers that its spatial transformation does not render it useless in the identification of activity areas. He further states that 'it should be possible for factor analysis to identify the elements of discrete activity sets on the basis of their constant proportionality among the secondary refuse locations (Schiffer 1976:68). Binford and Binford have also contended that in the case of multiple refuse areas, ' element sharing should be detectable because such elements will load equally on the factors (activity sets) that produced them' (Binford & Binford 1966:245-246).

Although rare in occurrence, multiple primary refuse areas would provide direct information about elements used there in the past. Single primary and single secondary refuse areas are simple cases of refuse manifestations in archaeological sites. Such refuse areas, are expected to show the inventory of preserved elements found within the activity area (Schiffer 1976:67-69).

1.4 Methodology

Ideally, across a PN site which was occupied for a sufficient length of time, when using the above discussed indicators, one should expect to find three general categories of structural spaces which can further be segregated into identifiable sub-paces that constitute activity areas. I have come up with the following general categories;

(i) Cleaned spaces

Cleaned spaces characterised by low density of coarse fraction, and small sized artefacts often in poor condition due to intensive use of areas.

(ii) Primary spaces

Primary spaces characterised by moderate to high densities, assorted size lithics and poor condition of artefacts.

(iii) Secondary spaces

Secondary spaces are those that form middens or refuse areas. These contain assorted and high densities of cultural remains often in good condition. They may contain cultural material from one or several activity loci.

This study, while using assemblage composition and site structure analysis is a departure from research influenced by the traditional activity model. It hopes to identify activity areas using utility debris and at the same time fill the gap left by the traditional activity model. The study wills also intensively employ reduction analysis in order to trace the processes that produced the obsidian artefacts and related utility debris found in all structural spaces.

While the method to be used in this study is not fool proof, it hopes to first eradicate the problem of 'tool kits' that may be the result of cultural material from different activity loci, lumped together after cleaning. Secondly, I expect that activity areas can still be discerned even after the process of cleaning of such areas has taken place.

The site under study has not been disturbed by farming activities and erosion has not been extensive since the site's gradient is very low and the rainfall marginal. Raindrop erosion and soil creep are expected to be the main agents that may affect spatial context at this particular site. An evaluation of these variables has been done using data from previous excavations. After careful study of the micro-topography of the site and the contiguous landscape, the conclusion has been that erosion has not significantly affected spatial context on this particular site, although gully erosion was extensive on several other Lukenya sites. An example is GvJm 44. GvJm 47 is however relatively intact. An example of the site's fairly undisturbed condition is a complete ovicaprid skeleton found *in situ* but exposed due to a road cutting in 1994. I came to the conclusion that although some amount of displacement has inevitably taken place, it would not make impossible the discernment of activity-related assemblages to an objectively credible degree.

However, post-depositional distortion of primary context at GvJm 47 and other PN sites at Lukenya Hill is evident in middens containing ash. This localised distortion, limited to specific structures (ash-heaps), has resulted in significant displacement of the matrices of cultural remains.

Midden areas with animal burrows have hence been avoided during sampling and excavation.

Analysis of previously excavated data shows that some areas of GvJm 47 were intensely used (Muia, 1998). This is evidenced by extensive scratching of obsidian artefacts found in one of the seven trenches sunk by University of Nairobi graduate students in 1994 (pers. observation). These multi-directional scratches are most likely caused by attrition of obsidian by sand particles in an area of constant stock movement. Such movement not only results in scratching but in small scale horizontal and vertical displacement as well as fragmentation of small sized artefacts. The latter consequence may artificially increase sample sizes of some artefact categories.

Having taken the above-discussed problems into consideration before excavation and during analysis. I hope to demonstrate the utility of the framework discussed in detail in the next chapter.

1.5 BACKGROUND TO LUKENYA HILL

Lukenya hill is an inselberg, 40 square kilometres in area, found within the Athi-Kapiti plains 40 km south east of Nairobi (Fig 3.1). The earliest excavation was carried out by M.D and L.S.B Leakey in the 1940s at GvJm 2 and was primarily for teaching amateur archaeologists (Gramly, 1975). Up to date, over 300 sites are documented and range from the Acheulian to the Iron Age. There are nearly 50 PN sites among which GvJm 44, 47, 48, 52, 184 and 299 have structural complexity suitable for this study. Of these, GvJm 44, 48 and 299 are partially destroyed. GvJm 47, 52 and 184 are suitable for this study. GvJm 47 was selected for this study because it was complete and preliminary analysis of obsidian artefacts indicated that it had adequate density and clusters that may have been indicative of activity areas (Muia, 1998).

Lukenya hill has however only been studied on a broad level by the University of Massachusetts team and is becoming an important study area outside of the Rift Valley that may well change the existing known archaeological patterns about the PN period in East Africa.

Since Lukenya hill has more than 300 sites that span through the Acheulian to the Iron Age, it forms a site complex that provides an interesting array of topics spanning all time periods. This can for example be used to study cultural evolution through time. Within the PN context, Lukenya hill provides an invaluable setting for further advancement of studies of this time period.

The PN in East Africa is only well documented in the Central Rift (Bower *et. al.* 1977). Equally well defined is the associated culture known as the Elementaitan. PN related studies in Kenya have also been carried out in parts of the Turkana region and South-western Kenya (Robertshaw 1990, Barthleme 1984). Lukenya Hill may provide an important setting for the following topics although this list is by no means exhaustive because a wealth of information pertaining to PN studies abounds at this site complex.

1- Advancement of PN studies in a geographical setting outside the Rift Valley with a view to improving the known cultural- historic and stratigraphic frameworks.

2- Explore the possibilities of cultures resulting from migratory nomads /pastoralists who had used the area as a seasonal stopover but settled here with time and spent most of the year in the Lukenya vicinity (Gramly, 1975).

3- Explore the possibility of an independent Lukenya culture probably borne out of seasonal settlements that gradually became permanent.

4- Determine the discontinuity or transition between the Late Stone Age (LSA) and the PN as the two do not differ radically in terms of technology. The evidence of early domestication would be the departure point here and would be possible since both time periods are well represented.

1.6 GVJM 47

This site is located on the western flank of Lukenya Hill and is in excess of 60,000 square metres. It extends 300 metres in the east-west axis and 300 metres in the north-south axis (Muia, 1998). Its most distinguishing features are three large ash-heaps exposed by animal burrows. In this study, two smaller nondescript ash-heap containing very low densities of archaeological material have been found. It also has numerous erosional exposures. The site is dated to 1340 $\pm$145 Bp from unidentified pottery (GX-4161/A) and 970 $\pm$130 Bp (collagen) from exposed bone hence making these dates unreliable (Bower *et al.* 1977). However, if GvJm 47 is contemporaneous to other sites, then it should be dated at between 1850 and 2300 Bp. These are the age ranges of other dated 50 PN sites. However, site GvJm 299, found and excavated in 1994 by University of Nairobi graduate students, has not yet been dated.

GvJm 47 was also excavated by University of Nairobi graduate students in 1994. A typological analysis of lithic artefacts yielded different artefact associations from open spaces and ash-heaps. This pointed strongly to the presence of activity areas hence sparking interest on the part of the researcher.

Preliminary analysis attested to cleaning, presumably from work and living areas and discard into ash-heap. However, not all open spaces exhibit cleaning. Some open areas contained relatively high concentrations of cultural remains and were thought to represent primary discard areas or processing zones (Nelson pers. comm.). It could not, without further excavation, be established if other non-ashy middens were primary or secondary.

1.7 Setting

The hunter-gatherer mode of subsistence does not facilitate prolonged settlement. (Nelson n.d). This is because social units, mostly comprising of related family members, would have been in constant movement in search of food. It is instead characterised by temporary camps and small sized social groupings, which would not require elaborate space definition. This is due to the small size of the social group and very short span of occupation. Space demarcation was more likely to be territorial rather than intra -site and territory would be limited to the foraging zone. The result would be little or no discernible patterns evident in their cultural remains that can concretely be ascribed to specific activities. Serial occupation of sites by different social units results in lack of temporal continuity by one cultural group. A site may be occupied by different social units that may not necessarily belong to the same cultural entity (Dunnell, 1992). An example of this would be a cave site (Brooks & Yellen. 1987). Tools are buried only in as far as they are trampled in and skeletal remains are removed by animals (Brooks & Yellen. 1987).

A prerequisite to the formation, hence identification of activity areas is the presence of permanent or near permanent settlements. The search for the earliest evidence for activity areas can only then be within the Neolithic period and in the case of East Africa, the Pastoral Neolithic.

Permanent settlements provide consistent and more prolonged accumulation of cultural debris within defined spaces hence enabling the discernment of spatial patterns. Each space where a distinct activity or set of activities was carried out forms a structural space. This could be in the form of;

(i) Presence of ash,

(ii) Thickness of cultural debris,

(iii) Indurated (compacted) ash layers,

(iv) Presence of burnt earth and daga which indicate hearths, house walls or cooking spaces and

(v) Density of different categories of cultural remains.

The above features may combine to form cultural strata. For example, thick deposits of ash (stratum 1) with a high density of cultural remains (stratum v), defines ash middens where material from hearths and associated spaces was discarded after cleaning. Indurated ash layers (stratum iii) at the base of thin deposits (stratum ii), having a very low density (stratum v) of cultural debris appear to define small stock enclosures with hardened floors.

Site GvJm 47 provides an ideal setting for the identification of activity areas.

1.8 CONCLUSION

This chapter has introduced the concept of discriminatory use of space, its manifestations in the prehistoric setting and prerequisites.

The PN is the logical starting point for the search of activity areas associated with prehistoric societies. Lukenya Hill forms an ideal setting since it has been occupied for a long period and provides a kaleidoscope of cultures culminating in the final phase of the Stone Age and the onset of the Iron Age.

The study hopes to find activity areas that resulted in the assemblages and structural spaces found at PN sites. An assemblage composition and site structure analysis will be used to discern and explain variation in the assemblages found. This study is a radical departure from previous modes of identifying activity areas in that it will involve the use of utility debris where activity sets have been cleaned and artefacts deposited in secondary refuse areas.

CHAPTER 2

LITERATURE REVIEW

Site formation processes have shown that the archeological record does not always mirror past human activity. Any studies hinting the contrary have been labeled as suffering from the "Pompeii Premise". This is because site formation and preservation have been influenced by a myriad of factors, which include taphonomic processes and human modification. Also, activity area research is intrinsically linked to interpretations of spatial patterning of archaeological remains. Even in the light of taphonomic studies, researchers have different, if not polarized views about the method and interpretive frameworks for such remains.

Activity area studies derive from intra-site spatial research and denote loci at which past human activity occurred. This is, in turn, based on the recognition that humans make subliminal and unconscious decisions concerning the locations at which a diverse range of activities are performed (Kent, 1984). The content and patterning of cultural material remains on a site, are assumed by some archaeologists, to represent different activities performed there (e.g. Binford & Binford, 1966). The Activity Model as described by Binford & Binford (1966), perceive activities as functionally, spatially and temporally discrete tasks usually involving the use of a few tools. Activity sets are thus expected to correspond a Tool Kit used to perform a certain task(s) and will be found in an Activity Area (Schiffer, 1976). Binford (1964: 454), further states that "the loss, breakage and abandonment of implements and facilities at different locations where groups of variable structure performed different tasks leaves a 'fossil' record of the actual operation of an extinct society."

The general consensus regarding site formation is that a complex of interaction of both geomorphologic and cultural processes created the deposits in which artefacts, ecofacts and features occur. Whittle (1988:14) argues that "the reality of stratigraphy is that its complexity defies separation into neatly sealed envelopes which contain a discrete set of behaviours". In a critique to Binford's assumptions from which the Activity Model derives, Schiffer (1976) counters that the archaeological record is a distortion of a past behavioural system. Instead, it has been shown that the archeological record has constantly been re-arranged over time (Dunnel, 1992), and that all artefact clusters may not be synonymous to patterns of human behaviour. At the extreme, Dunnell, (1992) argues that sites are at best accreational phenomena.

Taphonomy is the study of what happens to things when they die. Behrensmeyer and Boaz (1980) describe taphonomy as studies pertaining to burial and preservation of animal and plant remains.

In faunal remains, post-mortem disarticulation and transport are a function of microenvironments, shape and shape and density of bones (Gifford 1981, Behrensmeyer and Boaz 1980, Hill 1989). Different body parts of a carcass also contain variable amounts of fat and muscle, thus appeal to carnivores differentially. This results in differences in damage and transport of bones by carnivores (Gifford, 1981). Hill (1989), has also observed, that, Hyenas habitually collect bones, which may easily be confused for archaeological sites. Carnivore-damaged and/or collected bone may mistakenly be associated with human activity (e.g. Dart 1953, Brain 1969). Although damage inflicted by human activity can be discriminated from that of carnivores, it has been difficult to discern the primary agent of faunal remains accumulation at prehistoric sites. This is because such remains at sites, which also contain lithic artefacts, exhibit damage on bones caused by humans, carnivores and sometimes both (Hill 1989, Potts 1988).

Water transport also significantly changes the composition of an assemblage. Smaller artefacts and skeletal elements are winnowed out of the assemblage (Gifford, 1981). Where water velocity is low, horizontal displacement of cultural remains results in 'site stretching' or exaggeration of boundaries of sites (Schick, 1992). This may result in patterning that does not correspond to the initial human activity that produced the cultural remains and give the impression of activity area locations.

Comparison of spatial behaviour resulting in activity areas, at different sites may be rendered impossible since such sites may be formed under different hydraulic regimes and will exhibit different degrees of disturbance.

Apart from non-cultural site modification, human use of the landscape since prehistory has resulted in significant post-abandonment site alterations. Site reoccupation by the same of different social groups inevitably leads to imposition of new patterning in the cultural material. It is difficult to discern such patterning from the archaeological record where the period of absence was not long enough for a culturally sterile layer to cover the patterning left behind by the earlier occupation.

Scavenging of reusable material at abandoned sites results in archaeological material being reintroduced back into the systemic context (Schiffer, 1987). Structures may also be salvaged and used as foundations or raw material for the constructions of new ones (Whittle, 1988, Schiffer 1987). The visibility, utility and scarcity of the material being salvaged also influence the reuse of cultural remains (Camilli 1992, Schiffer 1976).

Mining, construction of dams, roads and cultivation are human activities that have also been responsible for large scale disturbance in the vertical and horizontal patterning of cultural remains and invariable activity areas associated with such patterning.

From the above discussion of the effects of cultural and non-cultural site modification processes, it is evident that patterning found in the archaeological record has been does not represent human spatial behaviour frozen in time and space. To this end, Behrensmeyer and Boaz, (1976), have underscored the importance of understanding the taphonomic history of a fossil assemblage in regard to how it was 'accumulated and deposited'. The implication for the identification of activity areas at occupation sites is thus a daunting if not a difficult task. The battle has however been more methodological than practical and has been waged between researchers.

Schiffer (1976) suggests that the solution to understanding archaeological patterning lie in the tracing of transformation processes that act on cultural material. These processes are behavioural and involve the stages of procurement, use/maintenance, and loss/discard. He classifies cultural remains into three contexts: primary, *de facto* and secondary. He further contends that only material in the primary and *de facto* contexts is indicative of the original activity performed there. Most archaeological material is however found in the secondary context. Schiffer has also argued that with 'increasing site population and increasing intensity of occupation, there will be a decreasing correspondence between the use and discard locations for all elements used in activities and discarded at a site" (Schiffer, 1972:162). This argument is tenable since it discerns between use of relatively abundant space and very limited space of hunter-gatherers and sedentary social groups respectively.

In contrast to Schiffer, Binford (1981) has argued that the archaeological record is not a distortion in its own reality but a "faithful remnant of the causal conditions operative in the past, and our task is to understand those causal conditions". Binford does not regard the processes of cleaning and dumping of cleaned material into secondary contexts, or transformation of cultural material from the systemic into the archeological, as distortion. He argues that cultural behaviour is not synonymous to material remains per se but is a result of mental phenomena. Implicitly, equating spatial patterning derived from material remains to activity areas is fallacious. Binford argues for recognition of social, economic and ideological factors that come into play in the manufacture, use and discard of material items found in the archeological record.

In an ethnographic study based on use of space by Navajos, Euro- Americans, and Spanish- Americans, Kent (1987), found out that activity areas are neither arbitrary nor universals. They are certainly behaviour-oriented and involve compartmentalization of space, but are also influenced by levels of social and political complexity as well as the physical environment.

In studies based on size sorting resulting from cleaning of surfaces, it has been shown that even after diligent cleaning, small sized artefacts, averaging 1.8 cm in width or length, are left behind (Baker, 1978). Such artefacts are left found at difficult to clean areas such as along walls. Smaller-sized artefacts may be trampled into the subsurface of a floor thus preserved in areas where they were used (Stevenson, 1990). In the case of lithic artefacts, microdebitage preserved at the primary context may be informative about can be used to trace the larger tool classes associated with it thus may be informative about a “tool kit’ used in that context.

Micromorphological studies of archaeological sediments at occupation sites has promise in identifying activity areas (Whittle, 1988). It employs variations in deposit size, microstructure, the related distribution between fine and course fraction, and orientation and distribution. These factors are in turn related to differences in discard, trampling, and maintenance practices. Micromorphology also provides information on the agencies of deposition and post-depositional alterations of surfaces at occupation sediments (Whittle, 1988). What is significant about such studies is that they can separate the characteristics of different components at a site. This thus solves the problem caused by overprint of activities by different social groups and consequently facilitates the isolation of activities associated with different occupations.

CHAPTER 3

METHODOLOGY

3.0 Introduction

The main objective of this study is to identify activity areas at a PN site and to determine to what extent the composition of stone tool assemblages reflect the different activities carried out on a site's spaces.

Equally important is the testing of the underlying hypothesis that utility debris can be used to discern activity areas where they have otherwise been masked by the process of cleaning and disposal into secondary refuse middens.

The internal organisation of the site can be revealed by the character of its assemblages. Also, patterned relationships among classes of artefacts should document the context in which they were made, used, lost or discarded (Longacre, 1968).

Like any other archaeological investigation involving excavation, phenomena incidental to this study, if found, will be used for relevant studies about Lukenya hill.

3.1 Methodology

The basic framework is that of site structure and assemblage composition analysis. Within this rudimentary framework are the underlying hypotheses that comprise a multi-working hypotheses scheme. Test implications were made about the propositions raised. All propositions were tested and validated at the proposal stage.

Among the most important propositions made were that;

1- PN sites contain identifiable spaces that can be defined by structures, middens and the density of different material such as bone refuse, tools and utility debris.

2- Assemblage composition is different in different spaces on a site.

3- Distinct, spatially segregated assemblages, identify areas of different activities and discard on a site.

4- Utility debris can be used to detect activity areas where such areas have been cleaned and cultural remains deposited in secondary refuse dumps.

3.2 Site structure analysis

Site structure refers to the set of all occupation surfaces that were in contemporary use in the past (Wilcox. 1975).

Site structure analysis deals with the physical aspects of the site, especially the internal organisation of artefacts, ecofacts and features at site GvJm 47. These aspects may be specific to spaces, form structures or combine in a variety of ways to form structures or structural spaces.

Identifying a site's structure is a necessary prerequisite to defining activity areas. This is because while spatial concentrations of material remains are evidence of focused human activity, such concentrations have to be related to the structural spaces they occupy. These spaces are differentiated from each other by artefact densities, stratigraphic structure and the clustering of artefact types.

Test implications were first made about propositions regarding activity areas at Lukenya hill. Purposive sampling was used to define the site's external boundaries. Purposive sampling involves biased selection of areas with aspects that one wishes to investigate (Nelson, pers. comm.). This mode of sampling was also used for structures found within the site's boundaries. The process involves halving the distance between test pits sunk in areas with different characteristics until internal boundaries of the structures are found. These characteristics included; high density and low density cultural material and ashy areas. The purpose was to determine the available range of structural spaces within the site, which were then mapped. Once defined and mapped. spaces were sampled for excavation and material recovered was sieved through both the 1mm and 5mm-wire mesh sieves and analysed at the National Museums of Kenya Archaeology Laboratory.

3.3 Assemblage composition

While site structure largely involves the identification and mapping of structures on the site, assemblage composition forms the test for the existence of structural spaces. which can be concretely ascribed to activity areas. To affirm that an activity carried out in one structural space is different from that performed in the next space on the site. an analysis of the contents found in each space is necessary.

Activity areas were expected to be distinguished by their unique artefact configurations that set them aside from all others. This is because each activity calls for the use and discard of a particular set of tools and derived utility debris. Distinctive sets should then be found in specific types of structural spaces. Activity areas can not be discerned at this stage because they are rarely evident during excavation. The inherent assemblages as well as their character can only be deciphered after classification. This reveals the range of artefacts available, richness or paucity of all class types, their sample sizes, and general spatial patterning. The effects of these variables on the identification of activity areas will be appraised before subjecting the data to statistical analysis.

Assemblage composition was done in four phases. Phase one involved structural analysis to identify assemblages for comparison. Each assemblage was ideally expected to correspond to a structural space. A typological analysis was then carried out to yield general artefact types inherent in each assemblage.

Phase two involved reduction analysis of lithic artefacts (obsidian) associated with the spaces identified in phase one. The use of reduction analysis as a form of classification was preferred here given that cleaning of intensively used areas was already evidenced by the presence of four ashy middens on the site. It was then expected that areas that have been cleaned would be devoid of larger artefacts because this process results in the removal of the larger pieces of cultural material. Instead, small sized micro-debitage and utility debris would be left behind. These can be traced to specific manufacture processes. Utility products can only be attributed to larger production categories, such as curated tools, through reduction analysis. If only general typology was to be used, then one would come up with a few tool classes and a bulk of waste categories that would never reveal the finished tool types used in the spaces before cleaning. These classes would be manuports, cores, shaped tools, modified tools, unshaped tools and utilised pieces whose bulk would be found in secondary refuse areas and therefore in secondary context.

At Lukenya Hill, like in many other PN sites, there is persistent low frequency of curated tools, segmentation, tool transformation and re-use of finished tools. Given these circumstances, general typology, no matter how refined, does not provide adequate differentiation between the most abundant classes (reduction by-products) of lithic cultural remains. Individual tool types also have different ranges of function with different rates of breakage and hence different rates of curation, repair, reuse, and discard (Hietala 1984). These variables will be measured using reduction analysis fields (Nelson, n.d) in which utility debris and tool transformation are quantified. The analytical fields have been outlined in Appendix 1.

Phase three involved statistical analysis of the classified artefacts. Firstly, quantification of all classes derived from the analytical fields was done. Sample sizes and their impact on the identification of activity areas was then appraised. The second stage of statistical analysis was to explain the significance of the resultant assemblages from the different structural spaces and to verify if the differences, if any, were due to chance or not.

In some circumstances, statistical analyses warrant the integration of non-theoretical factors with theoretical frameworks. The following is a set of factors and variables that this study will take into consideration at the final phase of assemblage composition. This will involve an integration of the results of the analyses of obsidian assemblages with those of other lithic and non- lithic cultural materials. It is expected that non-lithic materials such as bones, ash, gastroliths and ceramics would further complement the assemblages hence make easier the discernment of activity areas. This would be done by documenting the range of variation of non-obsidian materials and the co-occurrence or lack of it with obsidian artefacts.

Co-occurrence, is based on the premise that all tasks performed on the site generate cultural debris and such debris is represented in this case by the remains found in the site. While this study is based on obsidian artefacts, activity areas were represented by the whole range of preserved archaeological remains found on the site. Consequently the objective identification of activity loci is dependent upon the integration of all cultural material generated by the social group (s) that inhabited this site. Moreover, the preserved remains represent but a small percentage of the sum of cultural material generated by the activities carried out on the site.

Associations of tool kits and specific refuse were used to make inferences about the activity performed in each space. The assessment of the test implications made earlier was also made in this phase.

3.4 Non- theoretical factors

As much as theoretical frameworks are indispensable tools for objective research, there are those factors extant in the real world that cannot be quantified for study using objective means. Changes also take place since the sites were abandoned by the social units that resulted in the accumulation of cultural remains that form the sites under study. Theories at most, are idealised concepts about what could have logically been the state of affairs and have been reached using quantifiable means. However, other factors may set in after the formation and subsequent abandonment of a site that may radically change the structure of a site in a way to distort idealised propositions about sites. This may then, help in the assessment of the implications of the results of the analyses.

3.4.1 Cells

Apparent lack of activity areas in some cases is due to numerous microsites (cells) scattered on the site (Nelson, pers. comm.).

Cells result from activities that are not practically or ideologically restricted to specific loci on a site and can be performed in different spaces on the site (Nelson, pers. comm). They may be referred to as 'portable activities'. Such activities are duplicated all over the site and their small sizes may render them difficult if not impossible to identify.

3.4.2 Context distortion

Because activity areas are mostly about spatial relationships of artefacts, it is important that these relationships resemble the original context at the time of the abandonment of the site as much as possible. However, the process of taphonomy results in the distortion of original contexts in disparate degrees. Erosion, predation, bioturbation, earth movements and farming have resulted in the destruction of important archaeological evidence rendering recovered cultural material insignificant. The extent of vertical and horizontal displacement has therefore been assessed before excavation to ensure that material to be recovered does indeed represent near accurate spatial relationships that the researcher wishes to investigate.

3.4.3 Sample size and threshold stability

An inadequate sample size results in huge differences hence erroneous variation. For example, an increase of 1 unit in a sample of 5 will result in a 20% increase in the difference with the next value. This may give an image of false variation where one hardly exists.

3.4.4 Caches

Where a site is used as a base for only certain times of the year as would be characteristic of pastoralism due to seasonal migration, a person (s) may bury tools for use at a future date. If such caches remain buried, they may be retrieved by archaeologists and may give the false impression of an activity area (s).

At Lukenya on site GvJm 47, as revealed by analysis of lithic materials excavated by Muia (1998), this has resulted in the occurrence of tools of the same type. These tools are approximately 3-5 in number, made from the same core and found together in one level and as a rare occurrence.

The PN sites of the Lukenya site complex exhibit most characteristics of the PN period. The sites fit in the late PN category although all sites have not been properly dated. An example is GvJm 299 first recorded and excavated by two University of Nairobi graduate students in 1994 but still undated.

3.4.5 Cleaning and dumping

Cleaning and dumping processes have far reaching consequences for this study and has a bearing to many factors discussed in chapter one. On a work site, within the PN context it is assumed that regular cleaning of the surface takes place. For example out of a total [x] of angular waste and flakes, 10 % [y] flakes may be removed for further utilisation leaving 90% [z], which is dumped. The total number of flakes found in secondary context at the middens may hence not reflect the total number of flakes used or made at an activity area.

The process of cleaning may be done in three ways.

i) Scraping

This involves the removal of loose material and breaks imbedded pieces consequently resulting in breakage of artefacts and inflation of waste ratios.

ii) Sweeping:

Sweeping sorts out material and only loose pieces are removed.

iii) Collecting by hand:

Only larger pieces easily visible to the eye and very large obtrusive pieces will be picked.

3.5 Ethnographic Analogy

Sometimes, phenomena independent of logic can dictate peoples' behaviour on the use of space. Insight can be gained into some phenomena by ethnographic analogy with existing or historical social groups that are nomadic herders. If deemed necessary at the end of the analysis, ideological related factors may be used to explain deductions made about the observations from GvJm 47.

3.6 Conclusion

In conclusion, this chapter has looked at the theoretical framework used in this study and the course of the analysis. The chapter has also looked at the interacting myriad of variables that may render the search for activity areas impossible or difficult even with a sound theoretical base.

CHAPTER 4
THE PASTORAL NEOLITHIC

4.0 Introduction

This chapter takes an in-depth look at the PN phase of adaptation, its associated geographical, lithic, and faunal characteristics, cultural markers that distinguish it from the others and also its relevance to the study of activity areas. The chapter will also expand on Lukenya Hill in the context of the PN period.

4.1 The Pastoral Neolithic.

The study of this time period has for many years taken the back seat as researchers were more interested in the earlier time periods especially the Early Stone Age (Robertshaw, 1990). However, a complete chronology of the evolution of human cultures cannot be achieved without the study of later time periods. Gradual studies have been carried on this time period but the chronological framework still remains inadequate hence the need for more research.

The term PN is used to designate the last phase of the Stone Age characterised by domestication of animals. This term is largely used in East Africa, where studies were initially carried out.

This period is a crucial phase in human adaptation in East Africa as it marks the beginnings of food production that in turn is an important step in the transformation of the human condition (Redman, 1984).

Domestication was, however a gradual process and wild game still accounted for a significant portion of the diet of early pastoralists (Gifford, 1980). Wild game was especially important during the dry season (Bower, 1984) and /or during game migration (Gifford *et al.*, 1980). Another related model envisages seasonally complementary subsistence on wild game and domestic animals exploited through transhumant migration 'between relatively fixed seasonal settlements' (Bower, 1984: 252-260). The reliance on wild game partially explains the lack of significant variation between the Late Stone Age (LSA) and PN lithic technologies. Domestication is also linked to the beginning of permanent or near permanent settlements associated with the accumulation of dense cultural deposits at the sites of early pastoralists. Activity areas are traced to this time period as their isolation depends both upon temporal continuity and settlement of social units for prolonged periods of time to accumulate cultural material adequate for this kind of analysis. Research carried out in the Central Rift concluded that there were significant differences in the settlement behaviour of LSA, PN and Pastoral Iron Age (PIA) cultures (Bower, *et al.*, 1977). Among the changes attributed to the PN are repeated and regular occupation of the same sites hence signifying a new set of environmental and/or cultural factors (Bower *et al.*, 1977)

The PN period is generally characterised by chipped stone tools whose bulk is obsidian although microcrystalline silica and basalt were also used (Ambrose, 1980). The faunal remains at PN sites comprise both domesticated bovids and ovicaprids found together with those of wild animals. The latter is dominated by ungulates and the ratio of wild fauna and domesticates varies from site to site. Older PN sites however contain marked higher densities of wild faunal remains (Gifford *et al.*, 1980).

The most important of the various consequences of food production in the case of East Africa, other than domestication, is settlement. Starting from the mid-Holocene, there was a gradual shift from cave sites and sheltered sites such as those provided by hillsides to the open plains. The return to plains renders the proposition that some man-made shelters replaced cave sites plausible. The presence of middens on these plain sites attests to long term settlements and consequently temporal continuity.

Also unique to this time period is the first evidence in the East African region of deliberate burial often done in rock crevices and caves. At Jarigole for example, a PN mortuary site dated at circa 4,000 BP, I observed human remains buried in a central mound with grave goods of ivory figurines, ostrich eggshell beads and obsidian tools among others. A site at Ileret, FwJi 5, dated at circa 4,000 BP is the earliest stone bowl site in East Africa, but does not 'contain domestic animal' remains (Barthleme, 1984:200-205). In the Central Rift however, stone bowls are associated with burial sites where they were used as grave goods, hence the name stone bowl cultures that was first used by L.S.B. Leakey to describe the PN (Leakey, 1931). Deliberate burial shows increasing cultural complexity and probable larger social groupings that are normally a consequence of food production (Redman. 1984).

The earliest dates obtained for the PN have been from site GaJi 1 from Turkana in northern Kenya. The date of 4,000 Bp was obtained from charcoal samples and is thus "at least 1,000 older than the Central Rift PN sites" (Bower, 1984: 252-260).

The PN period has been sub-divided into the early, evolved and late periods, all with distinct characteristic features that differentiate them from each other. Pottery has been used as a criterion for differentiation of the three stages of the PN. Despite this, all share the salient features of reliance upon wild, aquatic and domesticated animals for subsistence, exhibit complexity in social organisation and wider interaction through trade in obsidian.

Site GvJm 47 falls within the late PN period and provides an ideal setting for the search for activity areas in an area where little research on the subject has been carried out.

In conclusion, domestication is a hallmark in the East African cultural evolution because it has the important attribute of settlement, which in turn makes the discernment of activity areas possible.

4.2 Activity areas at PN sites: Justification

The justification for the use of the PN as a genesis for the search activity areas as earlier mentioned is based upon the premises of prolonged settlement and temporal continuity.

Within the hunter-gatherer mode of subsistence, foraging zones were wide spread and the home base consisted of dispersed caves, rockshelters and open sites. Social units were based upon family members and they remained persistently small because this was convenient for mobility. This however augurs badly for complex social structure or accumulation of substantial material remains. Constant movement would result in very short-term occupation of open sites and serial occupation of strategic locales such as rock shelters. Serial occupation instead took place, and may not necessarily have been by the same social group or cultural entity. Archaeological remains found at the sites of hunter-gatherer renders the search for activity areas difficult due to lack of cultural and temporal continuity (Dunnell, 1992). In the central rift LSA sites, it was noted by a University of Massachusetts research team that in areas lacking special topographical features such as caves, there were 'few environmental parameters to focus occupation in exactly the same place year after year' (Bower *et al.*, 1977). This resulted in 'small, isolated, single component sites which were difficult to relate to one another in terms of function and time' (Bower *et al.*, 1977:142). These sites included; Nderit Drift, Gambles Cave, Lion Hill, Salasun, Nadabibi, Maringishu, Remnant, Akira, Gilgil and Crescent Island (Bower *et al.*, 1977).

Thus despite the very close similarity of lithic technologies between the LSA and the successive PN period, there is a radical departure in the latter period in group size and the subsistence patterns. This may have been regular seasonal settlement or occupied year round by at least a section of the social group while the other went away in search of pasture and water. The practice of a section of the social group being left behind has been noted among the Maasai pastoralists of Kenya (Mbae, 1990). The significance of this is that the site is occupied all year round hence making it a permanent settlement.

4.3 Lithic characteristics of the PN

The technological aspects of this time period resemble those of the LSA (Nelson, 1973). The tool types are typically small in size with a very wide variety pointing to specialisation. Composite tools meant for hafting are also present although in low densities. This would go to explain the complementary role of wild game in the diet of PN societies.

Obsidian, especially in the Central Rift and South-western Kenya continues to be the most common lithic raw material. Curated tools include various shaped microliths, scrapers, burins and borers. *Outils ecailles*, backed blades and segmented pieces are also found in varying frequencies at PN sites.

Trade in obsidian did take place showing greater social interaction between cultural groups occupying far-flung geographical areas (Robertshaw, 1990).

Sites located far away from obsidian sources show frugal use of the raw material than those located nearer to raw material source (personal observation). Also, the degree of segmentation and tool transformation as well as re-use of older weathered artefacts is very common in sites located outside the Central Rift, which contains most of the larger obsidian quarries.

Small obsidian bombs occur locally at some Lukenya Hill PN sites although they are normally banded and with poor flaking properties. They however account for a significant percentage of tools found on sites GvJm 47 and GvJm 44, whose lithic material I have analysed.

The onset of the PIA, sees a steady decline in the amount of obsidian tools found in the sites. There is also a marked decline in the quality of flaked tools as iron took center stage in the societies' technology (Nelson, pers. comm.)

4.4 Environmental and geological setting

Lukenya Hill lies approximately one and a half-km from the Nairobi-Mombasa road. It is an inselberg of granetoid gneiss bedrock and folded Precambrian gneiss located at the edge of the Athi -Kapiti plains (Gramly, 1975). The hill, rising 200m above the surrounding hills, is 8 km long and

2km wide. Weathering along joints has caused detachment of rocks hence forming rock-shelters in some instances.

Today. Lukenya is essentially ranch land and is located in arid eutrophic savannah climate with high nutrient volcanic soils and low precipitation averaging 510 mm *per annum.*

The vegetation is typically grassland and wooded grassland characterised by *Acacia* and *Commiphora Africanus* trees and *Pennisetum, Digitaria* and *Themeda* grasses (Owaga, 1975). At the base of the hill is an alluvial apron formed by material eroding from the hillside and which supports mainly *Commiphora Africanus* . On the hill slope the dominant species are *Ficus,* and the herbs *Cissus Quadrangularis* and *Sarcostemma Viminale* (Gramly, 1975).

The bi-annual rainfall is attributed to the Inter- Tropical Convergence Zone (ITCZ) across the equator. The rainfall is unpredictable and this variation is reflected in the plant and animal structure. The wild fauna that was observed in this area by the researcher includes; Hyena, Leopard, Lion, Thomson's Gazelle, Giraffe and Rock Hyrax. Goats, Cattle, Donkeys and Dogs are the domesticated animals observed in this area.

Muia (1998), has defined a new Lukenyan Industry different from the Elementaitan but the pottery, analysed from the same sites, and used to define this new industry does not show a significant departure from known pottery types (Were,1998). The pottery ware from Lukenya shows occurrences, in random patterns, of most pottery types typical of the PN. This raises several propositions about the cultural groups that occupied the Lukenya PN sites. The pottery types at Lukenya Hill may have resulted, among other reasons, from seasonal migration between Lukenya hill and the Rift Valley, and the settlement at Lukenya hill of diverse societies probably due to population pressure elsewhere hence pooling and/ or exchange of stylistic and ceramic technologies. Bower et. *al.* (1977), document a difference in pottery wares between two sites, GvJm 47 and 44 but with identical lithic technologies and cites this as a phenomenon uncharacteristic of early PN sites.

4.5 Conclusion

The above discussion identifies the PN phase as the logical starting point for the search for activity areas. The concentration of PN studies in the Central Rift, while contributing to the understanding of this time period has not identified activity areas and neither have other PN related studies in northern and South-western Kenya.

Many PN sites have been documented and a few studied, their role and place within the PN framework stills requires more research.

CHAPTER 5

EXCAVATION

5.0 Introduction

This chapter will show the procedures used in the excavation of site GvJm 47. Excavation was aimed at establishing the structure of the site and also for the purpose of yielding material for assemblage composition analysis. This would also address the problem of space utilisation at PN sites.

5.1 Primary analysis

Primary analysis was done on material excavated by Muia (1998), and Were (1998). The preliminary analysis presented here is based on lithic material excavated by Mulu and Were in 1994 at GvJm 47 (Appendix 4). Their excavation involved the sinking of five trenches at different locales on the site, two of which were on ash-heap.

The lithic materials were first analysed by Muia (1998), and he observed clustering of certain tool types in some areas (Appendix 4). However, this observation was incidental to his study, as it was not based upon activity areas. I then did a preliminary analysis of obsidian artefacts with an emphasis on the variables of angular waste versus flake density, surface condition of artefacts, stratigraphic levels and the associated physical structures. This was aimed at understanding the following phenomena;

a) Density

The density of material in any given area on the site is valid because we are dealing with the intensity of use of space. This should also reveal archaeological ecotones on a site (Nelson pers. comm.).

b) Physical structures

The various physical structures and their respective contents may correspond to the activities performed there if the contents are in primary context. It was also expected that material from different spaces should reflect different activities.

c) Use and discard

The processes of manufacture, use and disposal of obsidian tools can also be better understood from primary analysis. Primary analysis was further expected to provide information about tertiary factors affecting activity areas independent of use and disposal. From the preliminary analysis, of bone and obsidian densities across the site, the following schematic representation emerged and is expected to represent activity sets at GvJm 47 (Fig.4.1).

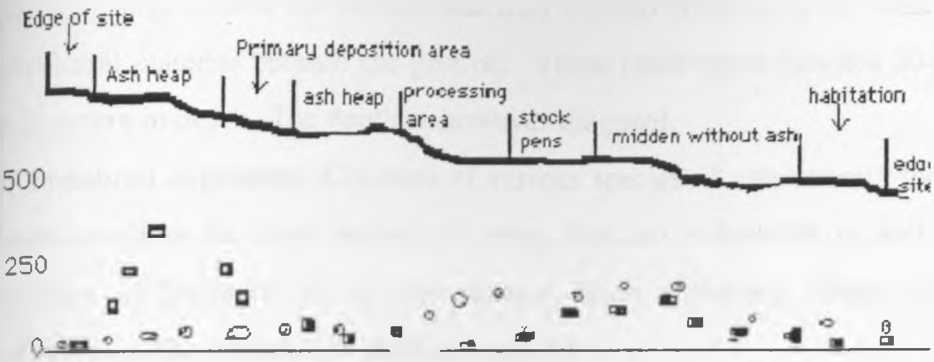


Fig. 4.1 Schematic representation of structural spaces based on bone and obsidian frequencies from GvJm 47.

From the primary analysis, the possibility of activity areas was present but further excavation needed to be carried out using a clear analytical framework. The sample sizes from Muia's 1994 excavation were inadequate for the current project. In order to solve this problem, the researcher conducted a second excavation.

5.2 Excavation

The initial step in the search for activity areas was to establish the external boundaries of the site. This was especially necessary as site GvJm 47, although dated, had not been mapped and the East - west and North-south measurements were based on surface indicators comprising of material eroding from the ground.

5.3 External boundaries

The ash-heaps and eroded material on some areas on the site were proof that an archaeological site did indeed exist here and the technology and surface conditions of the artefacts showed PN characteristics. However, little was known about the spatial extent of the buried archaeological material.

First, a master datum was set near a large tree lying between two ash-heaps. It was set at 0° using the Brunton compass (400° calibration) and 262° along a large rock face on the hill. All points of measurement (elevation and distance) were made in reference to this datum (Fig.4.2).

Due to the large size of the site, surface indicator materials were used as aids to show which areas had archaeological material. These indicators included;

a) **Animal burrows**- Rodents have dug holes on some areas of the site in search of ants. Such activity brings soils to the surface that may contain artefacts or not hence showing the concentration of cultural material beneath the ground. These holes range between 20 centimetres in width and up to 2 meters in depth. The depth is however diagonal.

b) **Erosional exposures** -Colonies of various species of ants beneath the ground destroy grass roots hence resulting in areas devoid of grass that are vulnerable to soil erosion. The result is the exposure of artefacts, if any are present. Such exposures, often less than 20cm in depth, are indicators of the densities of artefacts beneath.

c) **Road cutting** - The road to the Wambua home that branches off the Daystar road exposed material approximately 40 cm beneath the ground. This road marked the northern extent of the site (Fig.5.2).

d) **Post holes** - Postholes run across the boundary that separates the Wambua and Brown properties in an East -West direction and were dug shortly before our arrival. The soils dug out of the postholes contain cultural material in varying densities and helped the researcher to decide on which area to sink trowel pits.

The above discussed aids were helpful but the bulk of the points selected as the boundaries of the site was reached by sinking trowel pits from areas of known high densities to the unknown ones.

e) **Trowel pits**

The trowel pits were 30 centimetres by 30 centimetres by 30 centimetres and were aimed at probing the densities of cultural material.

At first, trowel pits were sunk in the four general compass directions i.e. north, east, south and west. Other trowel pits were then sunk between the original four. This process was repeated until the distance between the outermost points was 20 metres.

To establish if a point in any one given compass direction was part of the site or not, the trowel pits were sunk first from areas with visible cultural material near the master datum, then more pits sunk along the same line further away from the datum. If an area of very low or no cultural material density was reached, then the distance between that point and the last one (along the same direction) with high densities was halved, and another pit sunk. This process was repeated until an area of low and even concentration was found and this denoted the boundary in one direction. Such boundary points were established 20 meters apart around the site.

It was found that uphill, the site extended a few meters above an ash-heap and only quartz blocks and chippings were to be found up to the base and lower slopes of the hill. Downhill, the site ended a few metres from the road to Daystar University where the soils became very clayey. On the southern side, the furthest extent of the site was found along the fence separating the Wambua and Brown properties. On the northern side, the furthest point was on the road leading to the Wambua home.

Less than 30 meters from GvJm 47, was the piece of land owned by the Brown family and on which also had erosional exposures similar to those found at GvJm 47. These erosional exposures attest to areas of low and high densities, although no ash-heaps are found on this side of the fence. This site lying on the Brown property had earlier been designated the Daga site but appears to be part of GvJm 47. However, this section was not sampled for excavation or included in the map made of GvJm 47 (Fig.4.2).

The sampling procedure used here was purposive sampling. Areas with different structural spaces were selected for excavation since the immediate goal was to find adequate sample sizes for analysis from different structural spaces. The naming of the trenches was begun at 11 instead of 1, so that no confusion would arise with those excavated by Muia and Were in 1994.

5.4 Mapping of structures

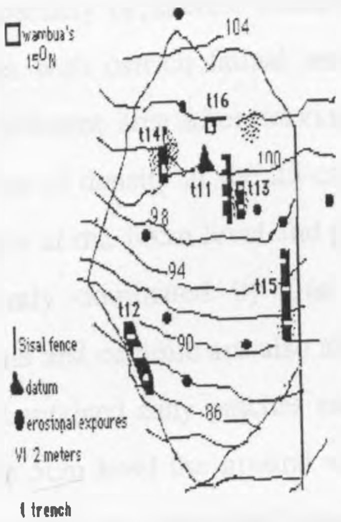
Once the external boundaries were established, structures on the site were mapped. This would show the range of available structural spaces, which would then be sampled for excavation.

Ash-heaps were the first structures to be mapped since they were easily identifiable. Four ash heaps were identified, three of which were found not far from the master datum and had previously been excavated. The two ash-heap close to the datum were designated trenches 13 and 14 and were selected for sampling with the aim of finding the difference in their contents since they were located close to one another. A small, previously unrecorded ash heap was also found to the north west, downhill of the site near the fence of the Wambua and Brown properties. This formed test pit 1 of trench 15.

An area with high densities of material was the other type of structural spaces found. Its location was aided by the presence of erosional exposures and road cutting. This space contained an assortment of both fine and coarse fraction lithics, most of them obsidian, bone and ceramics. The structural space lay away from all four ash-heap and formed the second trench.

Another structural space was a low density area away from the two ash heaps closest to the master datum. This area lay between the fence and an ash heaps that was characterised by bone. This area was sampled for excavation and two test pits forming part of trench 15 were sunk (Fig. 5.2).

Fig. 5.2 site map of GvJm 47



An area between the two main ash heaps was also sampled for excavation and formed the first trench. This was aimed at probing the relationship between the materials in the two large ash heaps (trenches 13 & 14).

Finally, an area at the edge of the ash heaps on the uppermost section of the site (trench 4) was also sampled. The contents of this space initially appeared different from the other five trenches. This was designated trench 16. However, during the course of analysis, these materials were found to resemble that of trench 11 and have hence not been included in the analysis.

The content, densities, sizes of lithic artefact, and their distances differentiated all the structural spaces from one another. These aspects were used as criteria to distinguish six structural spaces at the site. They were then mapped and sampled for excavation. A total of sixteen test pits were sunk on 6 trenches. Except were otherwise mentioned, all test pits were $1m^2$ in area. Soil colour was established using the Munsell Colour Chart (1971 ed.).

5.5.0 Trench 11

Trench 11 had the highest amount of test pits with a total of 4.

Test pit 4 was especially of interest because it contained a high density of gastroliths. These were not found together with ostrich faunal remains and may have been put to a specific use or were dumped from a different area after serving a specific purpose. The cultural layer here was most productive in terms of density at the 25-cm level. This differs with all other 5 trenches were dense concentration begin at the 10cm level and peter out at the 20 cm level. The size of obsidian artefacts here was apparently dominated by fine fraction. This would however be made clear during classification. Bone and ceramic are also abundant at this level but the former is highly comminuted. This trench also contained ashy patches and charcoal remains. The soils were loamy and brown in colour. Below the 5cm level the ground was compact and became even more compact at the 30cm level. This latter level was clayey and material ended between the 33-35 cm level.

5.5.1 Trench 12

This trench sunk near the road cutting leading to the Wambua residence. The road cutting exposed dense artefact concentrations and was situated away from the ash heaps, hence the sampling of this area for excavation. It had three test pits, two of which had low artefact concentrations and appear to be at the periphery of an intensely used area. Their contents have not been included in this analysis. Test pit 1 had dense concentrations and unlike other pits was expanded to a 2m by 2m pit.

The 0-5 cm level contained low densities and many rootlets. The density of material improved at the 5-10 cm level and reached a peak between the 10 -20cm levels, then dropped drastically. The 0 -20 cm level is characterised by loamy dark-brown soils. It also has ashy patches, which do not however form any strata due to the small amounts. From the 20-30 cm, which is characterised by low density of cultural remains, the soils become greyish-brown in colour clayey and very compact. This type of soil is near sterile. A distinct characteristic of this trench, especially of test pit 1, is the burnt bone. This comprises circa 60 % of all bone recovered. This pit alone produced the highest amount of lithic artefacts compared to the sum of pit densities of any other trench on the site.

5.5.2 Trench 13 (Ash-heap)

This trench was sunk south east of the master datum in a midden characterised by greyish-brown ash and contained two test pits. The dominant material here was bone, which was very well preserved. The concentration of lithic materials comprised mostly coarse fraction. The soil was not compact and had rootlets up to the 5cm level. However, the ash became compact at the 40cm level and formed a hard cement-like layer. This level was culturally sterile.

5.5.3 Trench 14 (Ash-heap)

This trench was sunk in the North-eastern direction from the master datum and had earlier been identified as a different structural space from the other ash heaps. This particular ash-heap does not exhibit surface signs of ash at first glance. It is extremely disturbed by rodent action and only two test pits were sunk in relatively undisturbed areas. There soils were brown sandy loams (2.5 yr 4/4). The 10-20cm level contained very little material. The 20-30cm showed a slight increase but the density continued to fall as one reached the 40cm level. Obsidian and ash nodules were the dominant materials found although in manifestly very low concentrations.

5.5.4 Trench 15

This was sunk in a structural space of low artefact density with an aim of establishing the differences in activity with other areas. It was sunk in the South-eastern direction from the master datum and contained 3 test pits. The soils in test pit 1 were brown and silty (10yr 5/3).

The 0-5 cm level contained moderate densities of obsidian fine fraction, microcrystalline silica (msc), quartz, potsherds and very low concentration of bones. Material began to drop at the 7cm level. At the 10 -15 cm level, the densities dropped further and comprised mostly of obsidian fine fraction. The soil structure becomes very compact from the 7cm level and this change corresponds to a drop in cultural material. This pit was closed at the 15-cm level when it became sterile.

The second test pit in this trench was sunk 30. 4 meters from the first one in a North-western direction. It was sunk in a small ash heaps lying at the lower end of the site, and which had previously not been excavated. The soils are loamy and brown in colour (10yr 5/3). This pit contained very low densities of material and resembled trench 4. It was closed at the 40-cm level.

The third pest pit was sunk 50 meters eastwards of test pit 1 and lay 203^{o} from the master datum. This pit was generally very compact and exhibited very low densities of cultural material. The soils were brown and loamy. It was closed at the 30-cm level. It marked a low-density area lying between two high-density areas. These high-density areas were an erosional exposure across the fence on the brown property and the ash heap designated trench 13.

5.5.5 Trench 16

This was located in a North-western direction from the master datum. It comprised of two test pits and the material closely resembled that found in test pit two of trench 11. These two trenches are in close proximity and were concluded to comprise either a continuous or coterminous structural space that had similar functions.

The soils were ashy at the 0-10 cm, as the trench lay at the periphery of the northern most ash heap It later grades into a brown then dark brown colour (7.5yr 4/4). The dark brown horizons contain a high density of materials. One distinctive aspect of this trench is the abundance of potsherds, which comprise of both very thick and thin sherds.

The excavation was conducted at 5cm intervals and material separated according to raw material. Obsidian artefacts were further separated into fine and coarse fraction. This material was first cleaned and then catalogued. This was done at the National Museums and Nairobi University Laboratories.

5.5.6 Conclusion

The mapping of the site as well as structures within the site yielded structural spaces that were sampled for excavation. The excavation on the other hand showed that different areas of the site contained varying concentrations of cultural material. The relationship of this material to activity areas could be established with the aid of analyses. Obsidian artefacts were then subjected to typological, reduction and statistical analyses. The results of these analyses are detailed in the next chapter.

CHAPTER 6

ANALYSES

This chapter presents the statistical analyses of the data from GvJm 47. These will include presentation of graphic data, description of individual trenches as well as inter-trench comparison. Sensitive indicators of activity areas and significance tests will also be discussed

A total of 26 variables were used in running statistical tests. The gross number of obsidian artefacts excavated was 14600, and whose greater percentage comprised fine fraction. 3656 artefacts were sampled from the five structural spaces for analysis. These structural spaces were made up five trenches. Trenches 13, 14 and 15 comprised low sample sizes hence all obsidian artefacts were analysed. Artefacts from trenches 11 and 12 were sampled due to their relatively high gross sample sizes. Variables that have been selected as having the greatest significance in the identification of activity areas will be presented and discussed in this chapter.

Table 6.1 Raw material and variables used in analyses.

Raw material	Variable
All obsidian artefacts	density (frequency)
	Size
Potsherds	Density (weight)
Smooth pebbles	Frequency
Bone	density of burnt weight
	density of unburnt weight

Table 6.1 shows variables that will be used for comparison between the five trenches at the site. These variables have been used as indicators for activity areas and comprise of both obsidian and non lithic material. The various trenches were of different volumes hence their respective densities have been used extensively in inter-trench comparisons. All densities are computed per cubic metre.

6.0 COARSE AND FINE FRACTION RATIOS

Fig 6a shows the frequency and density of the fine and coarse fraction obsidian, as well as their weight.

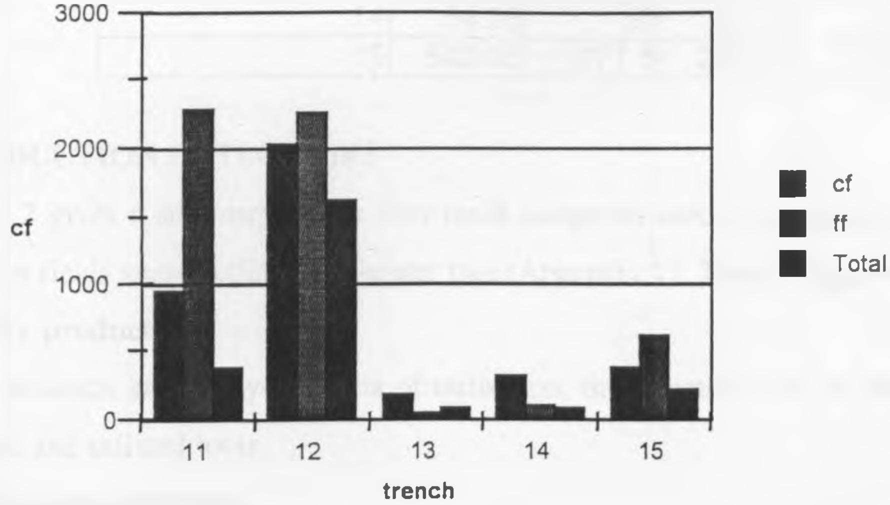


Fig. 6a. Gross coarse fraction (cf), fine fraction (ff) and total weight of obsidian artefacts from GvJm 47.

According to the Fig, all five excavated trenches exhibit differences in the frequencies of their coarse and fine fraction obsidian lithics. The combined weight of fine and coarse fraction also differs significantly in each trench. Trenches 11 and 12 compare well in their fine fraction densities but there is a disparity in their coarse fraction densities and this is reflected in the combined gross weight of their fine and coarse fraction. Trenches 13 and 14, both on ash-heaps, display the inverse in the fine and coarse fraction ratios compared to trenches 11,12 and 15. The latter have lower coarse fraction ratios than the former.

6.1 SURFACE CONDITION

Surface condition is important in the assessment of the intensity of use of a structural space by either human activity or stock movement. Table 6.3 shows the various forms of surface conditions of obsidian artefacts.

Table 6.2 surface condition of obsidian artefacts.

Trench	UT	PC	MP	UND
11	351.5	205.33	160	39.11
12	529.5	302.61	308.6	45.21
13	86.25	56.25	66.25	7.5
14	54.28	50	42.85	5.71
15	542.05	177.5	239.25	42.99

6.2 REDUCTION CATEGORIES

Table 6.2 gives a summary of the four main categories used in the reduction analysis using the reduction fields steps outlined in chapter two (Appendix 1). These categories are;

a) Utility products

Utility products are the by-products of utilisation, modification and, or resharpening of shaped, modified and utilized tools.

b) Production categories

Production categories differ from the other categories in that they are preconceived end products designated for specific purposes. These may range from cores to various curated and modified tool (Appendix 1)

c) Manufacture products

Manufacture products comprise all the products arising from (including mistakes) the preparation and or, manufacture of the above described production categories.

d) Undiagonistic categories

Undiagonistic categories in this analysis, comprise all artefacts that can not be ascribed, with certainty to any of the above three categories. These residual category comprises foot-fall and flakes whose surface attributes do not facilitate their identification to a specific reduction stage in the analytical fields shown in Fig 1.1

Table 6.3 Reduction categories densities.

Trench	UT	PC	MP	UND
11	351.5	205.33	160	39.11
12	529.5	302.61	308.6	45.21
13	86.25	56.25	66.25	7.5
14	54.28	50	42.85	5.71
15	542.05	177.5	239.25	42.99

<u>Key</u>

UT utility products

MP manufacture products

PC production categories

UND undiagonistic categories

Fig 6b Reduction categories.

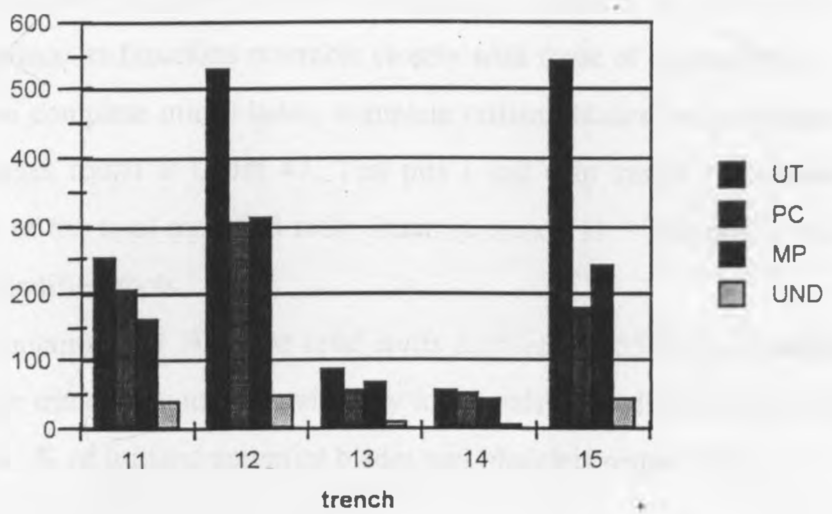


Table 6.4 mean, standard deviation (std. dev.), maximum (max.) and minimum (min.) values for reduction categories.

	N	mean	std dev.	min.	max
utility product	1463	292.8	234.43	54	542
production category	792	58.4	106.89	50	303
manufacture products	717	163	112.49	43	308
undiagonistic category	143	28	19.7	9.7	45

6.3 MODIFIED TOOLS

The Figs in table 6.3 are densities computed from the frequencies in each trench. Trench 12 has the highest total density. Both trenches 12 and 15 have high densities of utility products and manufacture products. Trenches 13 and 14 have persistent low densities of all categories.

Shaped tools and their relation to other classes of artefacts in any assemblage are sensitive indicators of activity areas. Few are however found in their primary use areas.

Table 6.5 shows the frequencies of modified tools in each test pit. This class of artefacts comprise tools with a shorter use-life compared to curated. It is thus an important part of any assemblage since its functions resemble closely with those of curated tools.

There are no complete mint blades, complete utilized blades and proximal segmented blades in the assemblages found at GvJm 47. Test pits 1 and 4 in trench 11 contain 43.1 % and 56.9 % respectively of the total modified tools found in trench 11. Test pits 2 and 3 in the same trench contain no modified tools.

Trench 12 contains 66.3 % of the total *ôutils ècailles* and 55.7 % of modified tools found at the site. All other trenches contain persistently low levels of modified tools. Trench 12 contains 70.6 % and 38.46 % of utilized and mint blades and bladelets respectively.

Table 6.5 modified tools

mt	1	2	3	4	5	6	7	8	9	10	11	12
a	0	0	0	1	2	0	0	1	0	0	0	0
b	0	0	0	0	0	0	0	0	0	0	2	0
c	0	0	0	1	7	0	3	1	1	0	0	2
d	0	0	0	1	1	0	1	0	0	0	0	0
e	5	0	0	6	13	3	0	0	0	2	0	0
f	4	0	0	2	4	3	1	0	0	0	0	0
g	5	0	0	0	4	0	1	0	0	0	0	2
h	2	0	0	1	3	2	1	0	0	0	0	0
i	0	0	0	0	0	0	0	0	0	0	0	0
j	0	0	0	0	0	0	0	0	0	0	0	0
k	0	0	0	0	2	2	0	0	0	0	0	0
l	0	0	0	0	0	0	0	0	0	0	0	0
m	0	0	0	1	1	0	0	0	0	0	0	0
n	0	0	0	3	15	1	0	0	0	0	0	0
o	0	0	0	1	6	0	3	2	0	0	0	0
p	0	0	0	1	13	0	0	0	0	0	0	0
q	8	0	0	13	61	6	1	2	1	0	0	0
r	0	0	0	2	5	3	0	0	2	2	2	0

Key

1 =trench 11 test pit 1 **2** =trench 11 test pit 2

3 =trench 11 test pit 3 **4** =trench 11 test pit 4

5 =trench 12 test pit 1 **6** =trench 13 test pit 1

7 =trench 13 test pit 2 **8** =trench 14 test pit 1

9 =trench 14 test pit 2 **10** =trench 15 test pit 1

11 =trench 15 test pit 2 **12** =trench 15 test pit 3

Table 6.5 modified tools

mt	1	2	3	4	5	6	7	8	9	10	11	12
a	0	0	0	1	2	0	0	1	0	0	0	0
b	0	0	0	0	0	0	0	0	0	0	2	0
c	0	0	0	1	7	0	3	1	1	0	0	2
d	0	0	0	1	1	0	1	0	0	0	0	0
e	5	0	0	6	13	3	0	0	0	2	0	0
f	4	0	0	2	4	3	1	0	0	0	0	0
g	5	0	0	0	4	0	1	0	0	0	0	2
h	2	0	0	1	3	2	1	0	0	0	0	0
i	0	0	0	0	0	0	0	0	0	0	0	0
j	0	0	0	0	0	0	0	0	0	0	0	0
k	0	0	0	0	2	2	0	0	0	0	0	0
l	0	0	0	0	0	0	0	0	0	0	0	0
m	0	0	0	1	1	0	0	0	0	0	0	0
n	0	0	0	3	15	1	0	0	0	0	0	0
o	0	0	0	1	6	0	3	2	0	0	0	0
p	0	0	0	1	13	0	0	0	0	0	0	0
q	8	0	0	13	61	6	1	2	1	0	0	0
r	0	0	0	2	5	3	0	0	2	2	2	0

Key

1 =trench 11 test pit 1 **2** =trench 11 test pit 2

3 =trench 11 test pit 3 **4** =trench 11 test pit 4

5 =trench 12 test pit 1 **6** =trench 13 test pit 1

7 =trench 13 test pit 2 **8** =trench 14 test pit 1

9 =trench 14 test pit 2 **10** =trench 15 test pit 1

11 =trench 15 test pit 2 **12** =trench 15 test pit 3 a =bladelet complete mint. **b** = bladelet complete utilized

c =bladelet segmented proximal mint **d** = bladelet segmented proximal utilized

e = bladelet segmented medial mint **f** = bladelet segmented medial utilized

g = bladelet segmented distal mint **h** = bladelet segmented distal mint

I = blade complete mint **j** = blade complete utilized

k = blade segmented proximal mint **l** = blade segmented proximal utilized

m = blade segmented medial mint **n** = blade segmented medial utilized

o = blade segmented distal mint **p**= blade segmented distal utilized

q = *ôutils ècaillès* (oe) **r** = segmentary flakes

6.4 SHAPED TOOLS

Shaped tools comprised microliths, borers, percoirs, points, scrapers and formal burins. All assemblages had low frequencies of points, borers and percoirs. The total number of tools was 95.

Microliths comprised 44 % in both trenches 11 and 12. Trench 4 had none while trenches 13 and 15 had 4% and 8% respectively. 34.5 % of scrapers were found in trench 11, 51.6 % in trench 12, 6.9 % in trench 15 and 3.4 % in both trenches 13 and 60 % of burins found were in trench 12, 17.1 % in trench 11, 8.6 % in trench 13, 2.9 % in trench 14 and 11.4 % in trench 15

Table 6.6 Shaped tools (st) frequencies.

st	1	2	3	4	5	6	7	8	9	10	11	12
mic	4	0	0	7	11	0	0	0	0	2	0	0
bop	0	0	0	1	1	0	0	0	0	2	0	0
pts	0	0	0	1	0	0	0	0	0	0	0	0
scr	4	0	0	6	15	1	0	0	1	0	2	0
fbu	2	4	21	2	2	1	0	0	0	2	2	0

Key

1 =trench 11 test pit 1

2 =trench 11 test pit 2

3 =trench 11 test pit 3

4 =trench 11 test pit 4

5 =trench 12 test pit 1

6 =trench 13 test pit 1

7 =trench 13 test pit 2

8 =trench 14 test pit 1

9 =trench 14 test pit 2

10 =trench 15 test pit 1

11 =trench 15 test pit

12 =trench 15 test pit 3

mic =Microlith

bop =borers & percoirs

fbu =formal burins

Scr =scrapers

Table 6.7 mean, standard deviation (std. dev.), maximum (max.) and minimum (min.) values of shaped tool frequencies.

St	N	mean	std dev.	Min.	Max.
microlith	25	4.8	5.72	0	11
borer/percoir	4	0.8	0.84	0	2
point	1	0.20	0.45	0	1
scraper	30	6	6.5	1	15
formal burin	35	7	8.03	1	21

Table 6.7 shows that the standard deviation is greater than the mean. This slightly higher standard deviation indicates a much wider scatter of values. The deviation from the mean is however not significant for borers & percoirs and points.

6.5 POTTERY

Pottery is expected to vary in each structural space and is also an important indicator of activity areas.

Trenches 11 and 12 show high density of pottery sherds and which relate closely to the higher number of both modified and shaped tools found in these two trenches. Trenches 13 and 15 have low levels of pottery (Table 6.10) compared to the other three trenches.

Fig 6c. Pottery weight and density.

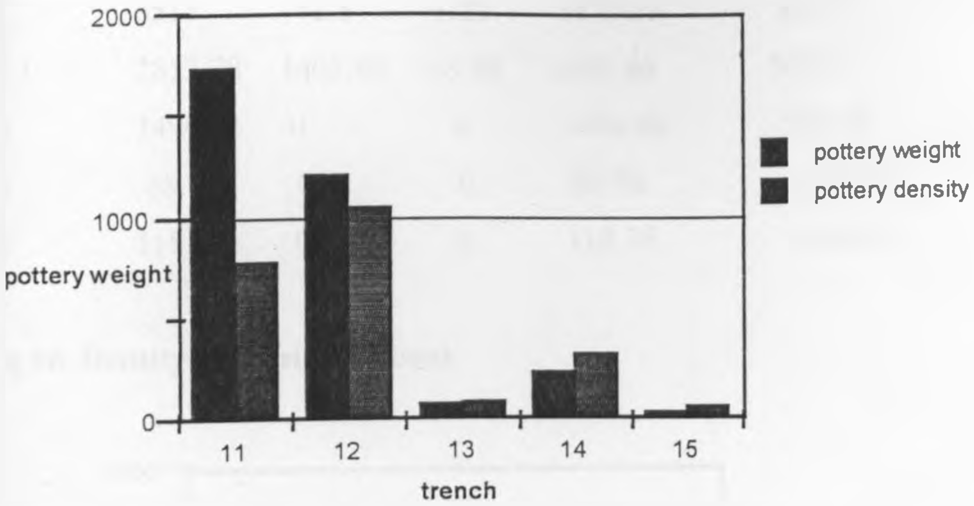


Table 6.8 Pottery weight and density

Trench	weight (grams)	density (grams)
11	1726.00	33767.25
12	1203.01	1046.09
13	60.09	76.13
14	221.94	317.05
15	28.27	52.84

6.6 BONE

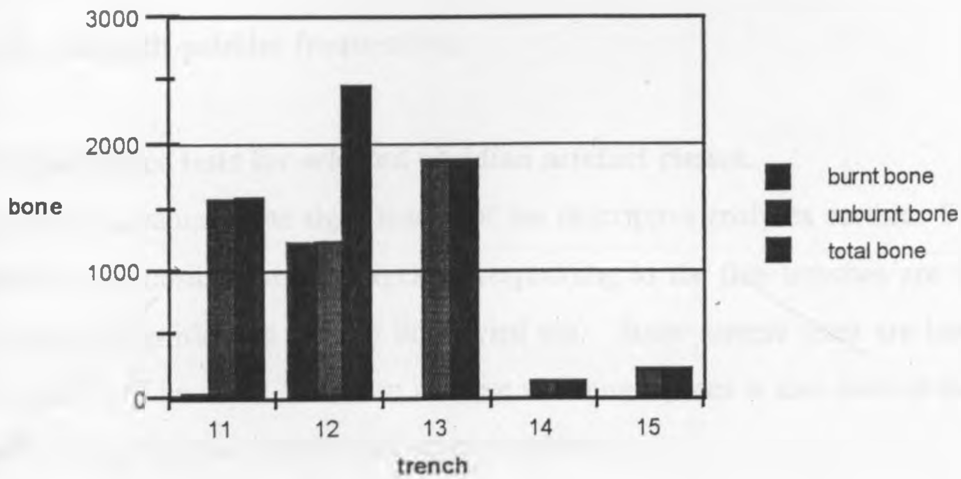
Fig 6d shows the respective densities of both burnt and unburnt weight as well as their combined weight from the five trenches.

Trench 12 has the highest weight of burnt bone. Trench 11 contains very little burnt bone while the other three contain none at all. Trenches 11,12 and 13 have high total bone weight. Trenches 14 and test pit 2 of trench 15, both non- ashy mounds, contain no burnt bone and very low levels of unburnt bone (Table 6.9).

Table 6.9 Bone weight and density

Trench	total	burnt	%	unburnt	%
11	3515	42.8	1.22	3470.55	98.97
12	2812.78	1405.98	48.98	1406.86	50.01
13	1496.86	0	0	1496.86	100.00
14	88.76	0	0	88.76	100.00
15	118.76	0	0	118.76	100.00

Fig 6d. Density and weight of bone



6.7 SMOOTH PEBBLES

Smooth pebbles have been used as a sensitive indicator to supplement the role obsidian artefacts in the identification of activity areas. These comprise microcrystalline silica stones found in ostriches crops, hence the name gastroliths. Most are amber coloured and are used in traditional societies for necklace making and rituals.

Smooth pebbles from GvJm 47 are found concentrated in test pit 4 of trench 11 which contained 80 out of a total of 97. Fig 6e illustrates the trench distribution of smooth pebbles.

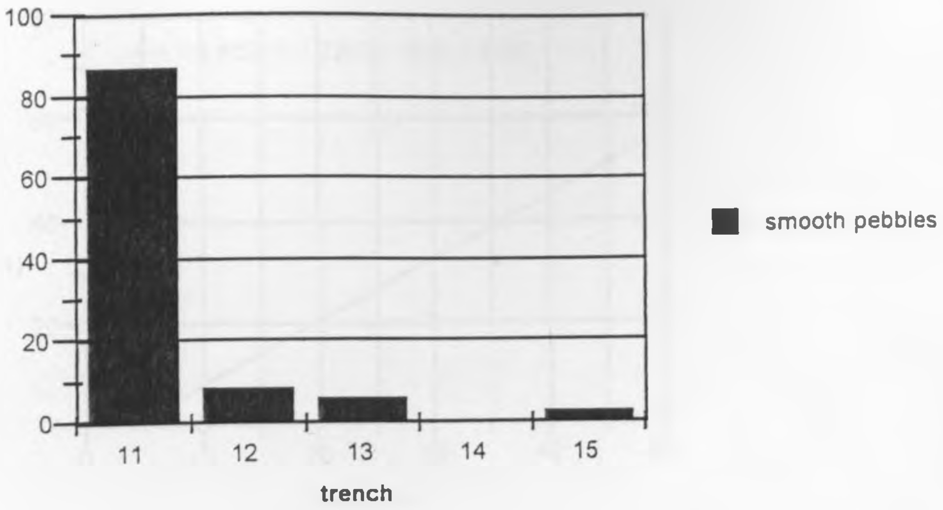


Fig 6e. Smooth pebbles frequencies.

6.8 Significance tests for selected obsidian artefact classes.

This section evaluates the significance of the descriptive analyses sections 5.0 to 5.8. Most tool classes in the obsidian assemblages corresponding to the five trenches are very low in number for credible significance tests to be carried out. Some sample sizes are however adequate and only those will be used. Variation in these structural spaces is also seen in the non-lithic cultural material such as bone, pottery and smooth pebbles.

The following scatter plots show the correlation between various tool classes.

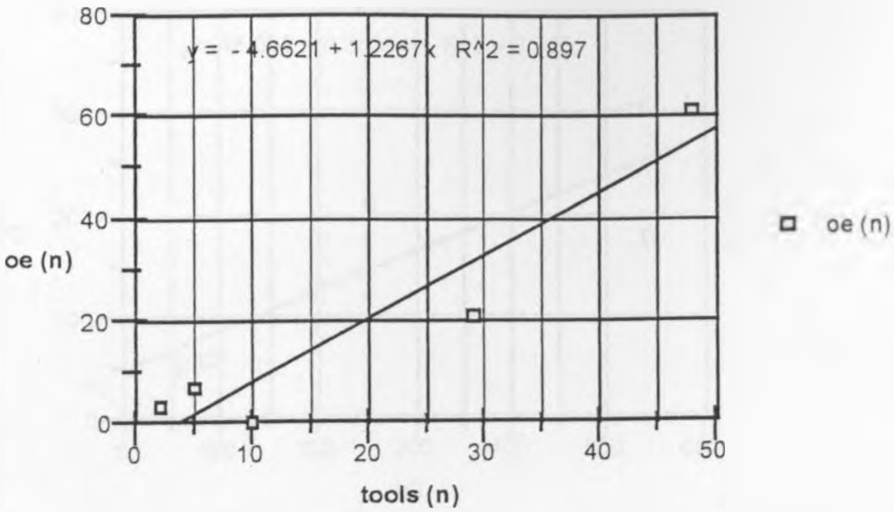


Fig 6f. Scatter plot of oe (*ôutils écaillés*) versus shaped tool frequencies.

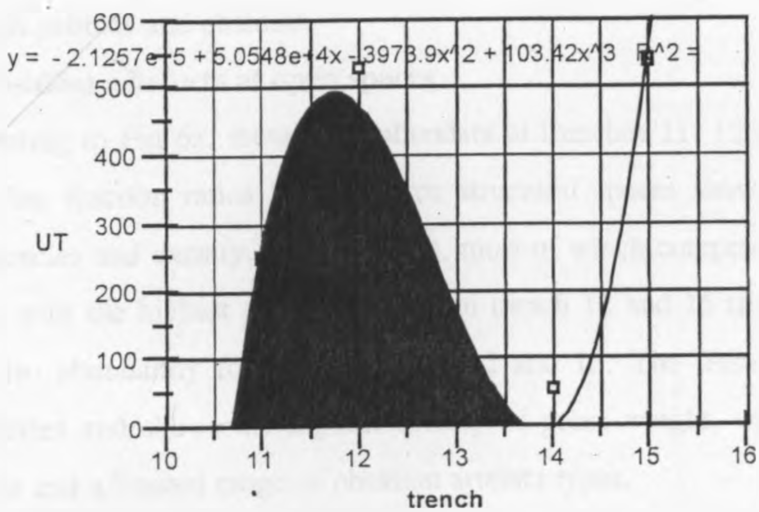


Fig 6g. Trench versus utility debris.

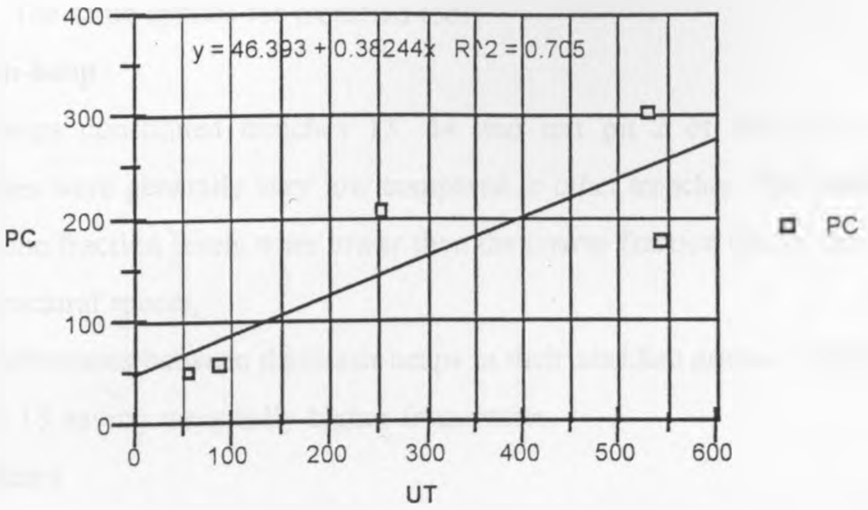


Fig 6h. Scatter plot of utility (UT) versus production categories (PC).

6.9 Discussion and conclusion

Five structural spaces corresponding to trenches 11,12,13 14 and 15 have yielded diversity in both the lithic and non-lithic cultural remains material. The material include: bone, pottery, smooth pebbles and obsidian.

a- Obsidian artefacts at open spaces

According to Fig 6a, these were abundant at trenches 11, 12 and test pits 1 and 3 of trench 15. The fine fraction ratios for the three structural spaces show significant variation in terms of frequencies and density. Utility debris, most of which comprises fine fraction, has been noted to vary, with the highest densities found in trench 12 and 15 (Fig. 6a). Manufacture by-products are also abundantly found in trenches 12 and 15. The former is however rich in all artefact categories and shows the highest density of gross weight, while the latter has very low gross weight and a limited range of obsidian artefact types.

Trench 11 shows moderate abundance of most artefact types that are however concentrated in test pits 1 and 4. This trench also has a high ratio of fine fraction coarse fraction. Its gross artefact weight is also significantly lower than that of trench 12, thus indicating that the size of artefacts recovered from this structural space was generally smaller than what was recovered from trench 12.

Most tools in the open spaces are however found in trenches 12 and test pits 1 and 4 of trench 11. The same applies for modified tools.

b) Ash-heap

Ash-heaps constituted trenches 13, 14 and test pit 2 of trench 15. Their obsidian artefact densities were generally very low compared to other trenches. The radical difference here is that their fine fraction levels were lower than the coarse fraction that is the reverse case in the rest of the structural spaces.

The differences between these ash-heaps in their obsidian artefact configurations is minimal with trench 13 having marginally higher frequencies.

c) Pottery

Pottery was well represented in trenches 12 and 11 as shown by the density of the weight (Fig. 6c). It is highest at trench 11. The ash-heaps and trench 15 have very low densities of pottery.

d) Bone

This is abundant in trenches 11, 12 and 13 but in varying ratios between the burnt and unburnt bone. The ash heaps, ie trench 13 has a high density of unburnt bone weight. Trench 12 has an almost proportional density of burnt and unburnt bone. Trench 11, while displaying a high density of unburnt bone, has a low level of burnt bone (Fig. 6d).

Trenches 11 and 13 are near to one another and they share the attribute of high unburnt bone densities. However, trench 14 is also physically near to trench 11 (Fig. 4.2), but contains very low bone density. The density of bone to that of obsidian is comparably high in trenches 11 and 12 but there is a lack of such correlation in trench 13 (Fig.6.1).

e) Smooth pebbles.

Smooth pebbles occur in significant sample size only in test pit 4 of trench 11. They are indicative of a set of tasks performed in this space. This is because the pebbles are found in association with other cultural material such as bone, pottery and lithics.

The above statistical analyses show variation in the classes of artefacts found using the analytical fields outlined in appendix 1. Since variation in the classes of both obsidian and non-lithic cultural material has been established, an assessment of the test implications outlined in chapter 4 can now be made. This will be discussed in the next chapter.

CHAPTER 7

SYNTHESIS

7.1 Introduction

Assemblage composition and site structure analyses were used in this study to find activity areas. In assemblage composition, emphasis was laid on utility debris. This chapter looks at the utility of this approach in identifying assemblages that can be associated with different activities at site GvJm 47.

After the consideration of factors that may erroneously point to activity areas (chapter 2), the statistical analyses of obsidian artefacts, plus the collaborating evidence of other non-lithic cultural material have yielded the following types of activity areas;

7.2 Primary deposition areas.

Primary deposition areas denote the loci where cultural material was deposited after it was manufactured /procured and used, re-used, or modified and finally abandoned. Such material comprises lithics, pottery and bone. This material comprises of small unobtrusive lithics and pottery sherds. Ochre, charcoal and ash has been found in small traces.

7.2.1 Trench 11

A primary deposition area is represented by trench 11. The obsidian artefacts point to a higher ratio of micro-debitage, especially utility products, compared to any other trench on the site. The greater percentage of the lithic remains is concentrated in test pits, 1 and 4 which are 4.2 metres apart. Test pits 2 and 3 are 35 and 39.2 metres respectively from test pit one.

The utility debris represents reduction by- products that result from core management, tool use and modification (Fig. 1.1, 1.2). Activities that may be inferred from this kind of debris would involve tool use, modification and curation. Fine fraction densities, far exceeding the coarse fraction, as well as the low gross weight of obsidian artefacts indicate cleaning of surfaces. Cleaning would also show intensive activity resulting from curation and use of lithic artefacts, hence making their removal necessary. Work and living areas are more likely to be cleaned because accumulated waste can be obstructive, and in the case of obsidian flaking, risky due to the sharp edges associated with the reduction of obsidian. No postholes or house remains have been found to support habitation of architectural spaces. Production categories of shaped and modified tools were fairly represented but manuports, cores, unshaped tools and utilised pieces were very low in density.

Pottery was used at the spaces as indicated by the weight of the sherds found at this trench. However, no evidence of pottery making was found. Pots may have been used for cooking since one hearth was found in test pit 2. Two hearthstones, both showing signs of oxidation on their lower edges and blackening on the upper sides, were found. Test pit 2 is very low in lithic coarse fraction but exhibits ashy patches at the 20 cm level. Charcoal remains are also found in test pits 1, 2 and 4.

Bone, although poorly preserved is also found at this trench. The bone found so far represents bovids and ovicaprids. Teeth have been used in the identification of the species. Very little charred bone has been found in this trench. Again, the presence of bone can be associated to cooking activities performed in a living area.

Smooth pebbles have been found only in test pit 4. They are evenly distributed between the 20cm to the 30-cm level and thus do not represent caching. No ostrich faunal remains were found hence the pebbles are likely to have been put to a specific cultural use.

The surfaces of this trench, with the exception of test pit 3, which was at the periphery of the ash-heap, were very compact and the cultural layer began at the 25-cm level. Compact surfaces represent structural modification of a surface and results from mechanical trampling. This especially happens in stocking areas, droveways and surfaces intensively used by humans (Courtly, 1989).

This trench, given the above discussed evidence represents an activity set where lithic material were made, used, modified and bigger pieces removed and discarded elsewhere at the end of their use-life cycle. Activities performed in this structural space also involved dismemberment of carcasses and, or cooking. Cooking is supported by the presence of pottery, ash hearths and charcoal remains.

7.2.2 Trench 15

Test pits 1 and 3 of this trench represent a primary deposition activity area. This trench is characterised by high densities of fine fraction, low tool and modified tool as well as coarse fraction frequencies. The highest class of density of obsidian artefacts is manufacture products. These are largely the by-products of the processes of tool curation, conversion of manuports to cores, mistakes and other products of tool manufacture.

No ash and very little bone were found at test pits 1 and 3 of this trench. The cultural layer was very compact and close to the surface and rarely exceeded 15-cm. This space lay southwards of both trenches 11 and 13.

Trench 15, with the exception of test pit 2, represents an area of a set of activities that make necessary the removal of larger lithic material. The compact nature of the soil strata may be indicative of mechanical trampling. The soil profile is continous in colour and composition and lacks the variation noted in other trenches. This shows lack of secondary deposition and other anthropogenic factors that result in modification of the micromorphology of the soils.

Pottery is also very low in density at this structural space. This, combined with the lack of ash or ashy patches, shows that a different activity or set of activities from those that produced the assemblage of trench 11, were performed here. The high density of fine fraction and very low density of coarse fraction indicate an intensely cleaned space.

7.3 Secondary deposition areas

Secondary deposition areas are those whose lithic assemblages and non-lithic material are derived from the site's entire range of activities. These are called multiple secondary middens. Such areas are expected to contain a wide variety of cultural material. The density of each class of cultural material is high. In the case of lithic artefacts, the proportion of coarse and fine fraction is not expected to differ radically.

Where a secondary deposition area is created out of waste from a single activity, the resulting structure is called a single secondary midden and is distinguished by the dominance of one class of cultural material.

7.3.1 trench 13

Trench 13 is a bone and ash midden and represents a secondary deposition area. The cultural deposits are derived from ash. Uncharred bone is present in high densities, but it may have comprised part of the waste found around the hearths from which the ash was removed. The same case applies to obsidian artefacts and pottery which are however found in low quantities and are thus incidental to the ash deposits. This makes this structural space a single secondary midden whose cultural layers comprise ash from fireplaces and waste found around such fireplaces. Such waste comprised of bone, lithics and potsherds, which were however in low quantities.

Obsidian material found in this trench comprise of a higher ratio of coarse fraction compared to the fine fraction. This is again indicative of secondary context of the obsidian.

The association of bone and ash leads to the inference of cooking. This did not however produce charring hence indicating indirect burning in temperatures of not more than 400 degrees at which bone begins to change colour (Courtly, 1989). This ash midden is not located far from the source of the ash. This can be deduced logically and also from ethnographic analogy with the Maasai refuse disposal practices at the main settlements camps (Mbae, 1990). Trench 11, which shows evidence of hearths and ashy patches, is the most likely source of the cultural deposits that comprise trench 13. Test pit 3 of trench 11 is found on the periphery of the ash midden (trench 13), hence showing the physical proximity between these two structural spaces. This ash midden is the only one on the site.

7.3.2 Non-ashy middens

Trench 14 is a mound comprising of a mixture of ash, ash nodules and very low frequencies of lithic artefacts, bones and pottery. This area is highly affected by bioturbation and the natural gradient of the mound is difficult to discern. The soil comprises high levels of cellulose inclusives that can be related to bovid dung. Real dung has been found but may have been introduced to the lower levels through bioturbation. This trench resembles test pit 2 of trench 15, which displays the above characteristics.

Deductions made about this trench are that the trench may have been used as a *Kraal* area by the social group that occupied this site during the PN. This is supported by the low levels of cultural material found and also ethnographic evidence of *kraals* being located near the living areas for protection (Mbae 1990). Younger animals are especially kept near habitation areas, as they are more vulnerable to predators and trampling by the bigger members of a herd (Personal observation). In modern pastoral communities such as the Maasai, young animals are separated from the herd to control the suckling since milk also forms an integral part of the diet of pastoralists (Personal observation).

The mound-like structure of this trench, and also test pit 2 of trench 15, may have resulted from accumulated dung.

7.3.3 Trench 12

Trench 12 trench represents a secondary multiple depositional area and whose aggregate of culture material results from a stream of activities across the site.

Trench 12 has the highest density of gross lithic density in terms of frequencies and weight. It also has a high representation of all three major reduction categories. The result is a heterogeneous assemblage that is difficult to tie to any specific activity or set of inferred activities.

The coarse fraction ratios of obsidian artefacts are also high and the gross artefact weight shows that the coarse fraction material comprised heavier pieces than those of the other trenches.

This structural space is located down hill of the site and represents a wider area used for the same purpose. This is shown by material from erosional exposures (Fig. 4.2)

Large quartz and microcyrstalline silica pieces are abundant at this trench. Ash is also found, but does not form strata. It is instead found as thin patches together with both burnt and unburnt bones and potsherds. These cultural material remains are found in clusters about 20 cm 20 cm wide and 5cm-7cm in depth and they appear to represent dumping episodes.

7.4 Assessment of the test implications.

The statistical analyses have yielded the above discussed structural spaces. The inferences and deductions mentioned in the above discussion have been reached using the variation in the classes of obsidian artefacts and other non-lithic cultural material. Variation was reflected in density, size, and type of structural space, context and the raw material of the cultural remains. The latter has however been restricted to obsidian, ceramics, gastroliths, and bone.

The analyses outlined in chapter 5 have achieved the set objectives of the study, which was to identify activity areas at GvJm 47.

The core of the study revolved around the following propositions;

a) **That PN sites contain identifiable spaces which can be identified by structures, middens and the density of different material such as bone refuse and utility debris.**

This has been validated in that the structural spaces within the site have been found to have boundaries, which can be identified using the density of the cultural remains and the distinction of sedimentary features in association with another.

The specific density of artefact types and faunal remains found in the structural spaces vary, reflecting the kind of activity and intensity of use.

b) That assemblage composition is different on different spaces on the site.

This has been found to be true because the relative proportion of tool types in each type of structural space varies, reflecting the patterns of cleaning and discard.

Utility debris has been a sensitive indicator of the use of different tool sets for specific activities within the different spaces on the site.

The ratio of lithics, ceramics and food remains vary systematically. The condition of the artefacts to a moderate degree varies within the structural spaces due to activities independent of use and disposal.

c) That distinct, spatially segregated assemblages identify areas of different activities and discard within the site.

Assemblage variation can be correlated with types of spaces or parameters, which define sampling strata. The assemblage boundaries and the boundaries between spaces have been found to be coterminous or overlapping. The boundaries of trench 11 and 13 are coterminous.

Finally, the different assemblages found within the site's spaces are segregated into identifiable sub-spaces. An example is trench 11, whose four test pits are indicative a set of related activities.

7.5 Wider implications of the study

As earlier mentioned, the search for activity areas within the PN context has been confounding. The main reason has been attributed to the fact that intensely used areas are cleaned and cultural material, including tool sets, have been removed and discarded in secondary refuse middens. This study, using the micro-debitage and other utility debris left behind after cleaning, has been able to trace the larger artefact classes associated with such microdebitage. The utility of reduction analysis as a typological tool has also been demonstrated. This study has opened a new pathway in the identification of activity areas within the PN context.

Domestication in Eastern Africa marks a critical departure in the subsistence base of the prehistoric societies. Studies on the effects of food production on social groups have shown a gradual transformation in the settlement types, demographic profiles as well as technology, among other things. Such changes are, to a great degree, manifested in the spatial organisation of pastoral societies. The understanding of the range of activities, the organisation of space and its degree of elaboration, will go a long way in highlighting the transformation and transition phases that food producing societies went through. This is especially important since there are few if any architectural remains associated with prehistoric pastoralists. The only evidence of continous occupation are various types of middens containing food and lithic remains. Activity areas remain the only fundamental framework for understanding the organisation of prehistoric activities at settlement sites.

The above should lead to an understanding of the changes that took place in settlement types from the PN to the present and consequently the cultural transformation that accompanied the changes.

7.6 Recommendations for future studies.

The use of utility debris as an integral tool for the identification of activity areas was successful at GvJm 47. However, its applicability to other PN sites that may exhibit different use and discard patterns needs to be tested. Only then can the method be recommended as a solution to the search for activity areas at PN sites. More research using the method is required. This would also serve the dual purpose of increasing PN studies and facilitate a more comprehensive chronology of this period.

BIBLIOGRAPHY

Acker, E. 1996. *Life in a Rock shelter.* Texas: Hendrick Long Publishing Co.

Ambrose, S.H. 1980. Elementaitan and other Late Pastoral Neolithic adaptations in the Central Highlands of East Africa. In *VII Panafrican Congress*: Pp. 279-82

Baker, C.M. 1978 The Size Effect: An Explanation of Variability in Surface Artefact Assemblage Content. *American Antiquity. Vol.43. No. 2.*

Barut, S. 1996. *The Later Stone Age Raw Material Use at Lukenya Hill, Kenya.* Unpublished Ph.D. thesis, University of Illinois at Urbana-champaign.

Binford, L.R. 1981. Behavioural Archaeology and the Pompeii Premise. *Journal of Archaeological Research. Vol. 37. no.3.*

Behrensmeyer, A. & D. D. Boaz. 1980. The Bones of Amboseli, Kenya, in Relation to East African Paleoecology. *Paleobiology.* 56-64.

Behrensmeyer, A. 1978. Taphonomic and Ecological Information from Bone weathering. *Paleobiology,* 150-162.

Brain, C.K. 1969. The Contribution of Namib Desert Hottentots to an Understanding of Australopithecine Bone Accumulations. *Scientific Papers of the Namib Desert Research Station.*

Barthleme, J.W. 1984. *Early Evidence for Animal Domèstication in Eastern Africa.* In (eds.) J.D.Clark and S.A.Brandt, 1984 From hunters to farmers the Causes and Consequences of Food Production, Pp.200-205 Berkeley: University of California Press.

Binford and S.R Binford 1966. *New Perspectives in Archaeology*, Pp 89-102. Chicago: Aldine Publishing Company

Binford, L.R. 1983. *Working at Archaeology.* New York: Academic Press.

Bower, J.R.F. 1984. Settlement Behaviour of Pastoral Societies. In (eds.) J.D. Clark and S.A. Brandt, *From hunters to Farmers: the Causes and Consequences of Food Production,* pp 252-260 Berkeley: University of California Press.

Bower, J.R, C.M. Nelson, A.F. Waibel, and S.Wandibba. 1977. The University of Massachusetts Later Stone Age /Pastoral Neolithic Comparative Study in Central Kenya: An Overview. *Azania Volume* XII

Brooks, A.S. and J.E.Yellen. 1987. *The Preservation of Activity Areas in the Archaeological Record: Ethnoarchaeological and Archaeological Work in Northwest Ngamiland.* In (ed.) S. Kent, Method And Theory for Archaeological Research: An Ethnoarchaeological Approach pp 63-106 New York: Columbia University Press.

Cable, C. 1990. *Stone Artefact Assemblages from the Lemek-Mara region.* In (ed.) P. Robertshaw, Early Pastoralists of Southwestern Kenya, *Memoir11.* Pp 82-86. The British Institute in Eastern Africa.

Courtly P. 1989. *Soils and Micromorphology in Archaeology.* Cambridge: Cambridge University Press.

Dart, R. 1953. The Predatory Transition from Ape to Man. *International Anthropological and Linguistic Review.* 1 201-219.

Dunnell, R. C. 1992. *The Notion Site.* In Space, Time and Archaeological Landscapes. J. Rossignol and L.Wandsnider. (eds.). Plenum Press. New York.

Gifford, D.P, G.L. Isaac, and C.M. Nelson. 1980. Evidence for Pastoralism and Predation at Prolonged Drift: A Pastoral Neolithic Site in Kenya. In *Azania*: xv:57-100. The British Institute In Eastern Africa.

Gifford, D. P. 1981. *Taphonomy and Paleoecology: A Critical Review of Archaeology's Sister Disciplines.* In Advances in Archaeological Method and Theory. *Vol. 4*. Academic Press Inc.

Gramly, R.M 1975. *Pastoralists and Hunters: Recent Prehistory in Southern Kenya and Northern Tanzania,* Unpublished PhD. Thesis, Havard University: Cambridge.

Hill, A.P. 1989. *Bone Modification by Modern Spotted Hyenas.* In R. Bonnischen and M. Sorg (eds). *Bone Modification.* Center for the Study of First Americans.

Kent, S. 1987. *Understanding the Use of Space.* In (ed.) S. Kent, Method And Theory for Archaeological Research: An Ethnoarchaeological Approach Pp. 1-63. New York: Columbia University Press.

Leakey, LS.B. 1931 *Stone Age Cultures of Kenya Colony.* Cambridge: Cambridge University Press.

Longacre,W. 1968. Some Aspects of Prehistoric Society in East-Central Arizona. In (eds.) L.R. Binford and S.R Binford New Perspectives in Archaeology, pp 89-102. Chicago: Aldine Publishing Company.

Mbae, N.B. 1990. The Ethnoarchaeology of Masaai Waste Disposal Patterns in the Lemek Area. In (ed.) Robertshaw. *Early Pastoralists of Southwestern Kenya, Memoir11.* Pp 279-272. The British Institute in Eastern Africa.

Muia, M. 1998. *The Lukenya Industry: A definition.* Unpublished M.A thesis. University of Nairobi: Nairobi.

Nelson, C.M. (n.d) *The Transition to the Later PN at Lukenya Hill.*

Nelson, C.M. 1973. *A Comparative Analysis of Twenty-nine Later Stone Age occurrences from East Africa.* Unpublished Ph.D. Thesis. University Of California: Berkeley.

Owaga, M.L.A. 1975. *The feeding Ecology of Wildebeest, Zebra and Cattle in Kaputei Plains.* Unpublished M.Sc Thesis. University of Nairobi: Nairobi.

Potts, R. 1988. *Early hominid Activities at Olduvai.* Smithsonian Institution, New York.

Redman, C. 1978. *The Rise of Civilizations from Early Times to Urban Society in the Middle East.* Cambridge: Cambridge University Press.

Robertshaw, P. 1990. *Early Pastoralists Of Southwestern Kenya, Memoir No.11.* Nairobi. The British Institute in Eastern Africa.

Schiffer, M.B 1976. *Behavioural Archaeology.* New York: New York Academic Press

Schick, K.D. 1992. *On Making Behavioural Inferences from Archeological sites.* In Clark J.D. Cultural Beginnings, Bonn. 1992.

Schiffer, M.B. 1976. *Behavioural Archaeology.* Academic Press. New York.

Schiffer, M.B. 1987. Archaeological Context and Systemic Context. In *American Antiquity. Vol. 37:2*

Simek, J.F. 1989. *Structure and Diversity in Intra-Site Spatial Analysis.* In (eds.) R.D. Leonard and G.T. Jones. Quantifying Diversity in Archaeology, pp 59-68 Cambridge: Cambridge University Press.

Were, A.I. 1998. *Lukenya Ware: A Definition*. Unpublished M.A thesis, University of Nairobi. Nairobi.

Whallon, R.1984. *Unconstrained Clustering for the Analysis of Spatial Distributions in Archaeology*. In (ed.) Hietala H.J. Intra-Site Spatial Analysis In Archaeology, pp 242-277. Cambridge: Cambridge University Press.

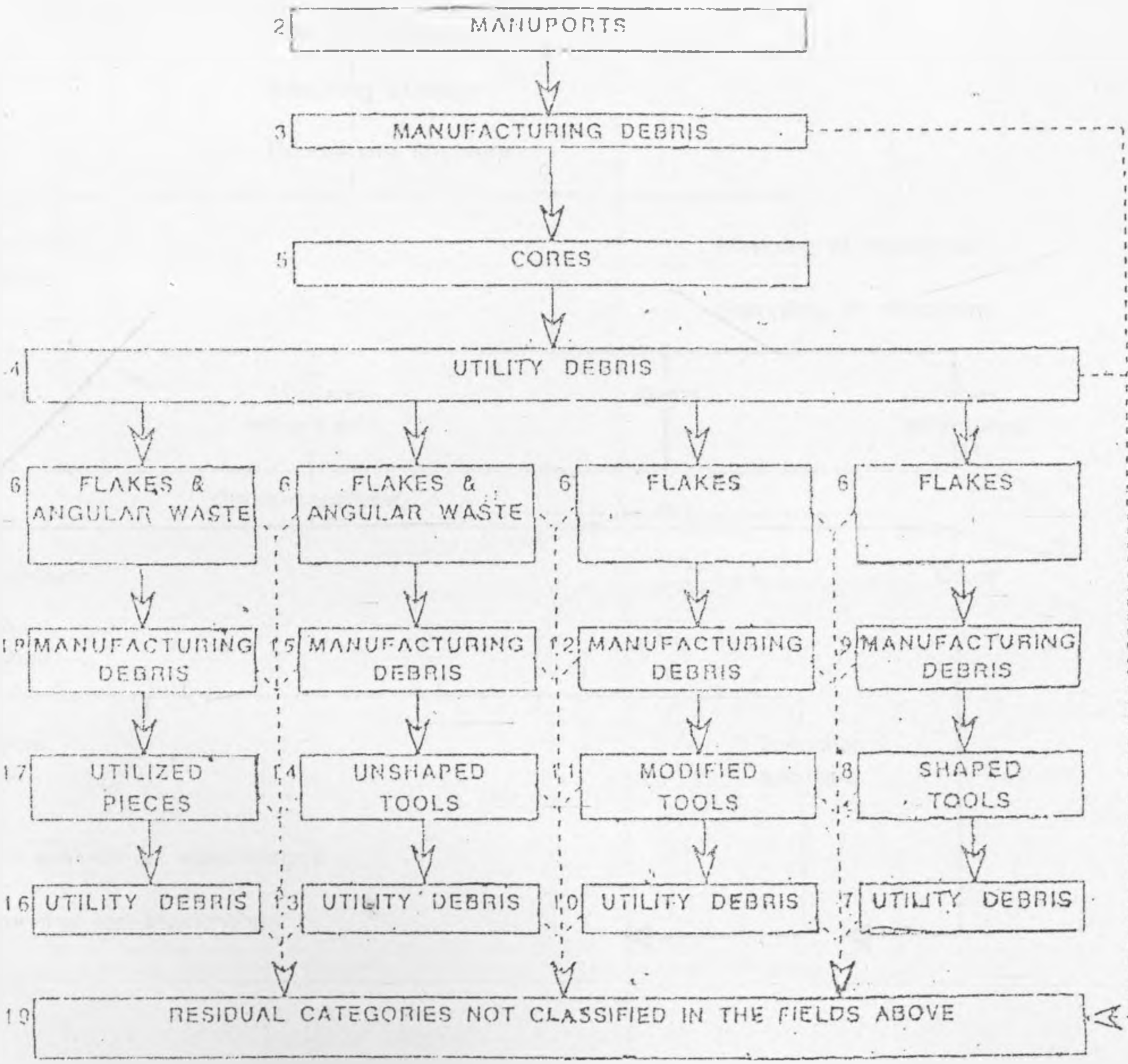
Wilcox, D.R. 1975. A Strategy for Perceiving Social Groups in Puebloan Sites. In Chapters In The Prehistory Of Eastern Arizona, IV *Fieldiana Anthropology* 65:120-159.

APPENDIX 1
Analytical Fields used for typological summary

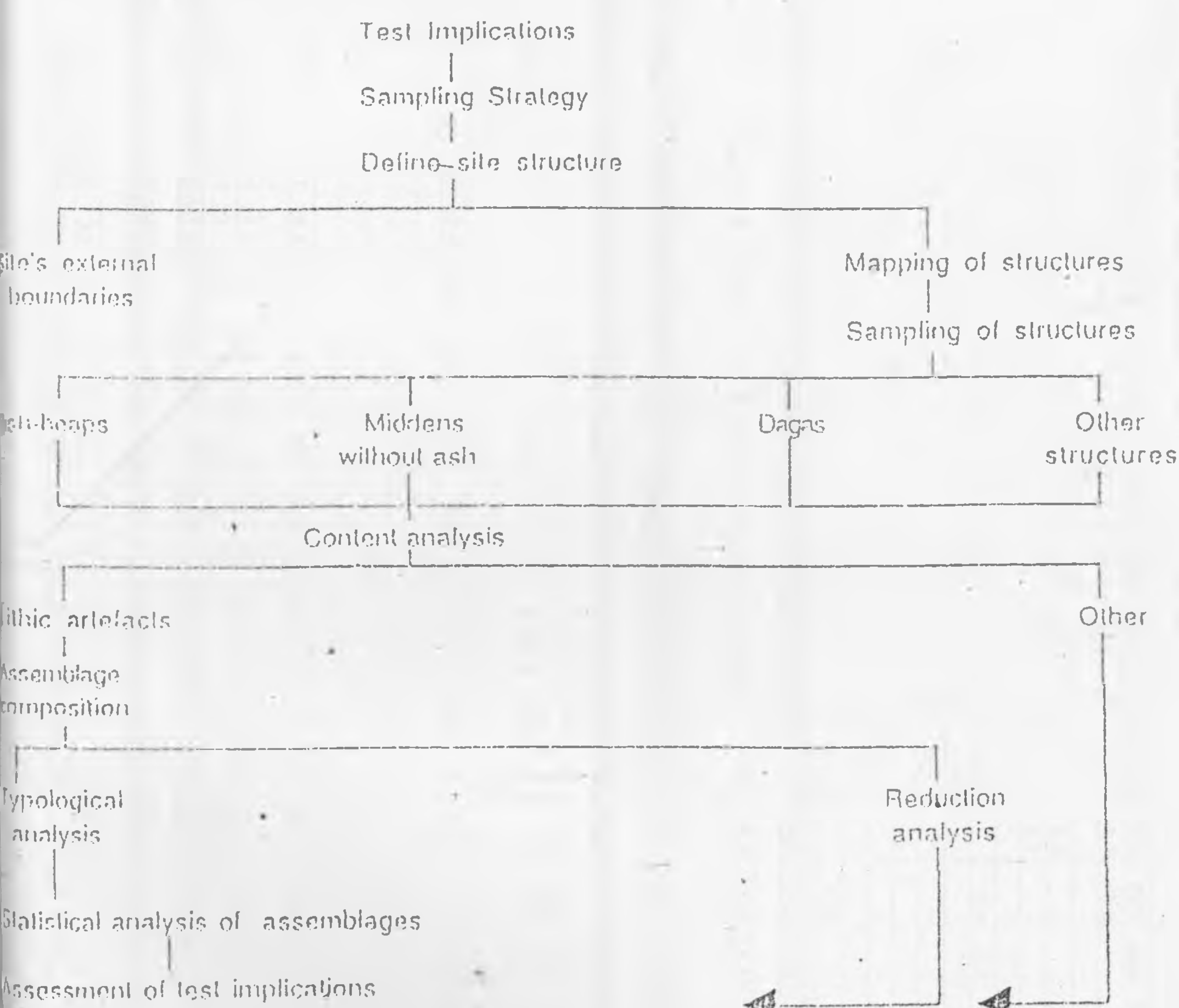
UTILITY PRODUCTS	PRODUCTION CATEGORIES	MANUFACTURE PRODUCTS
1 none	2 MANUPORTS Pebbles, Nodules, Quarry blocks, Weathered artefacts, Lapilli	3 Conversion of manuports to cores Split pieces, Testing flakes, Decortification flakes Primary platform clearing
4 Core management products Stepped/Hinge removal Platform clearing, Core rotation, and Platform edge preparation flakes	5 CORES Objects whose primary role is flake production	6.1 Mistakes Stepped, Hinged and Split Flakes 6.2 Material suitable for use Large flakes and Angular fragments
7 Products of tool use Resharpening flakes, Secondary burin spalls and tranchet flakes, Burin segments, Micro-debitage	8 SHAPED TOOLS Microliths, Backed pieces, Borers and percoir, Points, Scrapers, Formal burins	9 Products of tool manufacture Thinning and trimming flakes, Primary burin spalls and tranchet flakes, Microburins, Krukowski microburins, Flakes segmented on notches, Butt trimming segments,
10 Products of tool use Scalene flakes and angular frags, Scalene burin spalls Scalene tool rotation flakes Bipolar scalene flakes, Derived segments, Secondary burin plan spalls, Secondary chamfer flakes, Trimming flakes from segment faces, Micro-debitage	11 MODIFIED TOOLS Scaled pieces, Segmented flakes	12.1 Mistakes Plunged scaled pieces Plunging flake from scaled piece 12.2 Products of tool manufacture Derived segments (distal, mint), Derived segments (prox, mint), Primary burin plan spalls Primary chamfer flakes Micro-debitage
13 Products of tool use Micro-debitage	14 UNSHAPED TOOLS Becs, Notches, Casually retouched Retouched corners	15 Products of tool manufacture Primary notching flakes, Retouch flakes
16 Products of tool use Micro-debitage	17 UTILIZED PIECES Kasouga flakes, Edge-worn flakes, Utilized flakes, Edge-damaged flakes and angular fragments	18 Products of tool manufacture none
19 RESIDUAL CATEGORIES Undiagnostic flakes; Compression, Bulbar, End shock, Stress and Thermal fragments		

APPENDIX 2

Primary Reduction Pathways and their relationship to the Analytical Fields defined in appendix 1



APPENDIX 3
The Research Design



APPENDIX 4
Frequency of Obsidian Artifacts from GvJm 47 (Muia 1998).

GvJm47	Percentages:																	
	T1P1	T1P2	T1P3	T1P4	T1P5	T2P1	T2P2	T3P1	T4P1	T5P1	T5P2	T5P3	T5P4	T5P5	T5P6	T5P7	Daga	Total
crescent	-	-	-	-	-	-	-	-	2.6	0.3	-	-	-	-	1.1	0.2	-	0.3
Trapeze	-	-	-	-	-	-	-	0.8	-	-	0.4	-	-	-	-	-	-	0.1
Other M-lith	-	-	-	-	1.4	-	-	-	5.3	0.6	0.4	-	-	-	0.5	-	-	0.4
M-lith Frag.	-	-	2.4	-	-	-	-	-	-	-	0.4	-	-	-	2.7	-	-	0.4
scraper convex	-	-	-	-	-	-	2.7	-	-	0.3	-	2.6	-	1.0	-	0.5	2.0	0.4
scraper nosed	4.3	-	1.2	-	-		-	0.8	-	0.6	-	-	-	1.0	-	-	-	0.3
scraper other	4.3	-	-	-	-	-	-	-	-	0.3	-	-	-	-	-	-	-	0.1
Borer	-	-	-	3.1	-	-	-	-	-	0.3	-	-	2.4	-	-	-	-	0.2
Burin	4.3	-	-	6.3	1.4	-	2.7	-	-	0.6	-	-	-	1.9	-	0.5	-	0.6
TOOLS	13.0	-	3.7	9.4	2.9	-	5.4	1.7	7.9	3.0	1.2	2.6	2.4	3.9	4.3	1.2	2.0	2.7
OE 'S	17.4	3.4	2.4	6.3	4.3	-	8.1	1.7	5.3	3.3	2.9	2.6	-	8.7	8.7	1.4	13.7	4.1
Bec*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.2	-	0.1
seg. pieces	-	5.1	4.9	9.4	2.9	-	10.8	-	-	1.5	3.3	7.7	9.8	3.9	8.2	2.6	15.7	3.9
MODIFIED	17.4	8.5	7.3	15.6	7.1	-	18.9	1.7	5.3	4.9	6.1	10.3	9.8	12.6	10.8	4.2	29.4	8.0
Utilized	-	-	-	3.1	-	-	-	-	-	1.2	0.4	-	-	-	1.6	0.2	-	0.5
PRF	-	-	2.4	3.1	-	6.3	-	-	-	0.6	-	-	-	1.0	0.5	0.5	2.0	0.6
Burin spalls	13.0	-	-	-	1.4	12.5	2.7	3.3	6.3	1.5	6.5	7.7	4.9	1.0	4.9	3.3	3.9	3.4
Microburin	-	1.7	-	-	-	-	-	-	-	-	-	-	-	1.0	-	-	-	0.1
Sgmtd on ntch	-	-	-	-	-	-	-	0.8	-	-	0.4	-	-	-	0.5	-	-	0.2
Derived seg.s	13.0	11.9	7.3	15.6	12.9	0.0	8.1	14.0	7.9	4.0	5.3	2.6	9.8	3.9	6.5	4.0	9.8	6.4
K-microburin	-	-	-	-	-	-	-	0.8	-	0.6	-	-	-	-	0.5	-	-	0.2
Tech. n- scraper	-	-	-	-	-	-	-	0.8	-	-	-	-	-	-	-	-	-	0.1
Tech. bec	-	-	-	-	-	-	-	-	-	0.3	-	-	-	-	-	-	-	0.1
burnt obsidian	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.5	-	-	0.1
Flakes	39.1	44.1	31.7	18.8	45.7	62.5	40.5	35.5	36.8	43.5	45.7	33.3	24.4	43.7	39.7	34.9	27.5	39.0
Blade	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.0	0.1
Ang. waste	4.3	33.9	47.6	34.4	30.0	18.8	24.3	41.3	36.8	40.4	34.3	43.6	48.8	32.0	23.4	51.9	23.5	38.6
Total	43.5	78.0	79.3	53.1	75.7	81.3	64.9	76.9	73.7	83.9	80.0	76.9	73.2	75.7	63.0	86.7	52.9	77.6
WASTE	69.6	91.5	89.0	71.9	90.0	100.0	75.7	96.7	86.8	90.9	92.2	87.2	87.8	82.5	76.6	94.4	58.6	86.7
Cores	-	-	-	-	-	-	-	-	-	-	-	-	-	1.0	0.5	-	-	0.1
Sample size	23	59	82	32	70	16	37	121	38	329	245	39	41	103	184	430	51	1900
Totals	100.0	100.0	100.0	98.4	100.0	100.0	100.0	100.0	100.0	99.4	99.8	100.0	100.0	99.5	98.9	99.9	100.0	99.7

APPENDIX 5. Radiometric dates for Lukenya Pastoral Neolithic sites. Source: (Gramly 1975, Bower et al. 1977)

SASES NO	DATE	LAB.REF. NO
	1804±119	GX353
	1501±170	N-1827
GvJm 14	1991±13	N-1884
GvJm 22	1490±131	UCLA1709D
	2311±127	UCLA1709C
	1307±122	N-1076
GvJm 44	2085±135	GX4160-A
	1710±135	GX4160-C
	2030±125	GX4507-A
	2070±155	GX5638-G
	1775±150	GX4507-G
	2415±155	GX5238
	3290±145	GX5348
	1820±200	GX5638-A
GvJm47	1340±145	GX4161-A
	970±130	GX4161-G
GvJm	481810±135	GX5347-G
GvJm 52	1855±180	GX5692-A
GvJm 184	2115±130	GX5774-G
GvJm 202	2295±135	C
	2045±125	A

APPENDIX 6. TERMINOLOGY

Terminology used in stone artefact classification after C.M. Nelson. Source: C. Cable 1990.

A) Shaped tools

A retouched tool is one whose morphology is standardized such that artefacts within any tool type are closely similar in both morphology and the combination of other attributes.

i) Microliths

All small backed tools other than burins.

ii) Scrapers

Scrapers are characterised by unifacial flaking and planoclinal edges, most of which are complex. Some scrapers are made on blades and are distinguished from those made on non-segmentary blades.

iii) Percoirs

Percoirs are sharp tools with sharp points of less than 90° formed by two intersecting lines of steep retouch.

iv) Burin

A burin is a tool whose major working edge lies in the thickness of the piece. It is recognized by the presence of one or more burin facets resulting from the removal of one or more burin spalls.

v) Borer

A borer is a rod-like implement and which may have grinding-like utilisation.

vi) Point

A point is a convergent flake trimmed or retouched to a sharp point.

B) Modified tools

Modified tools are informal tools characterised by modification and/or retouch.

i) *Ôutils écaillés*

These are artefacts with one or more unifacially or bifacially retouched edges characterised by the presence of tiny steep step flakes, crushing and shattering along the edge.

ii) Flake with inverse retouch

Any flake with retouch on the ventral surface. However, blades with inverse retouch are classified as modified blades.

iii) Blades and bladelets

A blade is a flake that is twice as long as it is wide. Bladelets are blades that are less than 2cm in width.

These may be either;

complete

segmented

modified

complete and modified

Complete and mint (unmodified).

Segmented and unmodified

Modification is normally in the form of utilisation and retouch. Blade and bladelet edges in this thesis will be classified as either mint or utilised.

-Modified non-segmentary blades.

These are complete blades and whose edge (s) are modified by utilisation or retouch. Segmentary blades and bladelets may either be;

I- Proximal segmentary mint piece

This is a blade/bladelet segment that is twice as long as it is wide and whose edge(s) has been modified through retouch or utilisation. Proximal pieces are identified by the bulb of percussion and platform.

II- Medial segmentary piece

This is the central section of the blade/bladelet left after the proximal and distal sections have been removed.

III- Distal segmentary piece

This is the bottom part of the blade/bladelet and often smaller in width than either the proximal and medial sections.

C) Unshaped tools

Unshaped tools refer to any casually retouched artefacts other than blades.

i) Casually retouched

A flake or piece of waste, but not a blade, exhibiting casual retouch.

ii) Casual inverse retouch

A flake or any piece of waste, but not a blade, exhibiting casual inverse retouch.

iii) Casually trimmed

Any flake or piece of waste exhibiting casual trimming.

iv) Bec

A pointed artefact manufactured by casually retouching a natural spur or a piece of waste.

v) Kasouga flake

Any flake, but not blade, having a lateral margin modified by casual bifacial retouch interspersed with long, shallow flake scars.

vi) Retouch corner

A corner or snapped edge of an artefact exhibiting casual retouch.

D) Debitage

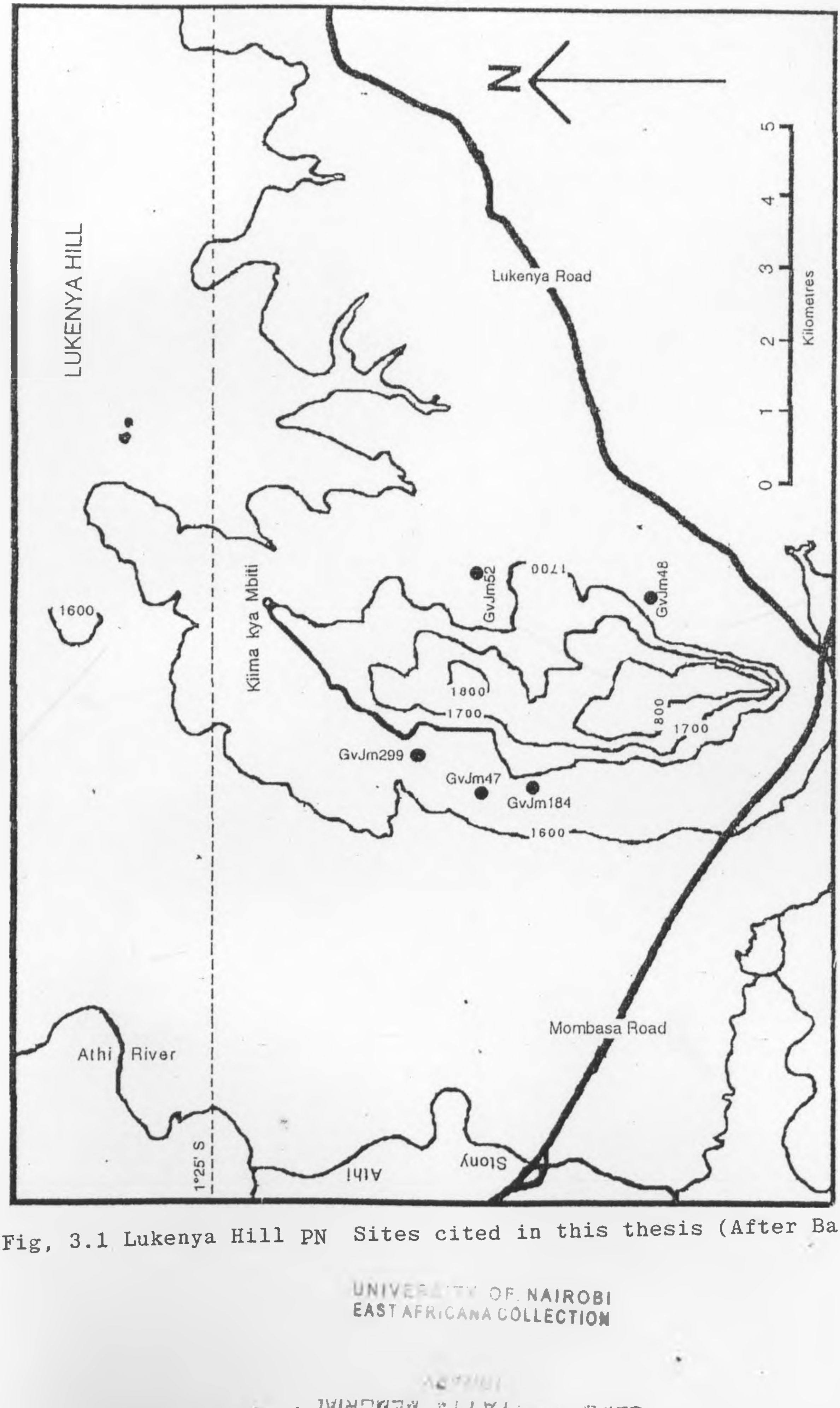
Debitage comprises cores and debris produced as by-products of tool manufacture.

i) Cores

Flaked stone artefacts thought to be sources of blades and flakes used in the manufacture of tools. Cores have been identified as those artefacts that have three or more flake scars.

ii) Debris

Debris comprises waste blades, flakes and angular waste. Debris derives from the processes of manufacture (manufacture products) and utilisation (utility products).



Fig, 3.1 Lukenya Hill PN Sites cited in this thesis (After Barut)