THE RELATIONSHIP BETWEEN THE LATER STONE AGE AND IRON AGE CULTURES OF CENTRAL TANZANIA

By

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ABSTRACT

Many archaeologists, anthropologists, linguists and historians have postulated that the spread of Iron Age (IA) Bantu speaking cultures south of the Sahara was associated with the displacement or absorption of Later Stone Age (LSA) autochthonous populations. The IA Bantu speaking cultures are suggested to have practiced agropastoralism and metal-working while LSA groups were hunter-gatherers. Recently however some scholars have raised questions about the general applicability of the displacement/absorption models to explain cultural developments in sub-Saharan Africa. It is on this basis that archaeological investigation was launched in the Pahi division of Kondoa district in central Tanzania where interaction between LSA and IA cultures took place.

The Pahi research had three main goals, namely to establish the Pahi LSA and IA cultural sequences, to investigate social and economic interaction between the LSA and IA and to ascertain the role of LSA people in the later development of settled societies in central Tanzania. The research involved extensive systematic land walkover and shovel test pits (STPs) survey followed by intensive trench excavation of recovered sites.

The sequence of archaeological remains from the Pahi STP survey strongly supported those of trench excavations. Results from both STPs and trench excavations indicated that lower Pahi stratigraphic sequences consisted of exclusively LSA cultural materials while upper levels consisted of both LSA and IA artifacts. The Pahi LSA cultures dated to 2500 ±40 BP and probably survived until 1030 ± 40 BP when IA cultures became incorporated into the LSA. Despite the early adoption of IA (from IA agropastoralists) by the local LSA populations, lithic production continued to be practiced along with iron-working until recent times when the former was abandoned. The

widespread and continuous distribution of lithic and iron-working remains over the Pahi landscape and the entire upper Pahi stratigraphical sequence suggests that LSA peoples were not replaced by IA agropastoralists after the adoption of IA cultures circa 1030 ± 40 BP. Instead, they incorporated IA cultural elements into their LSA culture. These findings call into question earlier assumptions, generally applied to sub-Saharan Africa, that LSA peoples were replaced or absorbed by IA agropastoralists.

DEDICATION

This thesis is dedicated to my mother Mrs. Epiphania Thomas Kessy and my father the late Mr. Thomas Adolf Kessy († 21 June 2004). Their commitment to my education helped me to achieve my academic dreams. *Ninawashukuru sana wazazi wangu kwa kuniwezesha kufikia hatua hii.*

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CHAPTER 1: INTRODUCTION AND AREA OF RESEARCH

1.1. Introduction

Prehistoric populations of Africa south of the Sahara are said to have been introduced to food production and iron-working as the result of the influence of the dispersal of Bantu speakers from West Africa. Exceptions to this pattern are found in Sudan, Ethiopia, Somalia, the central Rift Valley of Kenya and northeast Tanzania. Food production appeared in West Africa by the mid-fifth millennium BC (Phillipson 1993a:143-149) or perhaps earlier (Ehret 1998:13-14). Iron working in West Africa commenced much later, around the tenth to fifth century BC (Calvocoressi and David 1979; Grébénart 1985; Okafor 1993; Shaw 1978) or by 930-750 BC, based on evidence from the site of Do Dimi, Niger (Grébénart 1985). The introduction of these two cultural elements are believed to have stimulated developments, ultimately leading to an expansion of Bantu cultures towards southern Africa possibly within the last 3000 or 4000 years (Phillipson 1993a:198). However, there are some disagreements between archaeologists and anthropologists over the modes of dispersal and the time at which this process began. Many Africanist archaeologists such as van der Merwe (1980:478-85) and Phillipson (1993a:201-5) believe that the spread of these cultures was associated with large-scale movement of alleged Bantu speakers who ultimately absorbed, displaced, or wiped out autochthonous Later Stone Age (LSA) hunter-gatherers whom they encountered as they advanced southward. Vansina (1994-5, 1995) disagrees with these models and instead suggests that the widespread distribution of Bantu languages and associated cultural elements in sub-Saharan Africa was brought about by successive waves of diffusion of cultural elements without large-scale migrations.

While some of these models have been widely accepted in the literature there has not been substantial evidence to support such claims. In an effort to test the reliability of these models on the dispersal of Bantu culture, this work investigated sites in Kondoa Irangi (Pahi) of central Tanzania where cultural remains indicate long-term contact and interaction between LSA hunter-gatherers and Iron Age (IA) Bantu-speakers. The Kondoa Irangi is one of several areas of central Tanzania where LSA and IA sites are present (Masao 1979; Odner 1971b) although not investigated in detail. The main question posed in this thesis is what happened to Pahi LSA autochthonous populations when they came into contact with IA people? The research has focused on three major objectives: 1) to establish the Pahi LSA and IA cultural sequences, 2) to investigate social and economic interactions between the LSA and IA and, 3) to ascertain the role of LSA people in the later development of settled societies in central Tanzania.

The Pahi project involved systematic survey and excavations. Results of the research are compared to those of other parts of Africa in general and East Africa in particular. Both ethnographic and archaeological evidence as well as models of the interaction between hunter-gatherers and farmers from various parts of the world are used as a guide in formulating an appropriate interpretive framework for the Pahi case (Zvelebil *et al.* 1986). The overall assessment suggests that contact and interaction between farmers and hunter-gatherers took place in various forms that are unique to particular situations. In this case the widely accepted and traditional models for hunter-gatherer and farmer interactions such as replacement, conquest, absorption and elimination cannot be applied as a general explanation for widespread movement of Bantu cultures in sub-Saharan Africa. The Pahi case suggests aceramic LSA autochthonous peoples acquired iron-working and food production techniques from their Bantu neighbours through interaction without replacement.

1.2. The Study Area

Kondoa District is located between latitude 4°10' and 5°40' S and longitude 35°06' and 36°23' E in the Dodoma Region of central Tanzania. The area is bounded by the districts of Babati and Hanang in the north and northwest, Kiteto to the east, Dodoma (Rural) to the south and Singida Region to the west (Figure 1.1). The total land of Kondoa area covers approximately 14,435 km^2. Administratively the District of Kondoa is divided into eight divisions namely, Farkwa, Goima, Kolo, Kondoa Township, Kwa Mtoro, Mondo, Bereko and Pahi. My research took place at the villages of Lusangi and Baura which are located within the Pahi division. The Lusangi and Baura villages are part of a geographical region known as the Irangi Hills (Figure 1.1)

1.3. Present-day Cultures

Kondoa is a small but ethnically and linguistically diverse area with four major language families represented. The majority of Kondoa people are Bantu speakers. The project area (Irangi Hills) is dominated by the Rangi who are matrilineal Bantu speakers (Liesegang 1975:95). Another ethnic group in Kondoa are the Sandawe who live to the southwest (Kwamtoro and Farkwa divisions). Sandawe speak click languages and are classified as Khoisan speakers (Sutton 1968:167). Towards the north, the Rangi borders the Alawa, who are a Cushitic speaking group. Other Cushitic speaking groups include

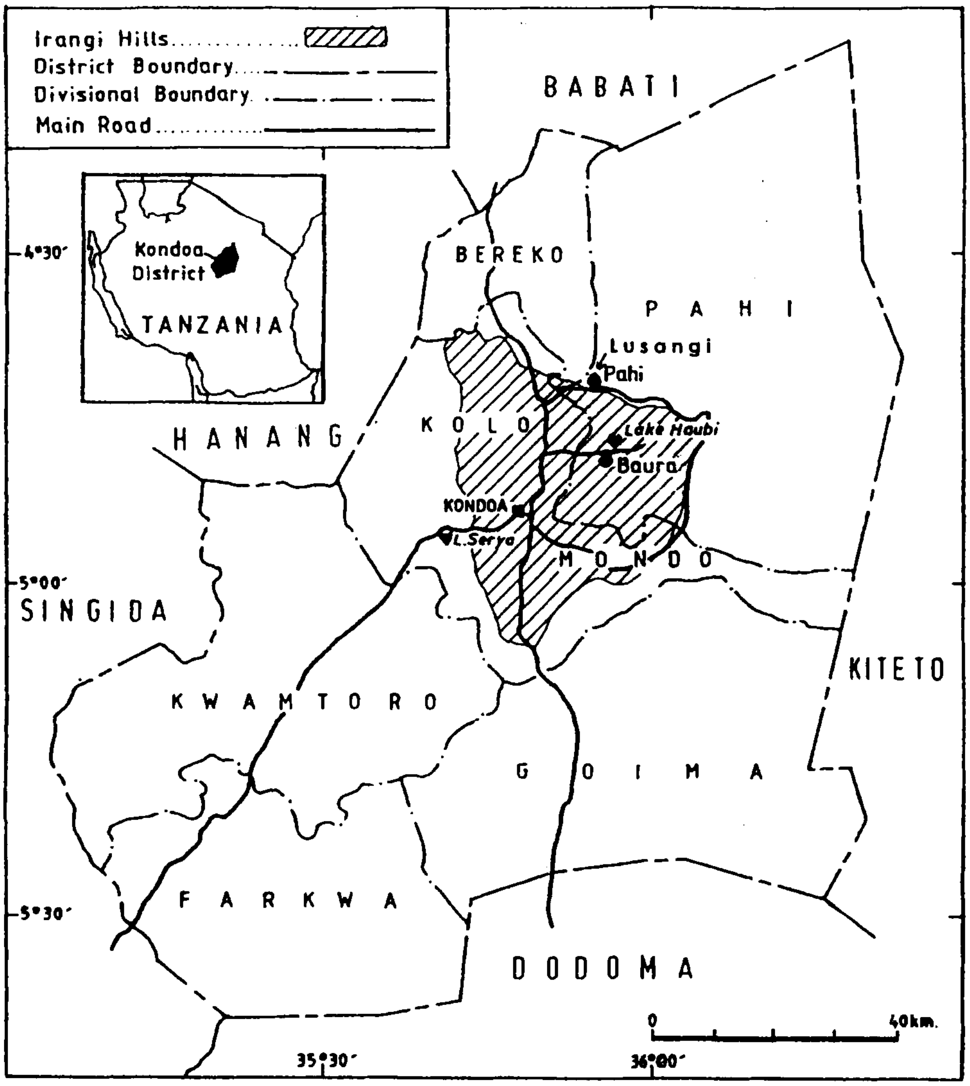


Figure 1.1. The study area: Irangi Hills, Kondoa District, central Tanzania

the Gorowa or Fiome located to the north and the Burunge who reside to the south of the Rangi. To the eastern plains and to the west are the Maasai and Barabaig respectively who are Nilotic speaking people. Overall, the majority of the Kondoa people are ethnically Rangi and Sandawe. The economic characteristics of these groups vary markedly (Newman 1970:19-21). The Maasai and the Barabaig are largely dependant on animal husbandry. The Rangi are primarily agriculturists although domestic stock is important in subsistence and exchange. Sesame, maize and finger millet are produced in substantial quantities to supply the northern regions of Kilimanjaro and Arusha as well as coastal towns such as Dar es Salaam. The Sandawe practice agriculture and they are also hunters who produce large quantities of honey. Until recently the Sandawe were hunter-gatherers (Newman 1970:25).

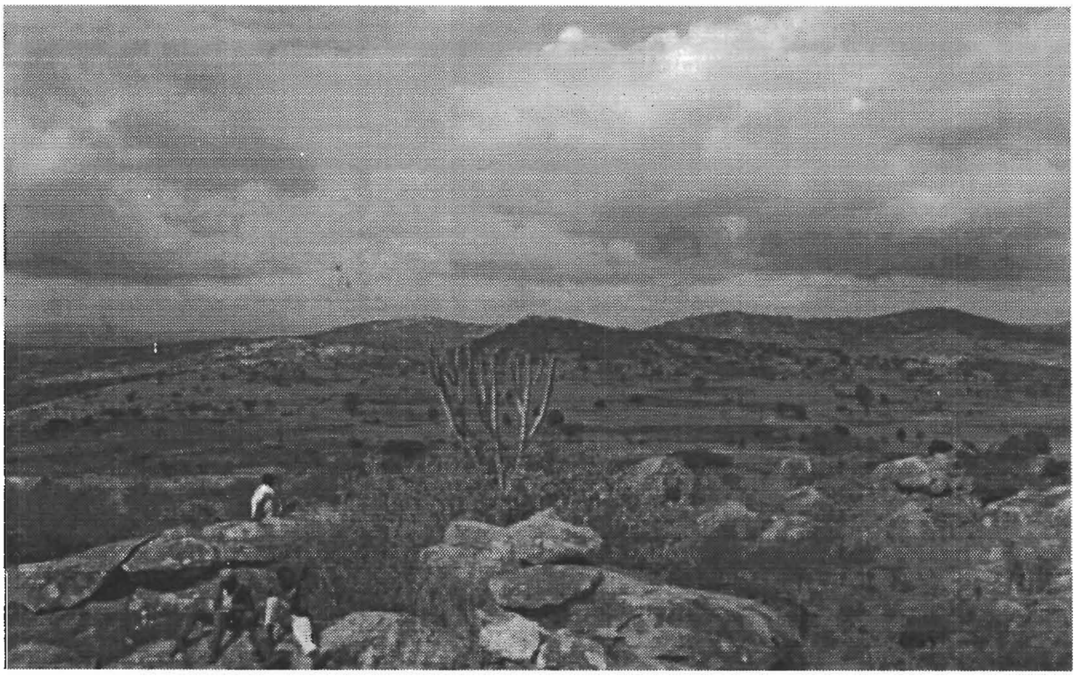
The Irangi people have practiced iron smelting until recent times (Lane *et al.* 2001:804; Liesegang 1975:93) when the tradition ceased partly due to abolishment by the British colonial administration and competition from cheaply imported iron products. Sources dating to the beginning of the 1900s describe Irangi people living in villages of 50 to 200 dispersed houses of a rectangular, flat-roofed *tembe* type made of wood poles and mud. Residences were surrounded by cultivated fields of millet and other crops (Liesegang 1975:93). Although some *tembe* houses are still used in some areas, the majority of the modern houses are constructed of burnt or sun-dried mud bricks roofed with thatch or corrugated metal sheets. The origin of the Irangi People is not known but their oral tradition suggests that they dispersed from the area near Lake Haubi (Fosbrooke 1958:21; Liesegang 1975:95). During pre-colonial times the political systems of the Rangi were segmentary, each local community being an independent unit with its own leader called Mwenesi (Fosbrooke 1958:21).

1.4. Geomorphology

The rocks which form the central part of Tanzania are part of the Dodoman geological system which extends some 480 km east-west and broadens westward (Temple 1972:42). The chief formation in Kondoa is the basement system with intrusions of pegmatitic materials (Aitken 1950:55). These rocks of Precambrian age are part of the central Tanzania Granitoid Shield (Christiansson 1972: 319; Saggerson 1972:7-1). In

Kondoa the granitoid shield formation predominates in the western area. The Dodoman geological system was subjected to folding and was metamorphosed approximately 2.5 - 2.6 billion years ago or earlier (Temple 1972:42). The mobilized granites are intrusive and were brought about by large-scale emplacement of 'younger' granites into Nyanzian and Kavirondian rocks (Atlas of Tanzania 1956:2). In general all rocks in the Dodoman system have been subjected to regional granitisation, including the development of migmatites and unfoliated granites (Saggerson 1972:70-1). The basement system consists of coarsely crystalline metamorphic rocks of sedimentary and volcanic origin (Temple 1972:42). However, I have observed that volcanic rocks are very rare in Kondoa and instead quartz, quartzite and derivatives of crystalline metamorphic rocks dominate the area (see also Masao 1979:14). The rarity of volcanic rocks is also apparent in the lithic artifacts described in chapter 6 where quartz forms over 99% of the raw materials used. Most of central Tanzania is made up of plateaus, isolated rocky hills and inselbergs (Masao 1979:14). The height of this plateau varies from 900 and 1350 m asl although in some areas it approaches 1800 m asl. The Serengeti plains and the Maasai Steppe (of which Kondoa is a part) are examples of this interior plateau (Ojany 1974:26).

The Kondoa landscape is made up of plains and the Irangi Hills (also known as the Kondoa Hills) (Figure 1.1 and Plate 1.1) with an altitude ranging from 1000 to 2000 m asl and with an average elevation of 1500 m asl in the highlands (Christiansson 1972:320). The hills are located on the eastern branch of the East African Rift system and are by-products of tectonic ripples and fault lines associated with the formation of the



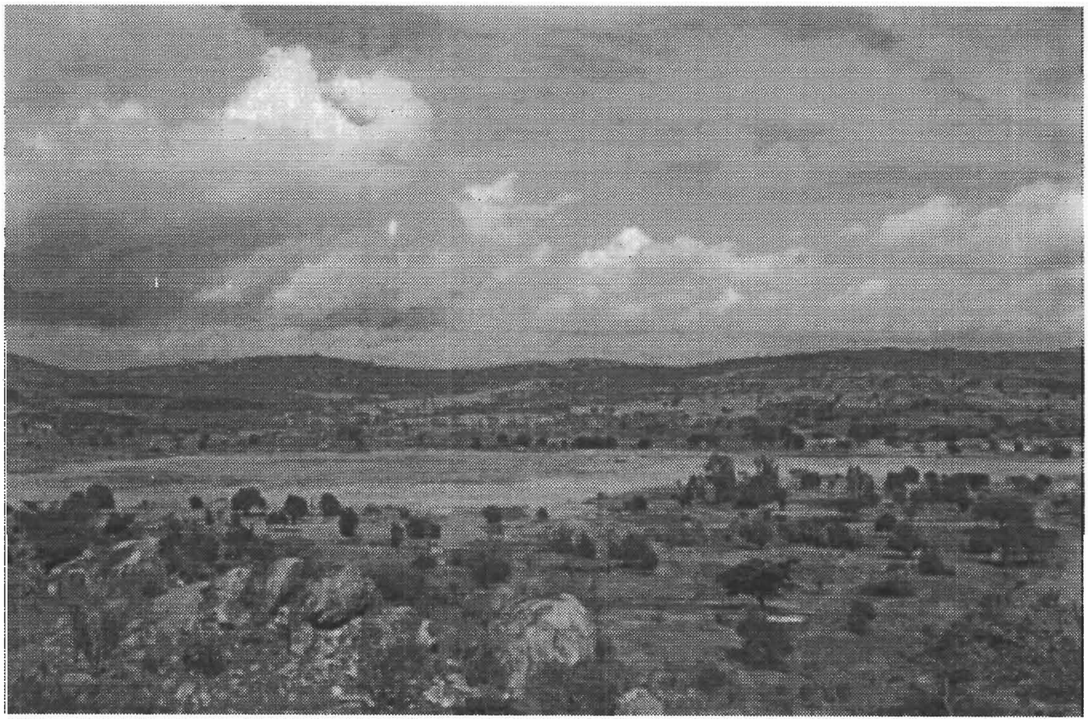


Plate 1.1. The hilly and flat-lying landscape of Baura. Top: A westward shot from the top of a hill located southeast of STP 3 (for location of the STP 3 see Figure 4.1). Bottom: A northwest shot from the same location.

East African Rift Valley (Christiansson 1972:319). The rift valley system forms a plateau which covers most of western Kondoa district. The Irangi Hills have been constantly subjected to active tectonic movements of the earth's crust, resulting in tremors and unstable structures (Eriksson 1998; Fozzard 1963). The faulting and uplifting processes took place during the Late Pleistocene (King 1967). Apart from fault topography the dominating features in the landscape are steep rock hills bisected by broad river valleys (Christiansson 1972:320). The bedrock has been subjected to deep weathering over millions of years so that now only isolated hills, called inselbergs, remain surrounded by weathered materials. Rivers in Kondoa flow mainly to the south and southwest. There are several internal drainage basins, one of them being Lake Haubi in the northeast. Others include Lake Bicha, Seese Swamp and the basin at the south end of the Chivi River. During the dry season surface water is not available in many parts of Kondoa, however water can be easily obtained from shallow pits or wells dug along river beds (Östberg 1986).

1.5. Soils and Erosion History

Kondoa district is divided into two main agro-ecological zones: the Irangi Hills and the Kondoa plains. The Baura and Lusangi study areas are found within the Irangi Hills (Figure 1.1). The Irangi Hills extend to the north and northwest of Kondoa district, while the Kondoa plains (sometimes identified as Lower Irangi) dominate the northeast and east (Maasai Steppe), and the central plateau in the southeast and south (Mun'gon'go 1995:30).

The Kondoa area has been drastically affected by soil erosion (Plate 1.2). Land degradation in general and soil erosion in particular, are serious problems in this area.

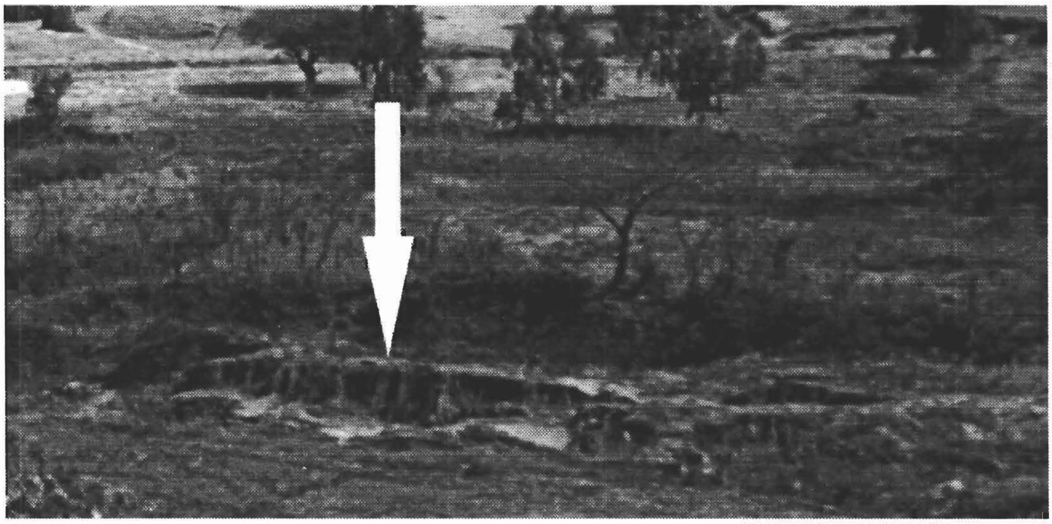


Plate 1.2. Soil erosion at Pahi near STP 4 (for location of STP 4 see Figure 4.1, Chapter 4): The arrow points at an erosional gully at its initial stage of development

The more resistant rocks left as a result of erosional activities have resulted in the formation of rock-shelters and caves (Aitken 1950:55; Masao 1979:15), many of which were used by LSA hunter-gatherers as camps or home bases. Two such rock-shelters at Lusangi are investigated in this study. The soils of Kondoa have been generally described as patchy, relatively low in fertility, low in organic matter with low water retention capacity. Because of their low organic matter and clay content they have poor binding properties, making them very vulnerable to erosion (Tosi *et al.* 1982).

> Soils are texturally coarse loamy sands to sandy loam, being sandiest in the surface horizon. They are low to very low in organic matter, low in bulky density, low in water retention capacity and probably low in inherent fertility and base exchange capacity. On favourable terrain they are deep except where bedrock has been exposed to sheet erosion or gullying. (Tosi *et al.* 1982:5,12)

Most eroded areas consist of deep gullies with earth pillars capped by quartz boulders or crusts (Plate 1.1 and 1.2). In some areas gullies may be as deep as 15-20 m and in many places the ground surface is stony with strewn pebbles (Christiansson 1972; Eriksson 1998). The land surface has been changing through time and buried horizons of laterite and quartz pebbles are evidence of earlier erosion and deposition processes in some areas. The Chivi/Gongo river valley that cuts through the village of Baura provides evidence of these processes. In some areas the Chivi River has cut through extensive and deep sediments that were deposited in the past. Studies have shown that upper pediment slopes are covered by reddish brown loamy sand to sandy clay loam soils (*haplic lixisols*), while red clayey (*ferric lixisols*) soil pediments are found on the middle and lower pediments (Payton *et al.* 1992). The thickness of soil on the pediment slopes increases down slope. Broad sand-rivers are common in many areas of Kondoa due to severe sheet and gully erosion in the highlands. The colluvial slopes are covered by weakly developed soils (*albic arenosols*, *haplic gleysols* and *haplic arenosols*) while sand wash deposits cover the valley floor burying *vertisols*.

Reports of severe degradation in central Tanzania are attributed to 19th - century European travelers such as R. F. Burton (1860) (Eriksson 1998:6). Since that time a number of studies have been completed on strategies to combat land degradation by both the British colonial government and the independent Tanzanian government. In addition, from the 1980s to the 1990s several studies were conducted on the history and causes of land degradation in Kondoa. In this regard, Christiansson (1981), Mung'ong'o (1990), Östberg (1986) and Yanda (1995) outline three factors that led to accelerated degradation in the Kondoa area before Tanzania (previously known as Tanganyika) came under British colonial rule in 1919. These are: 1) the 19th - century caravan trade; 2) the outbreak of the great rinderpest epidemic in the 1890s; and 3) colonialism. It has been argued that Kondoa was a flourishing caravan route centre in the 19th - century, a fact which led to a high demand for grain and other provisions (Mung'ong'o 1990:80; Östberg 1986:26; Yanda 1995:1). This resulted in extensive land clearance to increase agricultural production, an activity which ultimately accelerated land degradation. Secondly, the rinderpest virus of the 1890s may have encouraged land degradation. The rinderpest outbreak first caused a decline in livestock populations which led to an expansion of woody biomass on the plains. This created a suitable environment for tsetse flies which caused local Rangi people to retreat southwards into the more fragile environment of the Irangi Hills (Mung'ong'o 1993). This led to demographic stress in Kondoa and further environmental degradation. Thirdly, in 1885 a German colonial government was established in Tanganyika and by 1914 the First World War broke out. At this time agricultural production in Kondoa was increased to provide food for the German troops (Christiansson 1981:163). This led to additional land clearance for agricultural production and further degradation in Kondoa (Östberg 1986:27).

As land degradation in Tanzania in general and Kondoa in particular worsened in the early 1900s the British colonial government called for a conference in 1929 to focus on conservation measures. In the Kondoa highlands, conservation initiatives involved the construction of contour banks, and planting of sisal and other plants for the purpose of controlling soil erosion (Kikula 1998). However, these colonial policies did not receive popular support. For a number of reasons the land degradation campaigns were unsuccessful, although erosional rates did in fact decrease following the implementation of government measures. At the time Tanzanians were fighting for independence, these unpopular measures became a political issue. There are reports that some politicians took advantage of the unpopularity of the conservation initiatives and used them in their political strategies during national independence movements. Following independence conservation measures were ignored (Yanda 1995). Soil erosion in Kondoa continued until 1972 when the government formed the soil conservation project known as Hifadhi Ardhi Dodoma (HADO). Within the HADO project communal tree planting and destocking was directed towards the severely eroded areas of Kondoa where tree cutting and bush fires were prohibited (Yanda 1995).

Recent studies by Eriksson (1998) have shown that land degradation in Kondoa is a phenomenon that dates back several millennia. It is noted however that erosion has accelerated in the past 900 years (Eriksson 1998; Shishira and Payton 1996). Studies at Lake Haubi in Kondoa have identified two main phases of erosion, both of which commenced well before the 19th century (Eriksson 1998). The investigations involved a combination of geomorphological studies with optical stimulated luminescence dating techniques applied to sandy colluvial and alluvial hillslope deposits. According to Eriksson the two phases of erosion are not related to recent land use practices. The first phase of erosion occurred between 14,500-11,400 BP coinciding with the end of the Pleistocene when the climate was wetter than today. The second phase of erosion commenced by 900 BP with new phases of gullying initiated sometime after AD 1400 (Eriksson 1998:17). Archaeological data (Lane *et al.* 2001) have provided a probable suggestion for the second phase of erosion at Haubi. Archaeological investigation in Haubi has indicated farming and herding were well established by 2000-1800 BP. It is therefore suggested that increased human settlement, iron smelting and livestock grazing could have contributed to the initiation of the second major phase of soil erosion by 900 BP (Eriksson 1998:20-21; Lane *et al.* 2001:804).

The results of these studies indicate that soil erosion on the pediments and hill slopes has caused far-reaching changes in land quality due to deposition of sediments on low-lying grounds. This involved the replacement of chemically fertile, but intractable, clayey *vertisols* with poor workability, by light, easily worked *arenosols* with rapid permeability and low content of available nutrients (Shishira and Payton 1996). The archaeological survey in this project noted that the early human habitations on the hill slopes of Baura, Lusangi and at Haubi (Lane *et al.* 2001:804) were abandoned in favour of the flatter areas at the base of the hills. This was partly caused by severe gullying of the slopes. Radiocarbon dates indicate that Early Iron Age (EIA) remains/sites occur on the upper pediment slopes whereas the bulk of the Later Iron Age (LIA) (c.1000-200 BP) are found further lower down slope (sites dated after AD 1800 occur on both the middle slopes and lake basin floor) (Lane *et al.* 2001:804). In some areas these settlement shift processes seem to have taken place in more recent times. Kangalawe (2001:6) states that: "following the gullying and truncation of the pediment slopes that were used for cultivation, farmers have started cultivating the sandy colluvium and alluvium, whose suitability for agriculture is highly variable, and on uneroded patches of lower pediment slopes, abandoning former farmlands on the severely gullied slopes."

1.6. Land Use and Vegetation

Subsistence farming activities dictate current land use patterns in Kondoa. Agricultural activities are carried out on a small-scale and productivity depends mainly on the availability of rainfall and labour. Fallowing is no longer practiced as a method of regenerating soil fertility due to land scarcity. The major crops cultivated include maize, finger millet, bulrush millet, sorghum, cassava, groundnuts, peas, beans, sweet and Irish potatoes, and several varieties of oil producing seeds. Minor crops include sugar cane, onion, pawpaw and citrus fruit.

The original vegetation of Kondoa is believed to have consisted of savannah woodlands with small pockets of montane forests and savannah grassland (Lyaruu 1998). The present day vegetation is dominated by savannah grassland, miombo woodland, scrub and in a few areas by thicket. About 10-15 percent of the Irangi Hills is forested (Östberg 1996:11). The ground cover is dominated by short grasses including *Hyparrhenia* spp., *Heteropogon contortus*, *Aristida kenyensis*, *Hypachne schimperi*, *Eragrostis* spp. and *Dicanthium* spp. Montane forests cover some areas of elevated slopes in the northeast Irangi Hills, while woodland and bushland are commonly found along the moderate slopes (Mung'ong'o 1999). In general the major tree species found in Kondoa include *Acacia* and *Combretum* spp, however this is dictated by landscape type. In open woodlands for example, *Acacia tortilis* and *Brachystegia speciformis* are the most common followed by several varieties of *Combretum* spp., *Brachystegia* spp. *Cassia* spp. *Dodonea viscosa*, and *Acacia seyal.*

Human activities have been a major factor influencing the nature and distribution of the vegetation cover through cultivation, grazing, fire and wood harvesting. During the late 19th and 20th centuries the Irangi Hills have witnessed clearance of forests and woodlands, leaving only a few traces of the natural vegetation (Christiansson *et al.* 1993). The vegetation of Kondoa supported a variety of wildlife that was exploited by hunting and gathering societies. Leakey (1983), who investigated the rock art of the Kondoa area, reports a wide range of animals depicted by hunter-gatherers in the rock-shelters including carnivores, giraffes, eland, elephants, roan antelopes, birds, dogs, rhinoceroses, reedbuck, zebras, kudu, hartebeest, pigs, snakes, baboons, wildebeest, buffalo, hares, crocodiles, bat, oryx, tortoise and scorpion. It should be noted that animals depicted in the rock art represents only a small portion of the ancient fauna in the area. Certain animals were depicted and are interpreted as part of rituals and belief systems. It is suggested that at one time Kondoa may have had as high a carrying capacity as that present in modern day East African game reserves (Masao 1979:15).

1.7. Paleoenvironment

The paleoenvironmental history of central Tanzania is poorly understood because detailed research has not yet been focused on this issue. However in East Africa, isolated areas such as coastlines, lake and river sediments, including a few glaciated mountains and fossilized remains of fauna and flora, have been major targets for ancient environmental studies and it is from such sources that a general regional summary of paleoclimates can be derived (Hamilton 1982; Nicholson 1980, 1981; Thompson *et al.* 2002; Gasse 2001; Verschuren *et al.* 2000; Verschuren 2001). Mount Meru and Elgon for example show evidence of past glaciation (*ca.*, 18,000-11,500 BP), while permanent or temporary ice can be found on Mounts Kilimanjaro, Kenya and Rwenzori (Hamilton 1982:24-44). Many lakes, including Malawi, Tanganyika, Kivu, Edward, George, Elmenteita, Nakuru, Naivasha and Turkana, as well as the Nile, have in the past experienced major periodic changes in volume that have been linked to alterations in precipitation in East Africa (Hamilton 1984; Butzer *et al.* 1972; Hassan 1981, 1997a; Nicholson 1980). While the environmental history of East Africa has been traced back millions of years, only Late Pleistocene climatic events of the past 20,000 years are responsible for the present environment and ecology of the region (Beadle 1981:25).

Over the past 20,000 years, Mounts Kilimanjaro, Kenya and Rwenzori have experienced three major phases of glaciation. The earliest of these is dated to 18,000 BP, followed by another at 11,500 BP and the most recent at AD 1500 –1800 (Hamilton 1982, but see Shanahan and Zedra 2000). These glacial phases have been given different names in each mountain but they occurred at similar periods (Hamilton 1982:31). At Kilimanjaro for example, names such as Main (18,000 BP), Little (11,500 BP) and Recent Glaciation (1500 –1800 AD) are used (Hamilton 1982:31; Shanahan and Zreda 2000:24-5). The Main Glaciation reached its maximum by 21,000 -18,000 BP (Hamilton 1982; Shanahan and Zreda 2000; Nicholson 1980) and it is suggested that the Main and Little Glaciations were intervened by warmer periods. Such an amelioration dating to 11,500 BP may have been responsible for the permanent disappearance of glacial ice at Mount Elgon (Hamilton 1982).

The glaciations and intervening interglacials were prompted by several climatic events including changes in temperature, wind direction and precipitation levels which affected not only East Africa but many areas of the world. Temperature and precipitation reconstructions for the last 40,000 years based on pollen records indicate that Africa was colder and drier between 35,000 - 15,000 BP (Shanahan and Zreda 2000:39; Bonnefille and Chalié 2000, see also Nicholson 1980:316). Annual rainfall may have decreased by about 32-42 percent compared to today and lake levels dropped drastically with the driest period occurring at 21,000 BP (Bonnefille and Chalié 2000:46; Shanahan and Zreda 2000:39). It is suggested that moraines were deposited by the Main Glaciation on Kilimanjaro at this time. By 15,000 BP there was an increase in temperature and precipitation marking an interglacial period before the Little Glaciation which commenced by 11, 500 BP (Hamilton 1982) or earlier (Shanahan and Zreda 200:40). The Little Glacial period was also associated with a period of aridity experienced across East Africa. Ice cores from Mount Kilimanjaro indicate that the Little Glaciation was followed by a warmer and humid period from 11,000 - 4000 BP as a response to an increase in solar radiation (Thompson *et al.* 2002:591; Bonnefille and Chalié 2000:45-7; Nicholson 1980:314). Some lakes in East Africa rose to 100 m above present levels, such as Lake Natron (Magadi) which rose to 50 m above present levels while Lake Chad expanded 25 times from its present 17,000 km² size, to between 330,000 and 438,000 km² (Thompson *et al.* 2002:291). Although the period 11,000 - 4000 BP is generally considered warmer and humid it also included brief interludes of cool and dry spells (Nicholson 1980:314). For example, Kilimanjaro ice core data indicate that around 8300 BP there was a brief but pronounced dry period which led to a significant drop in lake levels (Thompson *et al.* 2002:592). The environment became humid again by 6000- 5500 BP but not as pronounced as the beginning of the Holocene at 11,000 BP. There was also an abrupt and brief cooling event around 5200 BP which led to a fall in lake levels and a reduction in vegetation cover. This is believed to be the largest drop within the warm and humid period (11,000 – 4,000 BP).

The period between 12,000 to 4000 BP is associated with several cultural developments in Africa. For example, although LSA industries were present in East and southern Africa by 40,000 BP (Manega 1993; Mehlman 1989) it is only during 12,000 – 10,000 BP that they spread widely in the region (Phillipson 1977a:28-36). There is also evidence that by 9000 BP inhabitants of Nabta Playa in the eastern Sahara Desert, were in the possession of domesticated cattle (Marshall 2002:111; Phillipson 1993:122-3; Wendorf and Schild 1994). The abrupt and brief cooling event around 5200 BP has been correlated to several archaeological events in northern Africa and west and central Asia (Weiss 2000), for example the formation of complex societies in Mesopotamia and the Nile Valley by 5300 BP and a complete abandonment of Neolithic societies in the inner deserts of Arabia during 5600 – 5200 BP (Sirocko *et al.* 1993:324).

As climates become cooler after 4000 BP, precipitation decreased in Africa leading to a decline in lake levels and drought in northern and tropical Africa, the Middle East, and Western Asia (Thompson *et al.* 2002:591-2). Around this time a severe drought in the Sahara may have caused most agricultural communities to disperse to the Nile, North and West Africa (Brooks 1998:139-44; Vernet 2002). Domesticates such as cattle, goats and sheep are said to have reached West Africa for the first time during this period. This was immediately followed by the spread of Bantu cultures to sub-Saharan Africa (Phillipson 1993:198; Ehret 1982:57-67, 1998:13-4). In Egypt the First Intermediate Period (4200 – 4000 BP) witnessed the collapse of Old Kingdom dynasties which plunged Egypt into political instability and economic disaster. At this time low Nile levels led to reduced agricultural production which generated food shortages and famine (Hassan 1997b; Weiss 2000:90).

The history of climatic change in East Africa over the past few thousand years covering the Medieval Warm Period (MWP) (AD 1000-1300) and Little Ice Age (LIAG) (AD 1300-1850) is poorly understood (Verschuren 2001:297; Gasse 2001). For the past 1800 years East Africa is said to have experienced variable climate conditions with the MWP being drier than today, while the LIAG was generally wetter but interrupted by three episodes of aridity. The three main periods of low precipitation in the LIAG are documented between AD 1390 - 1420, 1560 - 1625 and 1760 -1840 (Verschuren 2000, 2001). A detailed account of climatological changes for the past 1000 years based on geological, archaeological and historical data for the eastern African region has been compiled by Nicholson (1998). These data indicate that eastern Africa was affected by several series of drought and famine not only during the MWP but also during the LIAG. Nicholson's (1998) information suggests that generalized climatological data should be used with some caution in interpreting archaeological data. This is because long term generalized climatic patterns such as those which cover century or millennium time scales are also associated with complex short-term climatic variables. A decade of climatic instability for example can have enormous effects on subsistence, population and distribution patterns. The MWP period at 1000 BP roughly marks the end of the EIA and is associated with the development and spread of LIA traditions in East, Central and southern Africa (Vansina 1994-5:25; Phillipson 1976a:212-4; Huffman 1989). Also associated with this period is the beginning of social stratification and the origin of state societies in areas such as Mapungubwe and Great Zimbabwe (Huffman 1982:142-8, 1996) and the development of the Swahili city states along the East Africa coast (Connah 2001:215).

Recent data from Lake Haubi (Figure 1.1) on the history of soil erosion in Kondoa suggests that some environmental data there may be compared to those of other areas of East Africa. Eriksson (1998) and Lane *et al.* (2001) observed that the first major incident of erosion at Lake Haubi occurred around 14,500 and 11,400 BP (Later Pleistocene/Early Holocene changeover) which may have resulted in a shift from dry to humid climates documented in several other parts of the African continent. The second erosional episode commenced by 900 BP and has continued until modern times, with advanced gullying taking place after AD 1400 (Eriksson 1998:20-21). While the initial erosional phase at the end of Pleistocene is suggested to be a result of natural factors, that of 900 BP has been attributed to human activities such as agriculture and iron working (Eriksson 1998:20-21; Lane *et al.* 2001:804). Another phase of gullying was initiated sometime after AD 1400 (Eriksson 1998:17) during a phase of low precipitation and may be related to human activities (Verschuren (2000, 2001).

1.8. Present Climate

The general climatic pattern in central Tanzania is determined by the movements of the Intertropical Convergence Zone (ITCZ) between the northern and the southern hemispheres. On this basis the year is divided into two distinct seasons: the dry season lasts from May to October, while the rainy season persists from November to April (Christiansson 1981:33). Rainfall in Kondoa is generally low and unreliable (Dejene *et al.* 1997:10). It is mainly semi-arid although some higher altitudes experience a sub-humid climate with relatively higher rainfall. Generally the plains surrounding the Irangi Hills are drier than the Irangi Hills themselves. For example, the mean annual rainfall at Kondoa town (1390 m asl) on the lower part of the Irangi Hills is about 600 mm, while for Haubi mission (1700 m asl) it is about 900 mm. There is pronounced variation in annual rainfall in the area from year to year. The minimum recorded value is 509 mm (1964/1965) and the maximum is 1,416 mm (1967/1968) (Mung'ong'o 1999). Rainfall may arrive in short but intense convection storms that fall for an average of 60 days between the months of November to January and then decrease before it falls heavily again in March and April (Madulu 1999; Mbegu 1988). Up to 60% of the precipitation becomes surface runoff (Christiansson 1981). The dry season (January-March) can be completely dry and extended in such a way that crops planted at the onset of the rains perish (Liwenga 1999; Östberg 1986). Such short but concentrated rainy days in conjunction with sparse vegetation, steep slopes and patchy soils make a greater part of the Kondoa Irangi Hills highly susceptible to gully and sheet erosion (Christiansson 1972:320; Mun'gon'go 1995: 34). Furthermore, Kondoa has one of the highest rates of evapotranspiration in the country at 1500 mm/year. Rainfall comes from highly erosive storms which arrive when the protective crop/vegetational cover is at its sparsest. Because of low rainfall, overall soil development is poor (Christiansson 1972:320), and consequently hillslope vegetation is limited to scattered thorn bushes.

1.9. Chapter Summary

The Kondoa area has four different linguistic groups despite its small area. The Rangi who are mainly agricultural Bantu speakers form the dominant ethnic group in the area of the research project but their ancient history remains poorly understood. Geologically, Kondoa is dominated by metamorphosed Precambrian bedrock while its soils have been subjected to two severe episodes of erosion, with the first major episode occurring during the Later Pleistocene and the second at 900 BP continuing to the present. The latter episode commenced at a time when evidence of human activities such as settlement and iron smelting increased, especially at ca. AD 1300. Despite severe erosion the Kondoa area continues to support a number of grain crops and grazing grounds for livestock in well-watered areas. Higher altitudes such as the Irangi Hills are more fertile and receive higher precipitation than lower altitudes and for that reason support denser populations. Rock art indicates that the area formerly had a range of wild animals common to modern game reserves.

The paleoenvironments of Kondoa are poorly known. It is most likely that in the past Kondoa experienced similar climate to one that prevailed in most other areas of East Africa. At least two important climatic episodes have been recorded in Kondoa for the past 15,000 years (Eriksson 1998). The two episodes are said to have been associated with similar climatic changes in most parts of East Africa. The first episode in Kondoa occurred in 14,500- 11,400 BP and was associated with landscape erosion following a wetter and warmer climate than today. The Medieval Warmer Period was associated with the second episode of erosion in Kondoa by 900 BP which has been linked to intensification of human activities such as farming and iron working (Eriksson 1998:20-21; Lane *et al.* 2001).

CHAPTER 2: PREVIOUS RESEARCH

2.1. The East African Later Stone Age

2.1.1. Introduction

Research into the East African Stone Age began in the early 1920s with the work of Wayland (1924) and Leakey (1929). The first area to receive archaeological attention was Uganda (Cole 1963:50-5; Robertshaw 1990b). At that time, apart from a lack of knowledge about the components of the East African Stone Age, researchers were faced with problems of chronology. Many archaeologists assumed that the East African Stone Age was a recent phenomenon. This combined with a lack of adequate comparative data from within East Africa, resulted in the use of diffusion as an explanatory framework for describing the relationships between the East African Stone Age and similar cultures in Africa and beyond. Most research was based on guidelines of "normative" archaeology (Robertshaw 1990b:85-86). Data were treated qualitatively with little attention to quantative analysis. For example in lithic analysis preference was given to shaped tools and recognized artifacts while the rest were discarded or remained unanalyzed. An example of this was Kohl Larsen's work at the Mumba Rock-shelter in 1938, where many artifacts from the excavation were not retained (Mehlman 1989: 78-79), and Leakey's (1931) work in Kenya, where most lithic artifacts except for shaped tools and cores are underrepresented. In addition, faunal remains recovered from archaeological sequences were not used to study aspects of human activities such as diet and subsistence. They were studied by paleontologists to achieve paleontological goals and to delineate chronological markers (Robertshaw 1990b:86).

Prior to the 1960s cultures were defined on the basis of types and characteristic artifacts, *i.e.*, "fossilles directeurs", a theoretical perspective that dominated European archaeological tradition at the time (Robertshaw 1990b). Despite the flaws of pre-1960s archaeology, it laid the foundations upon which modern archaeological research is based.

Post-1960 archaeological research saw a profound change in theory and field methods directed by the New Archaeology (*e.g.*, Masao 1979; Mehlman 1989; Merrick 1975; Nelson 1973). This involved implementation of problem-oriented research designs and improvements in techniques of survey, excavation and data collection strategies including probabilistic sampling (*e.g.*, Bower *et al.* 1977). Comparative data had accumulated from various fieldwork conducted during the pre-1960s across Africa. The discovery of absolute dating techniques in the 1950s had a tremendous impact on assessment of the antiquity of the African Stone Age and ideas of diffusion were increasingly abandoned. Despite these developments in African Stone Age research, the LSA has remained one of the most poorly researched areas in Tanzanian archaeology.

2.1.2. General Features of the LSA

The "Later Stone Age" (LSA) was first defined by Goodwin and van Riet Lowe (1929). Since then the term has been used by several authorities to describe the end of the Stone Age in sub-Saharan Africa, but overall it remains poorly defined, carrying both typological and temporal implications (Phillipson 1977a:22-3, 1993a:5). The LSA is differentiated from the antecedent Middle Stone Age (MSA) based on typology and technology. Technologically MSA is dominated by Levallois and disc core methods while LSA is characterized by blade core technology (bipolar technology) (Mehlman 1989:5-6, 368; Phillipson 1993a:60; Mabulla 1996:85-6). The MSA is dominated by scrapers and points (Clark 1988) and in general lacks formal bone, ivory, shell tools, art objects as well as exhibiting relatively little variability in time and space that cannot be attributed to differences or changes in the availability of lithic raw materials (Klein 1989a:359, 377, 1989b:533). Typologically, LSA artifacts are much smaller in size, one special feature being the introduction of backed pieces (microliths) that are geometric in shape (*e.g.*, crescents, triangles and trapezoids). There is also an increased reliance on composite tools (Klein 1989a:369; Phillipson 1993a:60). Introduction of more diverse cultural practices are also some of the main features of LSA such as rock art, inferred use of bow and arrows, intensification in the utilization of plant and aquatic resources, symbolism, inferred personal aesthetic and evidence of religion (Klein 1989a; Mabulla 1996:86). For example, LSA industries demonstrate the presence of fishing gear and fish bones which are correspondingly rare in MSA (Klein 1989a:367-77). Industrial assemblages of the LSA are more diverse typologically and widely distributed over various ecological niches compared to MSA. Authorities such as Phillipson (1977a:23-31) have suggested climatic change to have been a stimulus in the development of the LSA tool kit and its distribution. However, whether the typological and distributional differences between the MSA and LSA are related to advances in working efficiency or the result of environmental change remains poorly investigated. The production of diverse artifact types by the Later Pleistocene people is viewed as an indication that these people engaged in a wider range of activities than their predecessors (Klein 1989a:369), but the reasons for this turnover are not yet fully known.

2.1.3. Chronology

The archaeology of the Upper Pleistocene in sub-Saharan Africa from 50,000-12,000 BP is very poorly known (Brooks and Robertshaw 1990; Klein 1989a:359). Only a few localities in East Africa have produced Pleistocene sites containing LSA lithic assemblages, the best are Olduvai Gorge, Nasera in northeast Tanzania and Kisese Rock-shelter in central Tanzania (Deacon 1966; Leakey *et al.* 1972; Inskeep 1962; Manega 1993; Mehlman 1989). Other sites include the Lukenya Hill and Enkapune ya Muto in south central Kenya (Ambrose 1992; Barut 1996; Gramly 1976).

In some parts of East Africa the period between 40,000-20,000 BP is dominated by lithic assemblages consisting of both MSA and LSA elements known as 2nd intermediate industries (Inskeep 1962; Mehlman 1989; Michels *et al.* 1983; Nelson 1977). Examples of sites with 2nd intermediate industries are the Mumba and Nasera in northeast Tanzania, where they are dated to between 39,777- 20,995 BP and 27,000-23,000 BP respectively (Mehlman 1989:20, 45, 103). The LSA industry at Nasera dates to 22,000-8,000 BP (Mehlman 1989:20, 45,) and similar LSA materials may be relatively younger at Mumba (Mehlman 1989:103). Based on bone collagen early LSA occurrences in the Naisiusiu Beds at Olduvai Gorge have been C-14 dated to 17,000 BP (Leakey *et al.* 1972). However Manega's (1993) reanalysis of biotites from the Naisiusiu tuffs yielded an average estimate of 42,000 years BP while ostrich eggshell produced dates older than 42,000 BP. This makes Naisiusiu one of the earliest LSA site assemblages in East Africa. In the Central Rift Valley of Kenya Early LSA was found below the Eburran industry where both are underlain by MSA materials. This LSA component is characterized by convex end scrapers, *outils écaillés*, backed pieces and ostrich eggshell beads and dates to

39,900-29,000 BP (Marean 1992:74). An industry that possibly represents a transitional LSA at Kisese Rock-shelter has been dated to 18,190 BP (Deacon 1966; Inskeep 1962).

Generally, the chronology of the East African LSA is suggested to be 40,000-1000 BP (Ambrose 1992; Mabulla 1996; Manega 1993; Masao 1979). However, it has been observed that while the LSA is as old as 40,000 more than 50% of sites fall between 3000-1000 BP (Masao 1979:212; Nelson 1973). In some areas the temporal span of the MSA and LSA presents a problem in that the MSA continues to be used until 20,000 BP (Phillipson 1977a:27-28, 1993a:60; Mabulla 1996:85-86). Furthermore, LSA and IA assemblages have been reported to co-exist in several parts of East Africa. This has been demonstrated by Mehlman's (1989) excavations at Mumba Rock-shelter in Lake Eyasi, by Masao (1979) in Kondoa and Singida, and by Phillipson (1976a, 1977a, 1993a) at the sites of Makwe, Makapapula, and Thandwe in Zambia. It has been suggested that widespread aridity throughout the continent during the Late Pleistocene and resulting low population densities are the probable causes for scant LSA archaeological traces (Klein 1989a:359). In South Africa this aridity led to expansion of grasslands and dramatic decrease in the diversity of plant species (Deacon and Lancaster 1988).

2.1.4. Early LSA Research Strategies in East Africa

In the early period of the colonial era there were several reports on the discovery of archaeological sites by travellers, colonial administrators and explorers. However such reports were anecdotal and had very limited archaeological information (Mabulla 1996:68). Systematic collections of stone tools in East Africa were carried out for the first time in 1893 (Gregory 1896:322-5). The collections by Gregory and others such as Dewey and Hobley (1925) were referred to as Neolithic (Leakey 1931:3). Wayland

(1924), reported on Stone Age cultures in Uganda. Having no preconceived scheme or framework for East Africa to conduct these investigations, early workers were faced with three major tasks: to establish chronology, culture history and explanations for culture change (Robertshaw 1990b). One of the most interesting attempts made was by Wayland whose aim was to establish a sequence of pluvial episodes in East Africa in order to correlate them with European glacial sequences (Wayland 1927). The main idea behind this strategy was that once established the correlations would provide a relative dating framework to determine the chronological relationship between stone tool cultures of Europe and Africa. Based on this framework, Wayland suggested not only that Uganda had been inhabited for as long as Europe but also that it was extremely probable that humans originated in Africa (Robertshaw 1990b:79).

Wayland's pluvial hypothesis was adopted by Leakey who in 1929 succeeded in establishing a fairly complete cultural sequence for the Stone Age (Leakey 1929:750). Leakey (1929) identified four pluvial periods from geological deposits in Eastern Africa which were linked to European archaeological and climatic sequences (Leakey 1931; Robertshaw 1990b). The pluvial sequences were also quickly applied to South African archaeological schemes. The pluvial hypothesis for the African continent was conceived at the Nairobi Panafrican Congress for Prehistory in 1947 (Alimen 1957:195-7), however not without criticism (Alimen 1957:208-9; Solomon 1939, see below). Characteristic type-series of tools were described for each culture, and were tied to paleoclimatic sequences. In this approach Leakey (1935) conceived an organic model where prehistoric cultural entities are defined on the basis of types and characteristic artifacts. Cultures were defined by the presence of *fossiles directeurs*, or highly specific artifact types found in narrowly defined stratigraphic contexts (Masao 1979:177; Robertshaw 1990b). Using this approach the possibility that people of the same culture could produce functionally different toolkits at different sites was considered impossible. Instead, variability was accounted for by temporal differences or attribution to different groups of people (Robertshaw 1990b). The organic model was also associated with the idea that certain attributes of culture were associated with race (Leakey 1935). The problems associated with a poor understanding of the causes of variability in cultural processes and also a lack of absolute dating techniques led early archaeologists to establish multiple cultural schemes which later were found not to be supported by the archaeological record. The organic model also assumed the existence of a close correlation between archaeological and geological stratigraphy (Robertshaw 1990b). The organic model was not adopted by Leakey alone but also by Wayland (1934) and Van Riet Lowe (1952). However some archaeologists went far beyond the organic model of cultural evolution. O'Brien (1939:51-52) for example, put forward an idea that cultural variability was a result of different environments and the use of varying materials.

The pluvial hypothesis proposed by Wayland and Leakey did not go without criticism. Although Solomon had assisted Leakey in developing the pluvial hypothesis in 1939 he was of the opinion that it rested on a very slender foundation and that there was insufficient data to support the glacial-pluvial correlation (Solomon 1939). Solomon's opinion was supported by O'Brien (1939:292-5) who suggested that the entire prehistoric complex in Uganda was different from that of Kenya and Tanganyika. O'Brien had reached this conclusion after a serious consideration of the role of the environment and raw materials in influencing/determining cultural patterning. Criticisms of the pluvial hypothesis were also received from geologists who attended the Nairobi Pan African Congress in 1947. Several geologists noted flaws in its general applicability pointing out that the climatic history of East Africa was marked by local and regional tectonic, volcanic and climatic events (Alimen (1957:208-9). However, despite criticism and final collapse of the pluvial hypothesis in the 1950s it laid the foundation for scientific studies for the past climates in East Africa.

While attempts to place stone tool industries into their geological sequences were being made in East Africa, a strategy to establish Stone Age nomenclature was developing in South Africa. In 1929 Goodwin and Van Riet Lowe established Stone Age nomenclatures for South African Stone industries based on the use of local rather than European terminology to describe the burgeoning number of African Stone Age industries. Schlanger (2002:203), states that: "While empirical arguments deriving from the accumulation of new sites and collections were also advanced, this break-away terminology was from the onset championed as a deliberate alternative, indeed a defiant act of liberation from the shackles of European domination." A general scheme was proposed for the South African Stone Age with three divisions namely, Early, Middle, and Later Stone Age. Goodwin (1926) and Goodwin and Van Riet Lowe (1929) identified two main cultural traditions within the LSA namely the Wilton and Smithfield. These were named after the localities where the stone industries were found in the Cape and Orange Free State. Both were vaguely defined and this led to the appearance of various regional variants.

The Wilton is characterized by high frequencies of microlithic tools including backed bladelets, small convex scrapers and crescents. Artifacts associated with the Wilton included ostrich eggshell beads, shell pendants, bone points and sometimes pottery. The essential factor that distinguished the Wilton from the Smithfield was the presence of crescents by the former and their virtual absence in the latter (Manhire 1987).

Smithfield scrapers were also much larger than those of the Wilton. The LSA was seen to be equivalent to the European Mesolithic on a broad cultural basis.

In the following years archaeologists attempted to fit artifact assemblages into this framework. However despite the strategy to develop local names for African Stone Age industries the emphasis on diffusion and migration as models of culture change and variation over different areas of the African continent dominated the minds of archaeologists. For example Goodwin and Van Riet Lowe (1929:150) developed a model which described that the Wilton came from North Africa to South Africa by means of waves of migration. Many historians also perceived the idea that the earliest microlithic bearers were "Caucasian" immigrants from the north, and their entry into Africa occurred several thousand years after the invention of the microliths in Europe (Coon 1962). Some went further, suggesting the existence of a bridge connecting North Africa and south West Europe to facilitate the migrations (Leakey 1936:180-196). However, Leakey (1936:83) also suggested that archaeologists should not neglect the possibility of a parallel evolution between the African cultures and those of the rest of the world (see also O'Brien 1939:292-5).

African archaeologists uncritically adopted the Goodwin (1926) and Goodwin and Van Riet Lowe (1929) terminologies such as Wilton and Smithfield despite regional, temporal and typological variability. This is best illustrated by the almost continental - wide adoption of the Wilton industry by Burkitt (1928); Clark (1942); Leakey (1931); Jones (1949) and O'Brien (1939), implying the associated technology extended throughout sub-Saharan Africa (Leakey 1936:192; Inskeep 1967). In a similar case the "Magosian" industry which was so named after the type site of Magosi Rock-shelter in northwestern Uganda, was suggested to extend to other parts of Africa such as Ethiopia, Kenya, Uganda, Zaire, Zambia, Zimbabwe and South Africa (Cole 1963:205). The Smithfield industry was believed to extend from South Africa to western Kenya (Inskeep 1967:658-9). It should be noted that the argument for these widespread cultures supported Goodwin and Van Riet Lowe's (1929) idea that the Wilton came from North Africa through waves of migration.

The nomenclature was later refined to account for variations between East and South Africa. For example, in the case of Wilton there was a Kenya Wilton, and in Smithfield a Kavirondo-Smithfield was defined. Where an equivalent name was unknown a new term was used, as for example in the Elmenteitan. In Leakey's (1931) work for the East African LSA, European terminologies such as Mesolithic and Neolithic were used as well. Under these categories the Kenya Wilton for example, was assigned to Mesolithic (Robertshaw 1990a:4). In circumstances with evidence of food production where the LSA was associated with stone bowls, mortars and grinding stones for example, the term Neolithic was employed. From the beginning of 1950s to the end of 1960s very little research was conducted on the East Africa LSA as most archaeologists turned their attention to the Early Stone Age (Masao 1979:175).

2.1.4.1. Pre 1960s identification of East African LSA industries

Prior to the 1960s, identification of LSA industries in East Africa was based on the use of *fossiles directeurs* as a principle of classifying cultural developments and their distinct features. Multiple LSA industries were introduced, some of which were not truly distinct because of lack of adequate comparative data and especially unreliable chronology (Phillipson 1977a:22-3). For example, in 1929 Leakey proposed existence of 18 different phases of the LSA industry. By 1945, he reduced this to eight major industries: the Kenya Aurignacian, Elmenteitan, Kenya Wilton, Magosian, Gumban, Njoroan, Tumbian, and Kavirondo Smithfield. In addition, O'Brien (1939) developed three new terminologies for the LSA industries in Uganda, namely the Kageran, Wilton A and Wilton B. In 1966, Sutton proposed an abandonment of most of the initial LSA terminologies developed by Leakey and O'Brien (1939) in favour of a single term "Later Stone Age". While a proper definition of the term LSA is pending, it is worthwhile here to briefly outline its history and why certain LSA terminologies and industries proposed by Leakey and O'Brien were abandoned.

Only the most important industries are discussed here. By the 1960s some of the aforementioned industries were abandoned in the literature. For example, in 1947 the Prehistorians of the First Pan-African Congress on Prehistory in Nairobi decided to abandon the term Tumbian and all its phases (Proto, Middle and Upper Tumbian) and adopt the new term Sangoan - a variant of the Middle Stone Age (Cole 1963:55, 188). The Magosian, named after the Magosi site in Uganda and first described by Wayland and Burkit in 1932 was found by Cole (1967) to be a mixture of MSA with LSA components. Consequently, the term Magosian is no longer used by archaeologists (Mehlman 1989:7). Lastly, the Njoroan industry defined by Leakey (1931:204, 1936:71) was discredited following new research into the Njoro site in Kenya. It was redefined as a component of the Pastoral Neolithic (PN) industries (also known as Stone Bowl Cultures/Savannah Pastoral Neolithic) (Nelson 1973).

Kenya Wilton

The Kenya Wilton industry was first defined by Leakey (1931:176-7) at the site of Long's Drift (Prolonged Drift) located on the lower reaches of the Enderit River. It is defined by the presence of crescents (lunates), thumbnail scrapers and burins (Leakey 1931:176). Kenyan Wilton sites occur in rock-shelters, open air and shell mound localities (Cole 1963:216). Wilton industries are far better known in southern than in eastern Africa (Cole 1963:216). They may have originated during what Leakey called the "Makalian Wet Phase" around 3000 BC (Cole 1963) and survived until the introduction of pottery (Leakey 1931:176). The Wilton Industry was divided into three phases: A, B and C, in order of decreasing age (Leakey 1936:68-9).

Wilton A occurs in widely scattered open sites in Kenya and northern Tanzania as well as Ethiopia. It may also be associated with Elmenteitan industry pottery which is characterized by a single incised wavy line decoration (Cole 1963:216). Wilton B is found mostly in rock-shelters and thought to be a direct derivative of the Magosian. In Tanzania, Wilton B is represented at the Apis Rock-shelter (Leakey 1936:68) later renamed Nasera Rock (Mehlman 1989). Wilton C is associated with shell middens along the shores of Lake Victoria (Cole 1963:218).

Elmenteitan

The Elmenteitan industry was first described by Leakey at Gamble's Cave II where upper levels produced pottery and fine lithic materials. Leakey (1931:172-174, 1936:67) described the lithic component as consisting of two-edged blades, backed blades, microliths and lunates, scrapers, *lame écaillées* and cores. Burins are very rare. Associated pottery was abundant and diverse, ranging from small bowls to immense jars

(Leakey 1931:175). The term Elmenteitan has been retained in the archaeological literature and is identified as a Neolithic type industry (Ambrose 1984a). Recent studies suggest the industry to be restricted to the western side of the Kenya Rift valley and the higher reaches of the Mau escarpment (Ambrose 1984a:220). Investigations have also determined that the lithic industry is characterized by long broad punched blades, long end scrapers, large side scrapers, *outil écaillés* and very large backed blades (Ambrose 1984a:220). The economic activities of the Elmenteitan included ovicaprid dominated pastoral activities, hunting of small game, and possibly cultivation.

Kenya Aurignacian

The Kenya Aurignacian was first identified at Gamble's Cave and Nderit Drift (Leakey 1931:90-171, 1936:58-9). It was divided into Lower and Upper phases with the former predating and the latter belonging to the Gamblian Pluvial (Leakey 1931:90-2). The Lower Kenya Aurignacian consists almost entirely of backed blades and very few end scrapers. Burins are absent. The Upper Kenya Aurignacian is characterized by backed blades, scrapers, burins, fabricators, sinew frayers, blades, cores and hammer stones. Pottery, beads and pendants are also associated with the Upper Kenya Aurignacian. Leakey (1936:192) believed that the later stage of Upper Kenya Aurignacian developed into industries such as Wilton A and the Gumban Neolithic.

Later excavation into the Lower Kenya Aurignacian by Isaac (1970) at Nderit Drift demonstrated it overlaid an earlier LSA horizon dated to 13,950 BP, while the Upper Kenya Aurignacian is dated to about 7,950 BP. The term Kenya Aurignacian was later replaced by Kenya Capsian and was recently renamed Eburran after Mount Eburru located at the centre of its distribution (Ambrose *et al.* 1980). Recent studies of the

Eburran industry characterize it as having long -narrow blades and flakes, long narrow geometric microliths, backed blades and narrow end scrapers. The Eburran industry is divided into five phases, with Phases 1-4 dominated by a hunting-gathering economy and Phase 5 indicating a mixed economy of hunting-gathering and farming (Ambrose 1984:220). The economic activities evident for Phase 5A for example involved hunting-gathering, incipient pastoralism and trade with food producing societies. Phase 5B was characterized by hunting large and medium-sized game and cattle-dominated pastoralism (Ambrose 1984a:220).

The Gumban

The Gumban industry was first described by Leakey (1931:198-200) as Neolithic based on the association of the industry with stone bowls, mortars, pottery, bone tools, beads and microliths. The Gumban industry was also associated with iron that Leakey suggested was imported rather than locally made (Leakey 1936:70). The lithic industry includes small backed blades, crescents and scrapers (Leakey 1931:202). Leakey divided the industry into two with Gumban A predating B. Gumban B has a microlithic industry very similar to Wilton A but differs chiefly by having stone bowls, pestles and mortars, saddle-querns and pottery (Leakey 1936:70). Gumban A is said to have a similar assemblage of artifacts but with distinctive pottery and flatter stone bowls that resemble plates. Leakey (1931:198) concluded that the Gumban industry included some form of agricultural practice, however the basis for classifying the industry into two phases remains unclear. Sutton (1966) and Ambrose (1984a:226) have proposed a total abandonment of the term because it is ambiguous and represents only a fraction of a widespread and ubiquitous Neolithic industry in the highlands of Kenya and Tanzania.

Sutton (1966) proposed the term Stone Bowl Cultures but Ambrose refers to these widespread industries as Highland Savanna Pastoral Neolithic (Ambrose 1984a:226).

The Kageran

The Kageran industry has been described at the Kagera Banks and Nsongezi sites (O'Brien 1939:268-70). It is comprised of fairly large tools, consisting of cores, choppers, scrapers made on chunks and flake made from blue quartzite. At Nsongezi, the Kageran is immediately preceded by a microlithic industry known as "Wilton Neolithic A", characterized by thumb nail scrapers, points, cores, crescents, backed blades and flakes in association with pottery (O'Brien 1939:268). Following the excavation of the Nsongezi Rock-shelter by Nelson and Posnansky (1970:160) the Kageran industry was abandoned.

Smithfield

The Smithfield industry was recovered from western Kenya and referred to as Kavirondo Smithfield (Cole 1963:201, 240). It is similar to Wilton but distinguished from it by an absence of crescents (Leakey 1936:96). Apart from Cole's (1963) work there are no additional published accounts for this industry.

In summary, early research of LSA industries in East Africa involved the definition of a larger number of type fossils and formally recognized taxa when compared to other areas of sub-Saharan Africa (Masao 1979:177). This is partly the result of early research biases and the great diversity of LSA industries which may reflect human adaptation to varying environments (Hance 1964; Nelson 1973). This conclusion however, remains tentative because no research has determined which industries are associated with particular environments. Variation in artifact assemblages in contemporaneous cultures may be a product of performing different activities within a site by the same group, or independent economies of various hunting-gathering groups.

Archaeological research before 1960 was conducted without a preconceived scheme to guide data collection. Diffusionary models were used to explain the variations and similarities in Stone Age industries because of poor chronometric control. This resulted in the introduction of several cultural traditions which did not necessarily belong to different phases. The main problems in this period were twofold: first, later prehistory in central Tanzania was neglected, and this led to faulty taxonomic systems. Secondly, local and regional variation within the LSA were little considered and certain industries for example Wilton, Smithfield and Magosian, were considered to cover larger area of sub-Saharan Africa (Inskeep 1967:658-9).

2.1.4.2. Post 1960s LSA Research

The 1960s signalled important developments in research on the African Stone Age (Inskeep 1962; Mabulla 1996; Masao 1979; Mehlman 1989; Merrick 1975; Nelson 1973). The New Archaeology developed archaeological methods and theory to improve data recovery and strengthen interpretation of the archaeological record. One of the themes introduced in theoretical approaches was ecologically based models for interpreting cultural evolution (Robertshaw 1990b:86). Researchers formulated their questions prior to field data collection (*e.g.*, Mabulla 1996; Mehlman 1989; Merrick 1975; Nelson 1973). Variations in material culture were explained in terms of functional, cultural, technological and ecological factors (Clark 1988; Mabulla 1996:82). The role of diet and subsistence in human adaptation were considered important components in archaeological studies (Marean 1990, 1992; Robertshaw 1990b:86). As a result, cattle bones were positively identified in association with LSA assemblages for the first time (Marean 1992; Sutton 1966). Studies of faunal remains led to interest in butchering practices and subsistence patterns (Marean 1992) and were used to generate informed hypotheses about patterns of seasonal land use.

As noted above pre-1960s archaeologists defined culture on the basis of *fossiles directeurs* leading to multiple narrations of lithic industries that were ill-defined. One goal in restructuring archaeology after 1960 was directed towards modifying terminologies that had dominated the classification of the Stone Age in general, and the LSA in particular. One such reaction was from Sutton (1966:38):

> It is now time to revise some of the earlier terminology for this later prehistory (Leakey, L.S.B., 1931; Cole) and a framework of "Later Stone Age" and "Iron Age" is proposed. The terms "Mesolithic" and "Neolithic" are felt to be cumbersome or subjective, and even Iron Age material has occasionally been placed in the latter category. Under the broad term "Later Stone Age" can be included most of the former "Mesolithic" and 'Neolithic" as well as some materials previously designated "Upper Paleolithic". Moreover, names of individual cultures and variants are no longer meaningful: "Gumban" and "Stone-bowl cultures"(formally included in the "Neolithic") should be abandoned all together. The Name "Kenya Capsian" and "Wilton" can judiciously be used to denote certain types of lithic industries ..., but not for pots, skulls or whole cultures.

African archaeologists began to abandon terms such as Wilton, Smithfield and Kageran (Goodwin and Van Riet Lowe 1929; Leakey 1931, 1936; O'Brien 1939:268; Inskeep 1967; Wayland and Burkit 1932). The 1965 Wenner-Gren symposium recommended a re-evaluation of Stone Age terminology and a re-assessment of the relationships implied by these terms (Clark *et al.* 1966).

Further attacks on LSA terminology resulted from the chronology provided by radiocarbon dating which demonstrated that the African LSA was contemporary with the

Upper Paleolithic of Europe (Willoughby and Sipe 2002). This challenged previous views that LSA technology diffused from the north. More recent interpretations argue that LSA peoples developed diverse technologies as a means of adapting to their environment, as has been argued for Upper Paleolithic peoples in Europe and elsewhere (Willoughby and Sipe 2002). The use of bow and arrow in the LSA led to more efficient hunting and consequently to more regular or predictable land and site use (Ambrose and Lorenz 1990).

In the 1970-90s, several studies contributed to an overall evaluation of the LSA (Bower 1973; Masao 1979; Mehlman 1977, 1989; Nelson 1973; Robertshaw 1991; Sutton 1966). The tremendous interest in LSA is demonstrated by production of a special volume (Azania, vol. 12) on the LSA in eastern Africa by the British Institute in Eastern Africa in 1977. Much of this research concentrated on Kenya with very limited examination of Uganda and Tanzania. This research led to the conclusion that East African LSA industries represented tremendous geographic, spatial and temporal variation (Masao 1979; Nelson 1973; Siiriäinen 1977:180-4), not adequately reflected in earlier classifications (O'Brien 1939; Leakey 1931, 1936).

On this basis, Nelson (1973) proposed three broad LSA industries: Standard LSA; Terminal LSA with pottery; and LSA with stone bowl industries. Masao (1979:212-15) has made a similar proposal with four divisions: Basal LSA (20,000-10,000 BP); Standard LSA (11,000-4000 BP); Terminal LSA (4000-1000 BP); and Stone Bowl Industries (3000-2000 BP). The differences between Basal, Standard and Terminal LSA are based on temporal clustering while their typological and technological differences remain unconsidered (Masao 1979:215). Masao's (1979) and Nelson's (1973) LSA categories were not adopted by other prehistorians partly because of their emphasis on temporal clustering with little consideration of typological and technological variations which are important features common in the African LSA industrial complex.

Currently the term LSA refers to a complex and widespread industry that postdates MSA (circa 40,000 BP) and persists until a few centuries ago. Some workers find this term to be too broad, incorporating many technological and chronological periods (Phillipson 1993a:5). The use of such a broad category tends to downplay regional and temporal variation. In an attempt to address this shortcoming authors have used local names to mark the difference. For example, Mehlman (1989:368-457), who completed a detailed study of MSA and LSA lithic artifacts in northeastern Tanzania, did not attempt to develop a generalized terminology for the East African LSA. He instead attributed the products of his analysis to specific localized LSA industrial complexes.

The overall analysis indicates that the LSA industry in East Africa includes several complex cultural traditions which cannot easily be categorized on the basis of geographic, temporal or component attributes alone. It has been recommended that to characterize tool kits, there is a need to study several variables such as activity facies, seasonality, length of site occupation, and number of groups involved at a particular site (Clark 1970:80). Furthermore, tool typology can no longer be categorized by functional attributes while excluding stylistic ones. However, deducing lithic style is still a subject of extended debate (Mabulla 1996:82). From the early 1980s, links between stone tools and hunter-gatherer mobility and social organization, including range size, length of site occupation, site types, and interregional social relationships, have been set on firmer theoretical ground (Carr 1994; Nelson 1992). This will allow a more complete understanding of prehistoric adaptation in many areas, even of the most ancient African landscapes.

In summary, although post- 1960 archaeology provided new methodological and theoretical strategies, the LSA remains one of the most poorly understood time periods in East Africa. Taxonomic problems still prevail and the LSA industry chronology in East Africa has not been subdivided into clear units. As Phillipson (1993a:5) has noted, the term remains too broad, incorporating many technological and chronological periods. Furthermore, although by 1970 research had already identified that East African LSA represented tremendous geographical, spatial and temporal variations (Masao 1979; Nelson 1973; Siiriäinen 1977) the causes for these variations remain poorly studied. The reclassification of the LSA industry is beyond the scope of this research. Instead the emphasis is a focus on the cultural interactions between LSA and IA in a particular region, the Irangi Hills of Kondoa.

2.1.4.3. Archaeological Research in Central Tanzania

Although there is a fairly detailed historical and ethnographic documentation of interactions between hunting-gathering and farming communities in central Tanzania (Fosbrooke 1950; Fozzard 1959, 1966; Newman 1970), very little archaeological research has been conducted on the introduction of agriculture more than 2000 years ago (Masao 1979; Sutton 1968:173). The archaeology of central Tanzania, in particular Dodoma and Singida, is not well known because only a few sites have been examined in detail. Early archaeology in central Tanzania has concentrated on the documentation of rock art (see Fosbrooke 1950; Fozzard 1959, 1966; Inskeep 1962; Kohl-Larsen 1943; Kohl-Larsen and Kohl-Larsen 1938; Leakey 1950; Lim 1996; Ten Raa 1974). Kohl-Larsen for example, travelled through Kondoa, Isanzu, Iambi and the Iramba plateau in 1934-5 excavating, recording and describing a large number of rock art sites (Kohl-Larsen and Kohl-Larsen

1938, 1943). From the excavation at Sandawe in Kondoa, Kohl-Larsen collected pottery which was classified by Smolla (1957) as "Ssandauweland-Typhus" (Kohl-Larsen 1943; Sutton 1968:169). Later excavation by Sutton (1968) led to a reclassification of the pottery, placing it in the EIA as "Lelesu pottery".

In 1969 Odner carried out fieldwork in Iramba, Singida and reported 17 LSA sites five of which had rock paintings and 13 with IA pottery (Odner 1971b). The IA pottery was decorated with cord-impressions and plaited roulette. It is suggested that the plaited roulette wares are as recent as the 19th century and that the cord-impressed pottery is older (Odner 1971b:162-3). At Sumtsilila cave Odner found Kansyore pottery which may belong to the LSA (Odner 1971b:159, 180). He suggests that the Iramba LSA dates to 7950-1650 BP with IA ranging from 350-1750 BP.

In 1974 Liesegang undertook a survey to identify different types of pottery in Kondoa and Singida during which several iron-working sites were located (Liesegang 1975). Sites investigated include Haubi, Kandaga, Musia and Kwa Ndee and Kinyingogo-Isanzu. Pottery from Kandaga was dated to 1650 AD (Liesegang 1975:105). No dates are provided from other sites but Liesegang suggests that most of the ceramics collected were probably recent.

Another important project in central Tanzania was conducted by Inskeep (1962) at Kisese II Rock-shelter in the Irangi Hills where LSA and MSA deposits were recovered. Unfortunately, only short descriptions and diagrams showing relative frequencies of scrapers, *outils écaillées* and microliths are published. Mehlman (1989:365) suggested that the Mumba industry is certainly present below Level 11 at Kisese II Rock-shelter and is associated with a date of 31,500 BP at Level 14. In some spits below Level 14 the Mumba industry is associated with ostrich eggshell beads. The Nasera industry is also present at Kisese II below Level 9 dating to before 18,200 BP (Mehlman 1989:365). The industries from Level 9 upwards are dominated by microliths. The dating and typology of these industries suggests that the uppermost industry may correspond to Lemuta of Nasera (Mehlman 1989:452). At Kisese, as was the case at Mumba and Nasera, early LSA industries are scraper-based with few backed pieces while later assemblages are rich in microliths. Ostrich eggshell beads are also present in early LSA industries. The intermediate industries at Kisese are said to be associated with fauna dominated by warthog (Mehlman 1989:365).

One of the few intensive archaeological studies in central Tanzania was that undertaken by Masao (1979) who provided a detailed description and comparative analysis of the LSA and rock art. According to Masao (1979:194, 210-14), most LSA sites in central Tanzania date to 3500-1000 BP, with a few sites like Kisese II Rock-shelter dating back as far as 18,190 BP (Deacon 1966; Inskeep 1962; Mehlman 1989:365). Masao's project covered the districts of Mpwapwa and Kondoa (Dodoma), and Manyoni and Iramba (Singida). With the exception of Kondoa and Iramba where rock-shelters were excavated the remaining areas were surveyed for rock art. Sites excavated included Kandaga A9 and Majilili 2B in Kondoa, Kwa Mwango-Isanzu and Kirumi Isumbirira in Iramba. Since Masao's project represents the only detailed work in central Tanzania, a short summary of the stratigraphic findings are useful for comparison with the current study. Since Kandaga A9, Kwa Mwango-Isanzu and Kirumi Isumbirira sites have the same stratigraphic sequences (lower layers are dominated by LSA and upper strata a mixture of LSA and IA), only the Kandaga A9 and Majilili 2B will be discussed in detail.

Kandaga A9 is a rock-shelter located on the eastern slopes of the Irangi hills overlooking the game rich Masai Steppe, about 17.5 km from Kolo (Masao 1979). The rock-shelter is covered with red stylized human figures, handprints, naturalistic animals and white geometric figures, including lines, squares, circles and ladders. Three trenches were excavated at Kandaga. All trenches consisted of a mixture of LSA and IA remains in the upper layers (Masao 1979:20-51). IA remains included pottery, slag, tuyeres, metal objects such as pieces of brass wire, ostrich eggshells beads, and bones of domestic cattle (Masao 1979:26-32, Tables, 1-3). The lower layers consisted of exclusively LSA artifacts most of which were lithics. Many remains of wild fauna were recovered in all layers possibly indicating their significance to both the LSA and IA occupants. Recovered wild animal remains included zebra (*Equus* sp.), hartebeest (*Acelaphus* sp.), reedbuck (*Redunca* sp.), oryx (*Oryx beisa*), roan antelope (*Hipotragus equinus*), bushbuck (*Tragelaphus scriptus*), grants gazelle (*Gazella grant*) and many unidentified bovids. Layer 3 in Trench 1 only has LSA remains dated to 3375 BP (Masao 1979:36). The bones of domestic cattle were recovered from Layer 2 Trench III where they were associated with pottery, pieces of brass wire, wild animal bones and lithics (Masao 1979:35, 50). A bone sample in this layer was dated to 200 BP (Masao 1979:36). Layer 5 Trench II which had IA remains including potsherds, tuyeres and slag in association with lithics and bones, and was dated to 200 BP (Masao 1979:29). Masao (1979:29-39, 190-1) was sceptical about the association of the LSA lithics with such a recent date.

Most of the lithic artifacts were made of quartz while a few were of chert, obsidian and lava (Masao 1979:35, 40). An examination of the shaped tools indicate that scrapers were the most frequent at Kandaga followed by geometrics, becs, *outil écaillés*, borers and burins while points were absent (Masao 1979: 39, 43). The Kandaga excavations also indicate that the beginning of IA may be very recent in this region.

The site of Majilili 2B is a rock-shelter located on the western slopes of Muheya Hill, part of the Irangi Hills in Kondoa district overlooking the Hembe-Korongo River (Masao 1979:51). Rock paintings are executed in two distinct colours: brick red and maroon. The depicted subject matter includes human figures and animals (Masao 1979:53). The finds from Majilili 2B site were rather peculiar. Only lithic artifacts were found with no IA or faunal remains. The character of the lithics (waste products and discarded tools) and the absence of faunal remains suggest that the site was used as a lithic factory occupied for short periods of time. As in Kandaga A9 scrapers dominated the shaped tool category. The Majilili 2B site was not dated but Masao suggests it to be older than Kandaga though the absence of IA materials may point to an earlier abandonment (Masao 1979:61).

At Kwa Mwango rock-shelter a date of 200 BP was secured for Layer 1 in Trench I which consisted of LSA and IA remains (Masao 1979:68-9). An LSA component from Layer 4 was dated to 3270 BP, however the exact types of cultural materials associated with that date remain unclear. For example, while there is no mention of pottery in Layers 2, 3 and 4 in Masao's description, Table 13 indicates that Layers 2, 3 and 4 produced pottery. The 3270 BP date is comparable to that of Kandaga but was obtained from a disturbed context (Masao 1979:69-71). Level 5 and 6 of Trench 1 at Kirumi Isumbirira with exclusively LSA artifacts were dated 3665 and 740 BP respectively (Masao 1979:80-1).

In general several conclusions can be drawn from the archaeology of central Tanzania from Masao's synthesis. The IA dates to 200 BP, while the LSA dates to 3500

BP. It is important to note that a date of 200 BP was obtained from Kandaga Trench II where iron-working materials were found in association with LSA lithic artifacts. The coexistence of iron and lithic technology is also found in trench I and III at Kandaga (Masao 1979: 29-7).

The lithic raw material used is almost exclusively quartz especially at the sites of Kandaga A9 and Majilili 2B, while at Kwa Mwango and Kirumi Isumbirira quartzite, obsidian and chert account for 10%. The stone industry is based on flake technology while blades form a small component of the assemblage (Masao 1979:90, 168). *Outil écaillées*, scrapers, utilized flakes, and non-descript trimmed pieces are the most frequently encountered tools followed by geometric microliths, backed flakes, burins, and bone tools (Masao 1979:90). Bifacially worked pieces and points are virtually non-existent. Most faunal remains recovered indicate that wild game was the main supply of meat, with some evidence of domesticated cattle from Trench II and III at Kandaga. The overall results indicate that LSA was not replaced by IA technology but both technologies seem to have co-existed (Masao 1979:81, 91). This conclusion is best demonstrated at Kandaga A9 where evidence of iron-working was found in association with lithic artifacts in several layers.

2.1.4.4. LSA Sites From Other Parts of Tanzania and Kenya

As discussed earlier, the East African LSA demonstrates significant temporal and technological variations. What follows is a short summary of LSA sites in East Africa that illustrate the temporal and technological variations.

Mumba and Nasera rock-shelters

A detailed study of the LSA industry was conducted by Mehlman (1989) at Nasera and Mumba rock-shelters in northeastern Tanzania. The Nasera Rock-shelter is on an inselberg in the eastern Serengeti Plain, about 27 km north of Olduvai Gorge and about 244 km north of Kondoa town. The shelter overlooks the Angati Kiti valley which connects the Serengeti with the Salei Plain and is an important seasonal migration route for game (Mehlman 1989:24). The Mumba Rock-shelter is located on the south eastern shore of Lake Eyasi, 145 km north of Kondoa and 99 km south of Nasera Rock-shelter. At both sites, the LSA industry overlies MSA deposits which are separated by an intermediate industry (Mehlman 1989). In addition PN and IA contexts are found at both localities.

Mumba Rock-shelter was first excavated by Kohl-Larsen in 1934 and 1939. Later excavation of the site by Mehlman (1989) revealed that Kohl-Larsen's data was biased in two ways. First, artifact retention was biased on size and only the largest 2% of all excavated stone was kept, while quartz as a raw material was under-represented by 15-20% in most levels. Secondly, Kohl-Larsen's excavation of beds III, V and VI did not have effective lateral control, and several temporal contexts may have been mixed (Mehlman 1989:78-9).

MSA industries at Mumba

According to Mehlman (1989:183) Level VI B which represents the lowest level at Mumba revealed 2 MSA industries, the Sanzako and Kisele. The Kisele industry was named after a prominent hill immediately south of Nasera across the Angata Kiti. At Nasera Rock-shelter the Kisele industry is represented from Level 12 to the base of the sequence while at Mumba the industry is found at Level VIB. At Nasera the Kisele industry was dated by uranium series to 55,960 BP (Mehlman 1989:45) (Table 2.1). The Sanzako industry dated to 131,710 BP is a Hadza name for Oldean Mountain, which dominates the northern end of the Eyasi Basin (Mehlman 1989:103, 183) (Table 2.2).

2nd Intermediate industries (MSA and LSA) at Mumba and Nasera

Level V at Mumba consisted of a "2nd intermediate" industry bearing MSA and LSA elements which Mehlman (1989:272) called the Mumba Industry. Dates for this level at Mumba are highly inconsistent including a C-14 estimate of 20,995 BP and a uranium series date of 65,686 BP (Mehlman 1989:103). At Nasera the Mumba industry is represented in Level 8-11 (Mehlman 1989:273). The Mumba assemblage is characterized by large backed pieces, retouched points, and radial, platform and bipolar cores (Mehlman 1989:272). The most common shaped tools in lower Level V are scrapers followed by sundry modified pieces, points and backed pieces (Mehlman 1989:274). However in middle and upper Level V, backed pieces outnumber points indicating a transition to LSA (Mehlman 1989:281, 283). Bipolar cores predominate over all forms of platform cores. Upper and middle Level V is more like LSA than MSA (Mehlman 1989:280). In terms of raw materials, 95% consisted of quartz, 3% fine-grained quartzite and 2% chert. Twelve obsidian pieces were recovered and traced to Kenyan sources (Sonanchi and Njorowa Gorge) (Mehlman 1989:280). Associated with the Mumba industry are faunal remains representing several species of wild animals (Mehlman 1989:313-18).

The Nasera industry (another variant of the 2nd Intermediate industry) overlies the Mumba industry at Mumba Rock-shelter. Here the Nasera industry is present in lower

Table 2.1. Chronometric age determinations from Nasera Rock, eastern Serengeti, Tanzania. (modified, after Mehlman 1989:45)

Level	Industrial Assemblage	Material	Dates BP	
			Apatite	Organic
3A	PN Akira Ware	B:C-14	2,060 ±100	2,180 ±200
3A	Olmoloti Industry/Kansyore Ware	B:C-14	5,400 ±150	4,720 ±105
3B	Sisale Industry (LSA)	B:C-14	8,100 ±120	7,100 ±75
4	Lemuta Industry (LSA)	B:C-14	22,460 ±500	14,780 ±205
5A	Lemuta Industry (LSA)	B:C-14	21,700 ±600	21,600 ±400
		B:C-14	18,475 ±860	22,910 ±400
6	Nasera Industry (2nd Intermediate)	B:Th-230	25,599 +600, -350	-
7	Nasera Industry (2nd Intermediate)	B:C-14	17,080 ±130	20,360 ±303
17	Kisele Industry (MSA)	T:Th-230	55,960 +2675, -2300	-

B = Bone, T = Tooth, Th-230 = Uranium Date, C-14 = Carbon-14 date

Table 2.2. Chronometric age determination from Mumba Shelter, Lake Eyasi, Tanzania (modified, after Mehlman 1989:103)

Level	Industrial Assemblage	Material	Dates BP	
			Apatite	Organic
II/III	LSA/PN/Iron Age	C:C-14	-	1,780 ±80
III - Low	Nasera Industry (2nd Intermediate)	E:C-14	26,960 ±760	-
V - Top	Mumba Industry (2nd Intermediate)	B:Th-230	23,620 +1099, -851	-
V - Mid	Mumba Industry (2nd Intermediate)	B:C-14	29,570 +1400, -1100	-
		B:Th-230	65,686 +6049, -5426	-
V - Low	Mumba Industry (2nd Intermediate)	B:C-14	20,995 +680	-
		B:Th-230	35,291 +749, -476	-
VI - B - Top	Kisele Industry (MSA)	B:C-14	19,820 ±750	-
VI - B	Sanzako Industry (MSA)	B:Th-230	131,710 +6924 -6026	-

B = Bone, C = Charcoal, E = Ostrich eggshell, Th-230 = Uranium Date, C-14 = Carbon-14 date

Level III (Mehlman 1989:103). It differs from Mumba in the greater proportion of points to backed pieces and the predominance of scrapers (Mehlman 1989:318-21). Although points normally outnumber backed pieces in the Nasera industry, the site of Mumba was different because both points and backed pieces were equally rare. At the site of Nasera, the Nasera industry is restricted to Level 6-7 and has been dated by uranium series to 25,599 BP and 18,475 BP by C-14 (Mehlman 1989:45, 318) (Table 2.1). At Mumba the

Nasera industry was dated to 26,960 BP by C-14 (Mehlman 1989:103) (Table 2.2). Quartz dominates raw materials accounting for 95% of the lithic assemblage at Nasera. The Nasera industry also includes ostrich shell beads, and bored stone balls. Terrestrial faunal remains associated with the Nasera industry at Nasera suggests a much drier climate than today, while at Mumba a climate resembling the present is suggested. The Nasera industry at Mumba is also associated with aquatic remains such as catfish and *Tilapia* (Mehlman 1989:361-2).

LSA and PN Industries at Mumba Rock-shelter

Overlying the Nasera industry at Mumba Rock-shelter was an LSA industry termed "intermediate LSA" (Aceramic LSA) found in a very thin level at 80-110 cm below datum. The sample was small and incompletely analyzed (Mehlman 1989:404). When compared to overlying assemblages with ceramics (the Oldean industry) the sample was deficient in geometric microliths and had a higher frequency of curve backed pieces (Mehlman 1989:401).

The LSA industry with Kansyore pottery from upper Level III at Mumba Rock-shelter was named the Oldean industry (Mehlman 1989:418). Excavations indicate that levels at 40 –80 cm below the surface contained exclusively Kansyore wares, however upper levels in both Mehlman's (1989) and Kohl-Larsen's (1938) excavations produced IA pottery in association with Kansyore ware. The Oldean lithic industry is dominated by backed microliths and scrapers which form 75% and 21% of the shaped tools respectively. The ratio of scraper to backed pieces in the Oldean industry is approximately the reverse of that of the "intermediate LSA" industry at Mumba where backed pieces and scrapers comprise 39% and 61% respectively. The raw materials were dominated by quartz (98.7%), followed by quartzite, obsidian and chert (Mehlman 1989:401-423, see Tables 9.10, 9.22, 9.24). The obsidian source is the Sonanchi Crater, Njorowa Gorge and Eburru in Kenya. Other artifacts associated with the Oldean industry include those made from bone and ostrich eggshell. Various species of fauna were represented suggesting subsistence was based on exploiting both water and land animals. Human burials from Level III have been dated to 4800 BP by C-14. However, the reliability of the dates is doubtful based on the associated ceramics (Mehlman 1989:450). Level II at Mumba consists of LSA, EIA pottery (Lelesu) and PN pottery (Narosura) and has been dated to 1780 BP (Mehlman 1989:103, 523) (Table 2.2).

LSA and PN at Nasera Rock

The Lemuta is an early LSA industry present at Nasera Rock-shelter. It was so named after a prominent hill of quartzite situated west of Nasera rock. The Lemuta Industry overlies the Nasera Industry in Levels 5 – 4 and is dated to 18,280 - 21,700 BP (Mehlman 1989:45, 368) (Table 2.1). The Lemuta industry is dominated by scrapers and backed pieces. The frequency of scrapers among shaped tools is 39% while that of backed pieces is 31%. The raw materials most used by the makers of the Lemuta industry include quartz (88%), and chert (10%) (Mehlman 1989:371).

The Lemuta at Nasera is overlain by the Sisale LSA industry, which is found in Layer 3B and C 14 dated to 8,000 BP (Mehlman 1989:45) (Table 2.1). There is a gap of about 10,000 years between the Lemuta and Sisale industries (Mehlman 1989:389). The latter is dominated by microlithic backed pieces and small convex scrapers. Of the total shaped stones, backed tools are 57% of the collection while scrapers constitute 27%. Sisale microliths are on the average 10 mm shorter and 4 mm narrower than those of

Lemuta industry. Quartz constitutes about 95% of the raw materials while chert represents only about 5% (Mehlman 1989:390-91).

Overlying the Sisale in Level 3A is the Olmoti (LSA/Kansyore pottery) industry named after the volcanic peaks east of Nasera (Mehlman 1989:404-5). The Olmoti shares several features with the Sisale industry in terms of tool types and core technology except that scrapers predominate over backed pieces. One aspect that distinguishes Olmoti from Sisale is the appearance of Kansyore ceramics as well as Nderit, Narosura, Akira and IA wares in the uppermost Level 3. Most of the Kansyore ware (found lower than the rest of the pottery) underlay a level containing Nderit pottery while most of the Narosura pottery is found in levels that overlie the Nderit. The Olmoti industry dates to 5,400 BP (Table 2.1). Quartz represents about 91% of the lithic raw material and chert 6% (Mehlman 1989:45, 406-9).

The Angata Kiti PN industry follows the Olmoti and is composed of lithics in association with Akira and Narosura pottery. Stratigraphic analysis at Nasera Rock-shelter indicated that Akira ware was younger than Narosura pottery but older than the IA deposits (Mehlman 1989:493). In the Angata Kiti industry microliths occur in moderate frequencies and geometrics are exceedingly rare. Scrapers represent 33% of the shaped tools while backed pieces represent 24%. Quartz forms about 84%, chert 7% and obsidian 9% of the raw materials in the Angata Kiti industry (Mehlman 1989:494-5).

Upper levels at Nasera Rock-shelter and the Lake Eyasi basin are generally associated with PN industries where domestic cattle, goats and sheep are represented. At Nasera the PN is found in Level 3A and has been dated to 2180 BP (Mehlman 1989:45). At Lake Eyasi, PN remains are represented at Ishimijega Rock-shelter and Jangwani 1 (particularly in Levels 2 and 3). The Lake Eyasi PN remains are dated to 1780 BP. Cattle amount to 25-33% of the domestic animals at Nasera Rock-shelter and 40% at Lake Eyasi. The upper most levels at Nasera and Mumba Rock-shelters consist of EIA deposits. At Mumba IA remains are associated with EIA Lelesu pottery, dated to about 1800 BP (Mehlman 1989:523, see also Soper 1971a & b and Phillipson 1977a:109).

Important work on LSA at Lake Eyasi was carried out by Mabulla (1996), and involved survey and excavation of several rock-shelters. In the excavations, LSA was found to overlay MSA deposits as well as intermediate MSA-LSA industries. The observations are similar to those of Mehlman (1989) for Mumba Rock-shelter (Mabulla 1996:351-353). At Gordfani 2, a rock-shelter located northeast of Lake Eyasi basin, Level VII-IX yielded artifacts that were transitional between the LSA/MSA. These are equivalent to the MSA/LSA intermediate at Mumba or the Late Pleistocene Lemuta LSA industry. Level IV-VI produced lithic artifacts, pottery and ostrich eggshell beads and is considered Holocene LSA or equivalent to Oldean industry (LSA/ "Kansyore" pottery) at Mumba Rock-shelter. From Level II to the surface cultural sequences were characterized by PN artifacts which Mabulla suggested to be equivalent to the "Ishimijega" PN (Mabulla 1996:341). Organic materials were represented in small amounts and restricted to Levels I and VII (Mabulla 1996:350).

Endahakichandi 2B is another rock-shelter at Lake Eyasi located in the Siponga Masiedha. Level I-III consisted of lithics, bones, pottery, ochre and ostrich eggshell artifacts. Level IV produced lithics and bones and Level V consisted of lithics and a burial. Level VI which was 50-60 cm below the surface consisted of lithics and was dated to 3090 BP (Mabulla 1996:385). Lithics from lower levels of Endahakichandi 2B are classified as LSA and upper levels are PN (based on pottery evidence).

Naisiusiu Beds – Olduvai Gorge

The upper geological sequence at Olduvai Gorge includes the Ndutu and Naisiusiu Beds which contain LSA and MSA industries. The Naisiusiu Beds are formed of aeolian tuffs covering about 10% of the gorge surface. Leakey *et al.* (1972) excavated an LSA site 110 m to the west of the second fault on the north side of the Gorge. The assemblage was found in a unit of sheet wash above stream channel sediments and below an aeolian tuff. The assemblage was dated by C-14 on bone collagen to 17,550 BP. A recent reinvestigation of the Naisiusiu Beds LSA dated the deposits by single laser fusion $^{40}AR/^{39}AR$ dating to 42,000 years BP (Manega 1993:94). Raw materials used in the manufacture of tools at Olduvai include quartz, chert and obsidian. Some of the obsidian used at Olduvai is said to come from the Central Rift Valley of Kenya (Merrick and Brown 1984).

Mbeya Region

Later Stone Age sites have been reported in the Mbeya region of southwestern Tanzania (McBrearty *et al.* 1982; Wynn and Chadderton 1982), specifically in the Kiwira and Songwe rivers basins. Unfortunately the sites have not been dated or studied in detail, so attributes of local LSA industries are not well defined. According to McBrearty *et al.* (1982:18) artifactual assemblages from the Kiwira (Kala) area as a whole do not resemble LSA assemblages from nearby regions. However, there are similarities to the Malawi (Fingiran Industry) and Kaposwa of Kalambo Falls in terms of frequency of shaped pieces and nature of scraper retouch. Microliths and backed bladelets which are common in Malawi and Zambia assemblages, were completely absent at Kiwira. McBrearty *et al.* (1982) suggest that the technical aspect of the Kiwira flakes and cores, as well as the frequency of scrapers, burins and absence of heavy-duty tools, most closely resemble those of the Polungu Industry at Kalambo Falls (Clark and Kleindienst 1974). However points and blades are lacking. McBrearty *et al.* (1982) also located areas with Early Stone Age, MSA and LSA sites in the Northern Songwe drainage.

The Kala Waterfall site was examined by Wynn and Chadderdon (1982). Excavations recovered cultural materials from the surface to underlying volcanic rocks. The Kala assemblage is primarily quartz (94%), followed by quartzite (4.1%), obsidian (1.3%) and chert (1%). The LSA assemblage (Kiwira industry) at Kala demonstrated a low percentage of trimmed pieces including irregular flake scrapers, bifacially retouched flakes, points, backed microliths and becs (Wynn and Chadderdon 1982:131-7). This is contrary to McBrearty *et al.* (1982:18) who state that microliths and backed bladelets are absent in the Kiwira aggregates. Bipolar cores were most common representing 40.6%, while platform cores constituted 17.7% and peripheral and Levallois cores 10%. The Kiwira industry has not been precisely dated but Kala assemblages may predate 7560 BP (Wynn and Chadderdon 1982:130).

The Songwe River Valley was investigated in more detail by Willoughby (1992, 1993, 1996) and Willoughby and Sipe (2002) who recorded thirty-three LSA, MSA and IA sites. A variety of flakeable stone was found in the area, including quartz, quartzite, chert and obsidian. The LSA sites showed high reliance on quartz which formed about 92% of the flaked stone (Willoughby 1992:32, 1996:65). Quartz also dominated MSA sites (50.1%), followed by chert (17.9%), volcanic rock (16.4%) and quartzite (12.4%) (Willoughby 1996:65). MSA flakes came from the latest stages of production, indicating that initial core reduction took place away from the site. MSA assemblages were comprised of scrapers, points, and bifacially modified pieces, made from flakes detached from radial, peripheral and discoidal cores. The LSA industry is dominated by backed tools, microburins and geometric microliths (crescents, triangles and trapezes) (Willoughby and Sipe 2002:209). Most LSA cores were single platform, prismatic or bipolar cores. At the site of Idlu 22 the LSA component has been dated to 7540 BP using bone collagen (Willoughby and Sipe 2002:213). This site is very rich in lithic artifacts and the proportion of retouched tools is enormous ranging from 2.6-27.6% of overall lithic artifacts. Cores are very rare but flakes and chunks are abundant suggesting that cores were reduced into unidentifiable fragments (Willoughby and Sipe 2002:210-3).

Kenya LSA

There are two important Kenyan LSA sites which date to the Pleistocene: Lukenya Hill and Enkapune ya Muto. Lukenya Hill is located on the Athi plains of south central Kenya about 40 km southeast of Nairobi. It is an inselberg of granetoid gneiss, about 8 km long and 2 km wide. Lukenya Hill was surveyed by Gramly in 1970-71 who conducted excavations in rock-shelters which contained Pleistocene LSA materials and modern human remains (Gramly 1976; Gramly and Rightmire 1973). The site was also surveyed and excavated by Bower and Nelson (1978) and Merrick (1975) who located numerous rock shelter sites with MSA and LSA materials. The overall analysis indicates that the Lukenya Hill vicinity consists of cultural remains ranging from the Acheulian to IA. The LSA industry at Lukenya Hill is dominated by quartz and a small percentage of tools were made from obsidian and chert. All materials were obtained locally except some of the obsidian. Several areas have been identified as external sources of obsidian for Lukenya Hill including Sonanchi, Kinangop, Mangu, Eburru, Kibokoni, and Naivasha (Barut 1996). The LSA occurrences at Lukenya Hill have been dated to 21,000 - 4,000

BP (Barut 1996; Gramly 1976; Gramly and Rightmire 1973). However most dates from Lukenya Hill are based on apatite and may have been contaminated with modern carbonates in ground water (Tylor 1987, 1980). Analysis of the faunal remains from Lukenya Hill suggests that hunters concentrated on migratory fauna rather than species available locally such as dikdik and klipsringer (Marean 1990).

At the site of Enkapune ya Muto in the central Rift Valley of Kenya, two LSA industries underlie Holocene Eburran assemblages. The topmost DBL horizon is characterized by convex end scrapers, *outil écaillées*, backed pieces, and ostrich egg shell beads (Marean 1992:74). The lowermost industry in GGOL levels is dominated by large backed blades but lacks convex end scrapers that are common in DBL horizon. The DBL horizon was radiocarbon dated to between 29,300 and 39,900 BP (Marean 1992:74). Below the LSA horizons is a small MSA component with a large number of *outils écaillées* and three large backed pieces (Ambrose 1992; Marean 1992). The marked typological and technological differences between two LSA (DBL and GGOL) industries suggest that the East African LSA, may in fact have successive, distinct industries similar to Paleolithic Europe. Bones were very rare in both LSA horizons and whenever available were extremely poorly preserved and almost unidentifiable (Marean 1992). Pottery appears at the rock-shelter at about 4,900 BP and domestic animals by 4,000 BP (Marean 1992:65, 73-74).

The Nderit Drift site has been interpreted as the remains of a campsite alongside an old course of the Nderit River (Merrick 1975). The Nderit assemblage is predominantly microlithic, resembling the Late Holocene Eburran, but it is unique in having few clearly defined microlithic types. Instead it includes a high proportion of poorly standardized miscellaneous pieces. Merrick (1975) noted that the low frequency of cores and high frequency of backed pieces is at odds with high frequencies of core trimming and tool trimming flakes, and suggested that either raw material was brought to the site as flakes or that cores and tools were removed from the assemblage. The Nderit Drift assemblage has been radiocarbon dated to between 12,000-10,300 BP (Ambrose *et al.* 1980:249).

2.2. The Iron Age and Bantu Migration

2.2.1. Introduction

The origin of East African iron-working has generated interesting and at times controversial discussion. This is partly because its origin was said to be foreign and its introduction to be contemporaneous with (Phillipson 1993a; Schmidt 1978), or earlier than, the appearance of iron-working in West Africa (van Grunderbeek 1992). In addition, although no longer widely accepted, the spread of iron-working has been associated with the movement of Bantu speaking peoples from West Africa southwards as an "Iron Age cultural package" made up of several cultural elements (Phillipson 1993a:183-201; van der Merwe 1980). A discussion of the history of iron-working in East Africa cannot be fully grasped without a discussion of these controversies.

2.2.2. Archaeological Explanations for the Introduction of Iron-Working in Africa

There are two main schools of thought on the advent of iron technology in sub-Saharan Africa (Holl 1993; Kense 1985; Mapunda 1995; Okafor 1993; Woodhouse 1998). One group proposes that iron technology originated through external influences (diffusion), while the second group supports an independent invention hypothesis.

The diffusionists base their arguments on two fundamental issues. In the first instance, diffussionists see the onset of iron-working in Africa to be rather abrupt. According to them iron was the first metal to be produced in sub-Saharan Africa together with copper and gold (van de Merwe 1980). The chief obstacle to the acceptance of the idea of an indigenous origin of African iron-working is the lack of definitive evidence for metal working prior to the beginning of iron production (Kense 1985; Kense and Okoro 1993, Woodhouse 1998). In other parts of the world, copper antedated iron production and this has led to the assumption that iron-working is always preceded by copper working (Kense 1985; Kense and Okoro 1993). The main reason for this is that iron smelting is a more complex process than working with copper (Holl 1993:333; Phillipson 1993a:158-9). Importantly, there is no evidence for furnaces capable of achieving sustained high temperatures for iron smelting (1100° C) predating the event of iron-working (Tylecote 1975a; Wertime 1973).

In the second instance, diffussionists argue that African iron-working is much more recent than in other parts of the world, especially the Near East. Iron technology was developed in the Near East during the second millennium BC (Muhly 1980; Waldbaum 1980). This comparatively early date, the geographical relationship between Africa and the Near East, and the cultural contacts that prevailed in the past have lent strong support for a diffusionist explanation. Diffusionists have proposed various routes or sources from which iron technology could have originated and penetrated the African continent (Holl 1993).

One group of diffusionists has proposed that iron technology first appears in northeast Africa and then spread to West and East Africa (Arkell 1966; van der Merwe 1980). Arkell (1966) believed that northeastern Africa was an important junction where iron technology was adopted from the Phoenicians who had settled in Egypt where the technology was refined and then exported to Meröe (Kense 1985; van der Merwe 1980). The technology then spread from the Sudan to West Africa before moving to the rest of sub-Saharan Africa (Arkell 1966). This conclusion was derived from a comparative analysis of aspects involved in West African and Sudanese iron technologies, but has not been supported by archaeological evidence (Mapunda 1997). For instance, large scale iron smelting in Meröe dates to the second century BC and the first century AD (Shinnie 1985; Shinnie and Bradley 1980) and is in fact more recent than iron technology in West Africa. In addition, Meroitic and West African iron technologies are significantly different (Woodhouse 1998:165).

A second group of diffusionists have proposed an alternate route for the spread of iron technology to West Africa from North Africa by Phoenicians in the 8th century BC (Kense 1985; Shaw 1975; Tylecote 1975a; van de Merwe 1980). These Phoenicians established settlements and traded with North Africans, and from such contacts iron-working was transferred to the Berbers of northern Africa who later introduced iron technology to West Africans and people who resided in the fringes of the Saharan desert (van Der Merwe 1980:477-8).

Recent archaeological research does not appear to support the diffusionist hypothesis (Okafor 1993; Rustad 1980; Schmidt 1996a:8-9; Schmidt and Avery 1983). For example, very little is known about iron-working in Punic North Africa and there is no substantial evidence that Berbers practiced iron-working before its introduction to sub-Saharan Africa (Okafor 1993). Existing evidence indicates that iron smelting technology in Punic North Africa dates to the 3rd century BC (Lancel 1978), which postdates early West African evidence for iron in the Nok Culture (Fagg 1972; Shaw 1978). Furthermore, most of the North African evidence that predates the 3rd century BC comes from utilitarian objects or stelae records (Tylecote 1975b:55; Van Der Merwe 1980:477). Some have suggested that given the wide distribution of iron ore in West Africa, iron technology was most likely an indigenous development (Andah 1979; Diop 1968; Rustard 1980). Andah (1979) argues that iron technology in sub- Saharan regions developed differently from that of other areas because iron ores in West Africa do not require complicated methods for smelting. Consequently, it is not necessary to assume that the technology evolved from pre-existing copper or bronze metallurgy. Furthermore, new evidence indicates the existence of metallurgy before the advent of iron smelting in sub-Saharan Africa (Tylecote 1982). Research in Mauritania (Khatt Lemaiteg and Akjoujt) and Niger (Agadez) has demonstrated the presence of copper-working predating the advent of iron. At Khatt Lemaiteg copper artifacts associated with stone tools have been dated to 1890-1390 BC (Vernet 1992, but see Childs and Herbert 2005:277-80). At Akjoujt evidence of copper-mining and working dates from the 9th to 6th centuries BC (but see Holl 2000; Woodhouse 1998:173-4), while the exploitation of native copper at Agadez is documented for the 2nd millennium BC and smelting from the early to the mid 1st millennium BC (Calvocoressi and David 1979:9-10; Holl 1993; McIntosh and McIntosh 1983:241).

The spread of iron-working south of the Sahara has been linked to Bantu-speakers (Greenberg 1963; Mason 1974), but the nature of this link is controversial. Firstly, linguistic studies indicate that the Bantu migration from West Africa took place as early as 4000 BP (Chami 2001c; Ehret 1982:57-67; Phillipson 1993a:198). If so, this gives very little allowance for West African iron technology to be associated with the Bantu migration theory, because they must have left the region before the advent of iron-working (Okafor 1993:434). Secondly, archaeological evidence from the Great Lakes region indicates iron production there may be contemporary with, or earlier than, West Africa. For example, some of the earliest iron-working sites in Rwanda and Burundi dates to between 2020 and 990 BC (van Grunderbeek 1992:56-7) although some authors argue that the early first millennium BC (800 BC) is a more agreeable chronology (Woodhouse 1998). At the site of Do Dimi (Niger) West Africa iron-working has been dated to 930-750 BC (Grébénart 1985), while at Otumbi Gabon iron-working dates to 910-780 BC (Clist 1995; Peyrot and Oslisly 1987). Although there is a limited knowledge for the advent of iron-working in both East Africa and West Africa, this chronological coincidence could indicate independent invention of iron-working in East and West Africa.

2.2.3. Evidence for Early Iron-Working in Sub-Saharan Africa

2.2.3.1. The Horn of Africa

Research by Shinnie and Bradley (1980) in Meröe has demonstrated evidence for iron use dating from the 7th to 6th century BC (see also Table 2.3). However, this evidence is associated with only iron objects for utilitarian purposes such as knives, tweezers, chisels, shears, wire and nails with no indication of iron smelting at this time (Adams 1977:365; Mapunda 1997:111; Trigger 1969:45). Evidence indicates that iron was not smelted on a large scale at Meröe until the 2nd century BC (Mapunda 1997; Shinnie 1985; Shinnie and Bradley 1980). Unfortunately the nature of Meroitic iron smelting has not been investigated in detail.

Iron-working research in Ethiopia, Eritrea and Somalia remains incomplete, particularly because archaeology there has been largely restricted to urban sites with

Table 2.3. Earliest radiocarbon dates for iron in Africa (furnaces, slag and artifacts) (modified from Woodhouse 1998:168-9)

Date BC	Standard Error ±	Calibrated Range (1 Sigma)	Site	Country
1665	205	2300 - 1700	Muganza	Rwanda
1230	155	1680 - 1260	Rwiyanje	Burundi
1210	135	1620 - 1260	Mubuga	Burundi
905	285	1450 - 750	Rwiyanje	Burundi
870	100	1130 - 840	Oliga	Cameroon
865	165	1220 - 820	Kabacusi	Rwanda
760	130	1090 - 770	Oliga	Cameroon
680	160	990 - 520	Ghwa Kiva	Cameroon
678	120	930 - 750	Do Dimi	Niger
591	104	810 - 520	Taruga	Nigeria
538	84	790 - 520	Taruga	Nigeria
514	73	770 - 510	Meröe	Sudan
450	50	910 - 780	Otumbi	Gabon
450	90	550 - 390	Ekne Wan Ataran	Niger
430	110	600 - 380	Oliga	Cameroon
375	135	800 - 200	Okolo	Cameroon
360	100	550-200	Obobogo	Cameroon
355	90	520 - 340	Nsukka	Nigeria
350	100	520 - 200	Moanda	Gabon
330	270	800 - 50	Oyemi	Gabon
310	110	420 -110	Meröe	Sudan
300	100	410 - 170	Samun Dukiya	Nigeria
280	120	410 - 110	Meröe	Sudan
210	180	400 BC – AD 30	Jenne-Jeno	Mali
200	210	450 BC – AD 150	Kemondo Bay	Tanzania
170	70	240 - 50	Obobogo	Cameroon
160	60	210 - 40	Marc du Flex	Congo
115	320	500 BC – AD 350	Zoui	Chad
30	60	90 BC – AD 80	Tiekene Bassoura	Senegal
10	60	40 BC – AD 120	Toungour	Chad

elaborate monumental architecture and burials (Phillipson 1993b:347-8). In Yeha (Pre-Axumite site), Ethiopia, iron implements were in use during the 5th century BC (Posnansky 1968:6) and, as is the case for Meröe, most objects are of a utilitarian nature (Mapunda 1997). No early smelting is known from Ethiopia. Iron technology and tool production in Ethiopia remained very scarce until relatively recently and in some areas, backed microlith stone industries continued to be used (Phillipson 1993a:173; Phillipson, Laurel 2000). Although evidence for iron-working in Ethiopia is poorly known some authorities such as Trigger (1969:50) and Sutton (1971) have speculated that Ethiopia was a centre for the diffusion of iron technology to other parts of sub-Saharan Africa after it was acquired from South Arabia.

2.2.3.2. West Africa

West Africa clearly has produced significant traces of early iron production, but this evidence has not been fully explored by archaeological research. As stated earlier, evidence suggesting the use of copper before iron is present at Khatt Lemaiteg and Akjoujt in southwestern Mauritania and in Agadez in Niger. Lithic and copper artifacts have been found in association at Khatt Lemaiteg dating to 1890-1390 BC (Vernet 1992). At Akjoujt copper was mined and smelted during the 9th to the 6th centuries BC (Holl 1993:334). It was once thought that elongated furnaces at Agadez were used for copper smelting in the mid 1st millennium BC (Calvocoressi and David 1979:25; McIntosh and McIntosh 1983:241; Tylecote 1982) but such claims have been disputed by Killick *et al.* (1988) who determined that the furnaces were remains of charred tree stumps from an ancient forest. In these areas copper ores were smelted in simple furnaces (Phillipson 1993a). There are several similarities between Akjoujt and Agadez copper working, which may be related to contacts that existed between West and North Africa at the time. Archaeologists such as McIntosh and McIntosh (1988) have used this evidence to argue for a transfer of expertise in copper working from North Africa where Phoenician colonies had been established since the 8th century BC but as it has been stated earlier there are no adequate data from North Africa to support this claim (Okafor 1993).

The earliest evidence for iron-working in West Africa is from the site of Do Dimi dating to 930-750 BC (Grébénart 1985) (Table 2.3). At Jenne-Jeno in Mali evidence of iron-working dates to the last two centuries BC (Holl 1993:338). Further evidence of iron-working comes from Jos Plateau of Nigeria where several occurrences of iron-working are associated with the Nok culture dating to the 5th - 3rd centuries BC (Fagg 1972; Posnansky and McIntosh 1976; Shaw 1978). Also in Nigeria, the Opi site has revealed evidence of iron-working which dates to the 5th - 2nd century BC (Okafor 1993:437). In eastern Nigeria south of the Benue River iron-working dates to the first few centuries AD, while in Ghana, mid 1st millennium BC to mid 1st millennium AD dates have been demonstrated for iron-working at Daboya (Kense 1985:16). The use of iron tools may have facilitated tilling of heavy clay soils of the inland Niger Delta (McIntosh and McIntosh 1984, 1988). In north-central Chad iron-working is attested in 5th century BC to 5th century AD contexts. In sum, although evidence for metal-working in West Africa is still poorly explored, the currently available data calls for reassessment of diffusionist ideas that iron-working was introduced from North Africa. Evidence suggests that West African people could have developed copper smelting before iron technology and this dates well before the North African evidence.

2.2.3.3. Central Africa

Initially, it was believed that while some were benefiting from the products of iron technology in West Africa by the middle of the first millennium BC other areas such as Cameroon and the Central African Republic were unaware of the technology (Phillipson

1993a:183). However, this belief is no longer tenable. At the site of Otumbi in Gabon iron-working dates to 910-500 BC (Clist 1989:71-84; Clist 1995; Digombe *et al.* 1988; Peyrot and Oslisly 1987). In Cameroon evidence for early iron working at the sites of Okolo, Doulo Igazwa and Obobogo dates to 800-200 BC, 790-530 BC and 550-200 BC respectively (Holl 1991; MacEachern 1996) (Table 2.3). Despite the introduction of iron-working, ground stone axes/hoes continued to be used (de Maret 1989). According to Digombe *et al.* (1988) there are closer similarities in iron technology evident at archaeological sites found in Gabon, Rwanda (Muganza- 2020-1980 BC and Kabacusi-990), Burundi (Rwiyange-1450 BC, Mubuga-1430 BC), (van Grunderbeek 1992:56-7) and northwestern Tanzania (Kemondo Bay- 5th century BC) (Table 2.3) (Schmidt and Childs 1996) than in Taruga sites in West Africa. Similarities include furnace size, pit volume and the use of long tuyeres. However, on the basis of chronology, ceramic evidence and the distance between the interlacustrine zone and Gabon sites, Clist (1989:85) has raised doubt over the possibility of connections between the two regions and favours a north to south direction for the introduction of iron-working to Gabon. Given the contemporanaeity of the interlacustrine sites and those of Gabon, and the distance of 1750 km between the two areas, it is unlikely that the technology could have diffused so quickly. Also pottery similar to Urewe of the interlacustine region has not been found between the two areas which further weakens a connection (Clist 1989:85).

In the Congo, iron-using sites date to the 4th century BC at the coastal site of Tchissanga. Though iron objects are present at Tchissanga there is no evidence of smelting activities (Denbow 1990:154-5). However, further along the coast at Mandingo Kayes iron smelting is attested for the 2nd and 3rd centuries AD (Denbow 1990:155). In the Central African Republic the first evidence of iron-working comes from the site of

Nana Mode dating to the 7th century AD (David and Vidal 1977). Pottery was decorated by means of carved roulette suggested to have diffused from the "Nok Culture" (David and Vidal 1977:52).

2.2.3.4. East Africa

The beginnings of iron-working in East Africa has engendered much discussion among archaeologists (Posnansky 1966). Diffusionists have proposed that iron came to East Africa from West Africa (Arkell 1966) or the Horn (Sutton 1971; Trigger 1969). The earliest evidence for iron-working in East Africa comes from the Lake Region at the sites of Muganza, Rwiyange, Mubuga and Kabacusi in Rwanda and Burundi which date to 2020-1980 BC, 1450 BC, 1430 BC, and 990 BC respectively (van Grunderbeek 1992:56-7) (Table 2.3). However, a chronology that falls to the first millennium BC (800 BC and possibly older) for these sites has been suggested by some authors (Woodhouse 1998:181). Another site of exceptional significance is Katuruka (Kemondo Bay) in northwestern Tanzania dated to the fifth century BC (Table 2.3) where steel was produced through a complex process known as preheating (Avery and Schmidt 1996; Schmidt 1978:152-234; Schmidt 1997). However the preheating hypothesis has received several criticisms (Killick 1996; Woodhouse 1998:170-3).

These early dates call into question the idea that iron-working diffused from the Horn to East Africa. Similarly there is no strong evidence to support the idea of West Africa origins (Lwanga-Luyiigo 1976). For example carbon dates for the earliest iron-working in both East (Rwanda and Burundi) and West Africa (Taruga-Nigeria and Do Dimi Niger) are roughly contemporary if not earlier in the East (Table 2.3). Given contemporary dates and the distance between the two areas there does not appear to be sufficient time for diffusion to occur. Furthermore, the idea that the Bantu were responsible for the spread of iron technology from West to East and Central Africa is no longer tenable. New linguistic studies suggest Bantu migrated from West to East and Central Africa around 3000 – 4000 BP (Chami 2001c; Ehret 1982:57-65; Phillipson 1993a). If this evidence should be supported archaeologically then this migration took place during the Neolithic period before iron technology was available. This would mean that the Bantu could not have been agents for spreading iron technology to East and Central Africa.

There are also no similarities between the artifacts that are associated with iron-working between West and East Africa. For example, the IA pottery of Taruga is different from that of the Lake regions in East Africa (Soper 1971b:31). Yet as observed above, Gabon iron-working technology is more similar to that of Katuruka in Tanzania than that of Taruga in Nigeria (Digombe *et al.* 1988), though this claim has several limitations (see Clist 1989). Linguistic evidence suggests that iron-working terms in Central Africa are derived from the Eastern Bantu (Vansina (1984, 1990:60). This evidence led Digombe *et al.* (1988:183) to suggest that iron-working could have spread from East to Central Africa. However there are some similarities between the Urewe ware (pottery associated with Katuruka iron-working) to pottery found northwest of Chad (Soper 1971b:31) which could support the West African origin of iron-working. This note has not been examined in detail and it is not yet known whether any connections might have been involved. In general more data is required to verify if there is any connection between East and West African iron-working. More evidence would be required along the alleged routes of Bantu migration from Cameroon, Equatorial Guinea, Gabon, Central African Republic and Congo (Mapunda 1995).

2.2.4. Chronology and Distribution of Iron Age Cultures in East Africa

In the past IA industries of sub-Saharan Africa have been characterized by a collection of traits known as the "Iron Age cultural package". These features include domestication (farming and animal husbandry), EIA ceramics, centralized political organization, and iron-working, all of which were acquired by Bantu-speaking peoples (Mapunda 1995:86-7; Phillipson 1993a; Vansina 1994-95:16). The association of the early iron-working with Bantu speakers, pottery, political organization and farming was first proposed in the mid twentieth century (Clark 1959a: 21-2, 283; de Maret 1990:128-29; Mortelmans 1957b). However, this cultural package model has recently been criticized by several scholars. According to Mapunda (1995:89) this model "took the coexistence of the cultural traits for granted, thus homogenizing the cultural history of Bantu- speaking Africa." Many archaeologists tended to believe that IA materials found in this region were made by "people of the same human physical type and language, with the same metallurgy, agriculture and animal husbandry" (Hall 1987:17). In many cases archaeologists interpreted the presence of pottery as proof that the whole cultural package was present (Vansina 1994-5:16). This has hindered the recognization of the cultural diversity that existed in sub-Saharan Africa.

This concept was applied to the EIA in East Africa and was further linked to large-scale movement of Bantu speakers (Phillipson 1993a; Vansina 1994-5:16). In East and Southern Africa EIA sequences have been defined mainly by specific pottery types (Huffman and Herbert 1994-95:31; Vansina 1994-95:16). It is unfortunate that the Iron Age Cultural package concept has been inferred even at sites where only a single attribute of the component is present. Such conclusions are based on the assumption that material culture can directly reflect group identity. For example, Huffman and Herbert (1994-

95:31) have proposed that material culture reflects "group identity because it incorporates an arbitrary but nevertheless integrated and repetitive code of cultural symbols". For material culture to be used and understood, they proposed that codes within the material culture have to be learned by a group of people speaking the same language. Ceramic styles are therefore part of this integrated code. The variability of pottery and abundance of pottery makes it the principle artifact category used to recognize and trace people in the archaeological record. "By tracing backwards, phase by phase, the ceramic styles associated with a language family it is possible to determine the antiquity of that language in any one area" (Huffman and Herbert 1994-95:31). However, Sinclair *et al.* (1993) have criticized the over-dependence on pottery in the archaeological identification of Bantu-speaking people. They argue that it is inadequate to use pottery in isolation to define the limits and forms of past societies and therefore call for a multivariate approach to the archaeology of farming communities of southern and eastern Africa (Sinclair 1993:412). Vansina (1994-95) also is of the opinion that such a package did not exist and that technologies did not necessarily move together.

2.2.5. The Role of Pottery in the Identification of Iron Age

With the exception of PN sites of the Central Rift Valley where pottery was produced at an early date, EIA sites until recently provided the earliest evidence of pottery and associated iron metallurgy in East and southern Africa. However new research has indicated that pottery associated with LSA industries could have been used in areas beyond the Central Rift Valley before the beginning of the EIA. Unguja Ukuu (Zanzibar), Kiwangwa, Mafia and Nguru hills (Tanzania Mainland coast) for example, have all produced evidence that hunter-gatherer occupants were using pottery before the introduction of iron (Chami 2001a & c; Chami and Kwekason 2003; Thorp 1992).

In the interlacustrine region, Urewe ware is often used as an indicator of the EIA. This ceramic type was originally known as dimple based pottery (Leakey *et al.* 1948) and was later renamed "Urewe" by Posnansky (1961). It occurs in numerous open sites and rock-shelters that have been excavated throughout the region (Soper 1971a). Urewe pottery is characterized by necked pots and shallow thick-walled bowls with externally thickened and fluted rims. Decorations include incisions near the rim and sets of grooves in pendant loops and other elaborate motifs (Soper 1971a & b). The Urewe ware at Katuruka has been dated to 2400 BP where it may be associated with iron smelting preheating technology that resulted in temperatures high enough for steel production (Schmidt 1978, 1975, 1997:16, but see Killick 1996 and Woodhouse 1998 for criticisms). Based on pottery alone, the Urewe industry may have occupied Rwanda and adjacent parts of Zaire, southern Uganda, northwestern Tanzania and southwestern Kenya (Phillipson 1993a:188). The subsistence economy associated with the Urewe has not been fully explored but there are indicators that they were herders and cultivators of finger millet and sorghum. EIA industries and Urewe pottery in the interlacustrine region show a preference for land with good fertility and rainfall and areas close to water (Sutton 1994-95:11). Although cattle were being herded east of Lake Victoria, especially in the eastern Rift Valley, there are no clear indications of pastoral activities there until very late in the first millennium AD. It is therefore suggested that from Lake Victoria southwards the EIA Bantu expansion was essentially an agricultural one without cattle, or at least without a substantial herding element (Sutton 1994-95:12).

The use of the IA cultural package concept led archaeologists to conclude that East and southern Africa were characterized by an astonishing degree of homogeneity. On this basis, these archaeological sites were attributed to a single entity known as the Chifumbaze complex (Phillipson 1993a:187-8). Studies have suggested that the iron-working (Chifumbaze complex) communities of central and southern Africa were derived from peoples manufacturing Urewe ware. Soper (1971a & b) was the first archaeologist to attempt a comprehensive and comparative analysis of EIA pottery styles in eastern and southern Africa. His investigation of Urewe and Kwale pottery assemblages from East Africa and Ziwa as well as Gokomere pottery from Zimbabwe demonstrated several shared features. In addition similarities were found in Nkope pottery from Malawi. As a result two routes, an eastern and western one were proposed for the spread of iron-working into southern and central Africa (Phillipson 1977a:140-2). Eastern groups had elements from the Urewe embedded in a modified form in pottery like Kwale, Lelesu, Mwabulambo, Nkope, Gokomere/Ziwa and Dambwa, while the western group incorporated elements of iron-working from Congo, Northern Angola and some elements of Urewe (Phillipson 1977a:140, 1993a:190).

In East Africa the Urewe traditions spread through southwestern Kenya and northeast Tanzania (also probably to Rwanda and Congo) and then eastward to the coast. In northeastern coastal Tanzania and Kenya, Urewe pottery is represented by a derivative called Kwale ware, which developed in the second century AD (Phillipson 1993a:190). Kwale elements derived from the Urewe include necked pots and open bowls usually with thickened rims and multiple bevels or grooves (Soper 1967a). In addition, Kwale ware decorations include bands of oblique or crosshatch twisted cord roulette or stamp impressions or incisions below the rim and parallel groves with chevrons on the shoulders and rim. Kwale ware is found in both highlands and lowlands where settlements are restricted to relatively well-watered areas (Soper 1967a & b). The Pare hills (Usangi Hospital) are an example of a highland area where this pottery has been found (Odner 1971a). The eastern most sites of Kwale are restricted to the coastal lowlands of Kenya and Tanzania. Kwale pottery has been dated to 1700 BP along the Kenyan coast, while a date of 1730 BP has been obtained for settlement around the Pare hills (Soper 1967a & b). Around the Pare hills, Kwale ware is associated with iron slag suggesting that its makers possessed iron technology (Odner 1971a).

In central Tanzania the EIA is represented by Lelesu ware which has been dated to 1800 BP (Mehlman 1989:523, see also Soper 1971 a & b and Phillipson 1977a:109). Lelesu pottery has been recovered from only a few sites in Kondoa (Sandaweland) and the Lake Eyasi region of north central Tanzania (Mehlman 1989:523; Sutton 1968). A typological study undertaken by Soper determined a close relationship between the three wares with Lelesu representing a typologically transitional phase between Urewe and Kwale (Soper 1971b:29).

Although iron technology began in East Africa at a relatively early date, it was not universally adopted in the region until much later. There is evidence that herding people residing in the Central Rift Valley (probably Nilotic and Cushitic language speakers) were unfamiliar with iron-working technology and continued to use stone implements throughout the first millennium AD (Ambrose 1984b; Bower 1991; Phillipson 1993a:173). The reasons for such a late adoption of iron technology are not yet fully known. However resistance or avoidance between the Central Rift Valley people and the Bantu peoples have been suggested as one of the causes (Phillipson 1993a:190).

In Tanzania, detailed research on the IA has concentrated in the east (Chami 1994; Odner 1971a & c; Soper 1967b), northwest (Schmidt 1978) and to some extent the southwest (Mapunda 1995), while the rest remains poorly researched. Recent work suggests that iron-working developed in northwestern Tanzania during the fifth century BC (Schmidt 1978:152-234; Schmidt and Childs 1995:527) while in eastern Tanzania it is present in the last century BC (Chami 1998). Iron-working appears to be of recent antiquity in the southwest (1040 BP) (Mapunda 1995:264). There is a general assumption that EIA sites in East Africa are older than those of Central and South Africa since the EIA in the latter areas had its source from East Africa (Phillipson 1977a, 1993a; Soper 1971b). If this assumption correct it is quite probable later research in southwestern Tanzania might locate older IA sites since those of Zambia and Zimbabwe date to the second century AD (Phillipson 1977a:140-2, 1993a:190-8).

The IA of central Tanzania is poorly researched. Collections of pottery in this region were first completed by Kohl-Larsen (1938, 1943), and later studied by Smolla (1957) who categorized it as "Ssandauweland Typhus." These ceramics were later re-examined by Sutton (1968:168-9) and since then the pottery has been referred to as Lelesu. As observed above this is an EIA type of pottery (Soper 1971a & b; Sutton 1968) which dates to 1800 BP (Mehlman 1989:523). Apart from Lelesu site of Kondoa no other sites in central Tanzania have produced EIA remains. Several LIA sites dating to about 200 BP have been reported (Liesegang 1975; Masao 1979) and 590 BP (Odner 1971b:163).

In summary, the origin of iron technology in Africa is still a subject of debate. Recent research has favoured indigenous origins as the best explanation owing to the absence of adequate evidence to support diffusionist claims (Schmidt 1996a:6-10).

Advocators of local origin have strengthened their position after the discovery of copper smelting, a form of pyrotechnology that predates the event of iron-working in West Africa (Calvocoress and David 1979:9-10; Holl 1993; McIntosh and McIntosh 1983:241; Tylecote 1982), however evidence is limited. A provocative question that remains to be answered is the coincident chronology for the earliest events of iron-working in West Africa and East Africa. The new evidence from Central Africa likewise has produced an almost comparable EIA chronology (Clist 1989:71-84, 1995; Digombe *et al.* 1988; Peyrot and Oslisyl 1987; Woodhouse 1998). Clearly more studies are required to establish detailed EIA chronology for East, Central and West African sites as well as along the alleged routes of Bantu migration from Cameroon, Equatorial Guinea, Gabon, Central African Republic and Congo to detail the connection that exists between the areas.

While most of the early research on IA has concentrated in eastern and northwest Tanzania most other areas remain poorly researched. It is my hope that the current research and that conducted by Mapunda and Lane (personal comm.) will bring more light to the history of the IA in this area. Certainly more sites need to be explored in central Tanzania to recover *in situ* iron-working and ceramic remains and to assess how they are related to those of other areas of East Africa. These research goals are brought forward in detail in the next chapter.

2.2.6. The Bantu Migration

2.2.6.1. The Spread of Bantu Languages in Sub-Saharan Africa

Scholarly interest in the Bantu and associated cultures started in the late 1950s and early 1960s (Sutton 1994-95:2). This was a time when many African nations were attaining their independence and there was a global movement to re-examine African history which in the past had been dominated by colonial interpretations (Robertshaw 1990b:87). New studies of African societies required modes of research to change and new classes of evidence to be developed particularly in the collection of oral traditions, archaeology, history and linguistic studies.

The first attempt to characterize Bantu as a distinct language was made by Meinhof (1906), yet this idea did not receive much attention until the 1950-60s (Blench 1994-95:83). During this time Greenberg (1963) classified Bantu as a branch of the Benue-Congo language group of southeastern Nigeria (Blench 1994-5:85). In the 1960s, Malcolm Guthrie demonstrated that Bantu languages, distributed over most of sub-Saharan Africa, shared a common ancestor language known as Proto-Bantu. He further proposed that Proto-Bantu was originally spoken in the open woodland country (near the Savannah belt) lying south of the equatorial forest (Malcolm Guthrie 1962, 1967 –71). Greenberg's (1963) and Guthrie's (1962) works were later revised by Oliver (1966) who defined the initial movements of Bantu speaking people to have taken place from a centre in Cameroon (proposed earlier by Greenberg 1963) through the equatorial forest, giving rise to second nucleus in the woodland region of the Katanga in Congo (location proposed by Guthrie 1962).

Based on new data generated in the 1970s, archaeologists and linguists began to reject Guthrie's hypothesis of Bantu origins south of the equatorial forest, in favor of the Nigeria-Cameroon area which is now widely regarded as the homeland of Bantu languages (Dably 1975; Ehret 1982; Phillipson 1976a:212; Soper 1982). There is also general agreement among linguists that modern Bantu languages may be divided into at least two major groups, spoken in western and eastern parts of Africa respectively (Nurse 1982; Vansina 1984). Lexical reconstruction suggests that the dispersal of Bantu speakers from their ancestral land in West Africa took place around 3000 - 4000 BP (Denbow 1990:143; Phillipson 1993a).

Eastern Bantu groups proceeded along the northern and eastern fringes of the tropical rain forest, arriving in the Interlacustine Region during the 1st millennium BC. Here they acquired knowledge of iron-working along with cattle and sheep herding (Ehret 1967; Vansina 1984:139, 1990). They continued southward spreading their culture until they reached the savannah regions of southern and Central Africa (Denbow 1990:142-3). On the other hand, Western Bantu groups moved directly southward along the western fringes of the tropical rain forest branching into maritime and inland groups by 1000 BC (Denbow 1990; Huffman and Herbert 1994-95; Vansina 1990:49). The western inland group made its way as far as southeastern Africa while the maritime group moved directly south toward the regions that are now Angola and Namibia (Vansina (1990, 1995, 1994-5). It has been suggested that the Western branch represents the earliest dispersal of Bantu speakers based on the greater linguistic diversity compared to Eastern Bantu languages.

In several parts of sub-Saharan Africa features that are used to determine the spread and adoption of iron-working have also been used as a yardstick to determine the origin and movements of Bantu-speaking people. As noted above these traits include domestication (farming and animal husbandry), EIA ceramics, centralized political organization, and evidence for iron-working (Mapunda 1995; Phillipson 1993a; Sutton 1994-95). It has been noted that this characterization has serious shortcomings. For example activities such as hunting and gathering could have supplemented subsistence activities of Bantu. It also has been suggested that it would be unwise to associate Bantu movements with the spread of food production to sub-Saharan Africa. This is based on the fact that food production could have spread through diffusion (Vansina 1994-5:19).

Vansina (1994-5:19) gives some examples from Africa where such evidence has been found:

> Many instances in Tanzania, Zambia and Zimbabwe show precisely this. Some local foragers there acquired pottery, and some among these began to produce pots themselves. The transfer of herding is also attested. A very early example comes from Enkapune ya Muto rock-shelter in the Kenyan Rift Valley (Marean 1992). The local foragers there first added pottery to their stone toolkit nearly five thousand years ago. A millennium later they began at least to eat, and probably also herd, some goats, acquired no doubt from the nearby pastoralists. But still they remained foragers. Foragers in northern Botswana went further. By 200 BC or so they adopted ceramics, sheep, cattle and goats, probably in rapid succession, and became herders.

Although Vansina makes a compelling argument, others have emphasized evidence for widespread language homogeneity, which must have been accomplished by substantial and rapid movements of populations (Phillipson 1993a:201). As noted by Phillipson (1993a:198):

> The Bantu languages, which are today spoken by upwards of 200 million people spread over an area of nearly 9 million square kilometers, show a remarkable degree of inter-comprehensibility; and there can be no reasonable doubt that they have attained their present wide distribution as a result of dispersal from a localized ancestral language within the comparatively recent past-certainly within the last 3,000 or 4,000 years.

The motivations behind the movement of Bantu-speaking people from West Africa are not well known. The dispersal may have been rapid and it is estimated that the Eastern Bantu group moved southward at an average rate of 15 km per year or about 350 km per generation (Phillipson 1993a:203). In Africa south of the Sahara evidence for rapid spread has been demonstrated through a study based on attributes associated with EIA industries, their chronology and distribution. For example, in the Eastern Bantu region evidence for iron-working is attested in the interlacustrine basin at the beginning of the 1st millennium BC (van Grunderbeek 1992). By the beginning of the Christian era the technology extended to the northwest and eastern parts of the basin and by the third century AD it appears that the technology has spread southward as far as Natal (Phillipson 1975; Sutton 1994-95; Vansina 1994-95).

The parallels between the archaeological record and the linguistic model suggested for Bantu migration are not always apparent (Vansina 1994-95). For example Soper (1982:234) argues that: "a straight one –for- one correlation of Early Iron Age variants with modern Bantu sub-groupings does not seem to be tenable, and perhaps it should never have been expected, implying as it does a sort of "columnar" development through all the vicissitudes of history for nearly 2000 years." This problem is more apparent in regions north of the Equator. For example, apart from similarities between Urewe pottery and types found in northwestern Chad and south of the Benue in Nigeria (Soper 1971b:30-2, 1982: 228-229), there are no similarities between the pottery of East and West Africa. The expansion of Bantu-speakers from the Great Lakes region to southern Africa should therefore be treated as a secondary movement. This is based on the fact that new material culture elements (including new pottery types, food crops and livestock) are involved that are different from those of West Africa where the Bantu people are said to have originated (Ehret 1982:61; Vansina 1984:139-140).

In East Africa it has been shown that EIA pottery attributes, dates and distribution follows a pattern that can be correlated with the dispersal of Eastern Bantu-speakers. For example, Kwale and Lelesu pottery were certainly derived from Urewe ware (Phillipson 1993a:190; Soper 1971b). Distributed around the interlacustine region and the adjacent areas of Burundi and Rwanda, Urewe pottery has been dated to at least the 4th to 3rd century BC (Schmidt 1978, 1997:16; Van Grunderbeck *et al.* 1983, 1992, but see Robertshaw 1991:67). Kwale (East African coast) and Lelesu ware (central Tanzania) have been dated to the second and 3rd centuries AD (Mehlman 1989; Soper 1971b). Further south in Central Africa, Zambia, Malawi and eastern Zaire, EIA pottery types such as Mwabulambo, Kalambo and Gokomere have been dated to the 3rd century AD (Clark 1974; Robinson and Sandelowsky 1968). In northwestern Mozambique and southern Malawi EIA pottery with elements derived from Kwale ware is known as Nkope pottery and has been dated to the 3rd and 4th centuries AD (Sinclair 1991). It appears therefore that dates for EIA ceramics become increasingly younger as one moves from East Africa southwards and this aspect has been used to support the southward movements of Eastern Bantu speakers in that area (Phillipson 1977a, 1993a).

Earlier research on the spread of Bantu into sub-Saharan Africa suggested that Bantu speakers were technologically superior to the indigenous foragers who were sparsely scattered throughout the region (Vansina 1994-95:16). The Bantu presumably brought with them ceramics, agriculture, domestic stock and metal technology. However, more recent studies have suggested that these elements were not immediately or completely accepted by every indigenous population (Musonda 1987). The archaeological record and oral traditions suggest that some groups continued to practice microlithic technology long after the appearance of metallurgy (Musonda 1987; Phillipson 1976a:196). For example, in some parts of south and central Africa, stone tool use continued until two or three centuries ago. In some sites such as Makwe and Thandwe rock-shelters, EIA materials and LSA are found in association suggesting an exchange of some kind to have taken place between LSA and EIA peoples (Phillipson 1976a:196, 1993a:202-3). In other areas many Bantu cultural elements seem to have been readily adopted. At the Nachikufu Rock-shelter in Zambia for instance, chipped stone tools typical for foragers were found along with pottery, metals objects and slag suggesting that LSA groups adopted work on iron (Miller 1969:87). These observations suggest that the responses of LSA hunter-gatherers to incoming Bantu were highly varied. It may be unwise at this point to develop generalized models on the interaction between LSA hunter-gatherers and IA farmers in the sub-Saharan region because there is not enough data available to do so.

Despite the suggestion that the Bantu left West Africa circa 3000-4000 BP (Ehret 1982:57-65; Phillipson 1993a:198) there are no significant linguistic similarities in agricultural terms between the Eastern and Western Bantu language groups (Ehret 1982:61). The oldest Bantu subsistence vocabulary that can be so far reconstructed includes the term yam, a crop associated with a tropical environment typical for the proto-Bantu homeland (Ehret 1982:61, 1998:13). Interestingly, grain terms cannot be reconstructed (Ehret 1982:61). This pattern may have been caused by differing ecological zones experienced by Western and Eastern Bantu, which affected their farming economy. Western Bantu groups exploited tropical rainforests where vegetatively propagated crops dominate. Lexical studies indicates that fishing, root crops and utilization of oil palm were all important activities in this western part of Africa. The Western Bantu did not farm cereals, and in addition, goat, cattle, sheep and cereal agriculture are not well suited to the forest zone (Ehret 1982:61; Vansina 1984:139-140). The Eastern Bantu groups settled in areas that are dominated by savanna environments where the cultivation of cereals and cattle herding are of major economic significance (Phillipson 1993a; Vansina 1984:139-140). Clearly terminologies associated with agricultural practice between the western and eastern divisions reflect these differences.

In contrast, linguistic studies suggest that grain economy and cattle herding dominated western and eastern regions of south central Africa after the Western Bantu acquired these cultural elements from Eastern Bantu speakers. Grain crops became widely accepted in areas like Angola (dominated by the Western Bantu branch) where the environment was not suitable for root-crop agriculture (Vansina 1994-5:23). Relevant vocabulary shows that all terms related to grain and cattle are Eastern Bantu in origin. Additional support comes from the impact of Eastern Bantu grammatical features on languages of Western Bantu in southern Africa, the spread of terms relating to social structure (including kinship), and the adoption of the circular settlement and house plans. Based on cattle remains from Kamabaga in Luanda, contact and ultimate diffusion of domesticates from the eastern to Western Bantu took place well before or during the 8^{th} century AD (Vansina 1994-5:23).

From an anthropological point of view, eastern and Western Bantu groups differ in social organization and worldview. Eastern Bantu social organization incorporates attitudes about hereditary leaders, bride wealth in cattle and a patrilineal ideology about procreation and the influence of patrilineal ancestors in daily life (Huffman and Herbert 1994-95:29). For example, the settlements of Nguni and Sotho-Tswana speakers (Eastern Bantu) are characterized by central cattle kraals in the domain of men surrounded by a residential zone in the domain of women. Conversely, Western Bantu-speakers tend to be associated with matrilineal ideology about procreation, marriage involving services to the father-in-law, and leadership by "big men" who achieve their position through talent and influence. Their settlements are arranged in a grid like pattern based on generational organization (Huffman and Herbert 1995-94).

2.2.7. Alternative Theories to the Spread of the "Iron Age Cultural Package" in Sub-Saharan Africa

The idea that population pressure and social unrest (as a result of food production) were the main force behind Bantu migration from the nucleus areas (see for example Collet 1982:184; Ehret 1998:31; 2002:170-82; Huffman 1970) has been overemphasized (but see Phillipson 1993a:203-4). This idea ignores other areas of Africa where similar modes of production were taking place. For example, the PN tradition, based on pastoral economy attributed to Eastern Sahelian and Cushitic-speaking peoples is said to date to the 2nd millennium BC (Ehret 1998:5; Phillipson 1993a:151-7; Robertshaw 1990a:6-7). This would imply that these peoples appeared and introduced food production to East Africa well before their Bantu counterparts. This begs the question of why the PN is confined to a small region and did not experience the same degree of expansion as later Bantu peoples. Did the nature of the agriculture economies practiced by the Bantu and PN play a role in their distribution or were other factors at play? One would expect a mobile pastoral society to be more widely distributed than the Bantu who relied more on cultivation economy than pastoralism (Sutton 1994-95:12).

Furthermore, the concept of an "Iron Age cultural package" involving the correlation between language and IA cultural material is no longer widely accepted. Criticism of the IA cultural package and associated Bantu movements started in the 1970s although such ideas were not widely accepted because of the infancy of linguistic and archaeological studies. For example, Gramly (1978:108-9) suggested that language and material culture can be a function of many other variables which need to be explored in detail before they are used as indicators of past cultural groups. Gramly observed that there is no substantial linguistic, biological or cultural evidence to support the view that some LSA hunter-gatherers, who presided in most of sub-Saharan Africa before the introduction of the Iron Age Package may have not been Bantu speakers. Basing his argument on Rightmire's (1974) reassessment of human fossil remains, Gramly postulated that some Bantu groups occupied several parts of sub-Saharan Africa for a long time before the spread of the so called Iron Age cultural package (Chami 2001b; Gramly 1978:109). This argument supports an earlier assertion by Lwanga-Lunyiigo (1976) that Bantu-speakers appeared in East Africa very early and that an expansion from West Africa never took place. Based on skeletal evidence he demonstrates that people with Negroid ancestry were already living in East Africa during the Terminal Pleistocene/Early Holocene. Of particular reference is the Ishango Negroid skeleton that is associated with cultural materials indicating an economy based on harpoon fishing dating to 9000-6500 BC. Lwanga Lunyiigo's idea is supported by research by Schepartz (1988) who suggests that there is no convincing biological evidence to substantiate the presence of Khoisan populations in East Africa during the later Pleistocene and Holocene. According to Schepartz (1988:69) biological findings indicate that most hunter-gatherer remnant groups in East Africa such as Sandawe and Hadzabe have more biological affinities to Bantu than to Khoisan.

Gramly (1978:111-2) further argues that pottery, iron technology and food production did not spread simultaneously into eastern and southern Africa, consequently it is unlikely that all these features were associated with the spread of the so called Iron Age cultural package. "The problem of how language and IA technology as well as food production become established in sub-Saharan Africa is not different from problems of culture change elsewhere in the world, and presumably 'diffusion' and independent invention should be considered equally as mechanisms of change along with population movement." (Gramly 1978:107, see also, Vansina 1994-5). Gramly (1978:112) believes that Bantu was spoken for millennia in most of the regions where the languages are prevalent today, and that the Bantu have been in the lands they occupied since before the advent of food production, ceramics and metals. However Lwanga Lunyiigo has a different opinion suggesting the origin of Central and South Africa Bantu to be from East Africa. For example, he maintains that iron smelting was invented independently in East Africa and that the interlacustine region was the centre from which metallurgy, Urewe ware and agriculture spread to central and southern Africa. His arguments are supported by the claim that the sickle cell gene originated in East Africa and spread to other regions (Lwanga-Lunyiigo 1976:283-5). According to Lwanga-Lunyiigo evidence for early iron-working in the interlacustine region is supported by extensive forest decline around 3000 BP which may indirectly point to the beginnings of agriculture in that area (Coetzee 1967). Recent evidence for forest loss in the interlacustrine region dates to 4800-3400 BP (Hamilton, Taylor and Vogel 1986; Taylor and Merchant 1994). However, there is no confirmed evidence that the forest reduction was directly associated with agricultural practice (Schmidt 1997:303).

While most authorities have suggested that only Bantu-speakers (EIA people) were responsible for the eastern migration, Ehret proposes at least two ethnic groups may have been involved (Ehret 1998:213-7). He argues for a presence of Cushitic speaking peoples in the middle Zambezi River (Eastern Sahelian) who domesticated animals and cultivated crops around 2450-2250 BP before the arrival of the Bantu. This is the first time in the scholarship of Africa, that Cushitic peoples are suggested to have spread beyond the northern Tanzanian Rift valley and thrived in the southwestern highlands extending as far as Zimbabwe and Botswana where the archaeological sites of the

Bambata culture are found. To account for the vast spread of the Bantu language in this area Ehret suggests Cushitic speakers were assimilated by Bantu groups. However as stated by Ehret (1998:217-8), there are no adequate archaeological data from Central and southern Africa to support his claims.

Some linguists have argued against the way language has been used to reconstruct Bantu migration theory. Möhlig (1979:122-33) for example has criticized the idea of family-like relationships among languages. He argues that convergence among Bantu languages has been so strong that no family can ever be reconstructed and that linguists who have tried to do so have completely ignored socio-linguistic findings as well as the findings of general "dialectology". Möhlig suggests that the Eastern Bantu did not originate from a single ancestral tongue but are representative of blends of different "genetic strata". He maintains that ancestors of Eastern Bantu-speakers originated in an area between the northeastern fringes of the Equatorial Forest and western shores of the interlacustine region.

2.2.8. Chapter Summary

Despite several attempts to explore the East African LSA, its temporal and geographic variability remains poorly defined. With the exception of Leakey's (1945, 1950) investigations at Hyrax Hill and Njoro River, studies predating the 1960s lacked quantative analysis. Initially, the lack of adequate comparative data and chronology for African LSA industries led early workers to invoke diffusion through migration or invasion as the main explanation for cultural change. Industries such as the Wilton, Smithfield and Magosian were believed to cover a large portion of sub-Saharan Africa (Inskeep 1967:658-9).

Although LSA research in Tanzania began in the 1930s (Kohl-Larsen 1938; Leakey 1936) most of the work completed in East Africa concentrated on Kenya (Masao 1979:174). It was not until the 1970s (Mabulla 1996; Masao 1979; Mehlman 1977, 1989; Nelson 1973; Odner 1971b; Willoughby 1992) that intensive LSA research began in Tanzania. At present much of the research has covered only central (Masao 1979; Odner 1971b), northeast (Mabulla 1996; Mehlman 1989) and to a lesser extent southwestern Tanzania (Willoughby 1992, 2002).

In contrast, post-1960s research was more problem oriented and influenced by tenets of the New Archaeology (Mabulla 1996; Mehlman 1989; Merrick 1975; Nelson 1973). As more field data accumulated and chronometric dates became increasingly available many diffusionist ideas were abandoned in favour of local development. With increased interest on comparative data based on quantative analysis at inter-site and intra-site levels it became apparent that some industries formerly thought as distinct (such as Wilton and Smithfield) were best categorized into an LSA technological complex. Much of the variation noted within the LSA industry can be attributed to variation in environment, economy and types of activities carried out by individual groups.

Although highly variable, LSA industries share several common features such as the occurrence of backed tools, bipolar technology, use of objects of personal adornment such as ostrich eggshell beads and utilization of a more diverse range of lithic raw materials than in the MSA. The most common lithic raw materials in East African LSA industries are quartz, quartzite, obsidian and chert with quartz usually representing over 80% of the artifacts in most sites. Long distance transport of raw materials is also an important feature of the LSA industry as demonstrated by the sites of Lukenya Hill, Nasera and Lake Eyasi.

The origin and spread of iron-working, Bantu languages, and agriculture is far from being completely understood. Many controversial questions still need to be answered. First, if a West African origin for the spread of IA traditions is to be accepted, the rapidity with which populations spread from West Africa to the southern tip of Africa has to be explained. Given the Eastern Bantu as an example, Phillipson (1993a:203) has estimated that they moved southwards at an average rate of 15 km per year or about 350 km per generation. Collet (1982:184); Ehret 1998:31; 2002:170-82 and Huffman (1970) have suggested that the driving force behind the migrations was population pressure and social stress at the nucleus area. This explanation is problematic on several accounts. Population pressure could possibly explain the initial movement away from the source, but it is unrealistic to assume that it persisted and encouraged movements all the way to the Cape.

The hypothesis that the Bantu left West Africa during the Neolithic period 4000 - 3000 BP (Ehret 1982:57-65; Phillipson 1993a:198) may prove more sound but adequate evidence is lacking. There are no Bantu Neolithic sites in southern Africa that predate the IA although stone tool using pastoralist sites (attributed to Khoisan-speakers) have been found in southwestern Africa dating to the second century AD (Kinahan 1991; Phillipson 1993a:206). Furthermore, the idea that the Bantu were present in East Africa long before the alleged migration from West Africa or the advent of the IA as suggested by Gramly (1978) and Lwanga-Lunyiigo (1976) needs further exploration. It contradicts the widely held views that around 5000 BP, almost the whole of Africa south of the Equator was occupied by hunter-gatherers related to Khoisan and Pygmy (Ambrose 1982:109-11, 116-7; Clark 1970:122; Chittick 1975:16-7; Olderogge 1981:277-81; Phillipson 1993a:7; Vansina 1990:47). While this claim has persisted among African historians, archaeologists and anthropologists more physical anthropological research needs to be done (see also Schepartz 1988).

Finally, the archaeological evidence for the beginning of iron-working in East and West Africa does not support the theory of a so-called Iron Age cultural package. In particular the contemporaneity of early iron-working cultures between the two areas argues against such a spread. Investigation into furnace size, pit volume, and the use of long tuyeres indicates that central African (Cameroon and Gabon) iron-working bears closer resemblance to that of the Interlacustine Regions of East than West African sites (Digombe *et al.* (1988:183). Furthermore linguistic evidence has indicated that iron-working terms in Central Africa were derived from the Eastern Bantu. In the light of this evidence iron-working might therefore have spread to Central Africa from the east in the first millennium BC (Digombe *et al.* 1988:183) despite the contemporaneity of the iron-working chronology between the two regions (Woodhouse 1998, but see Grunderbeek 1992). This final evidence also challenges the unilinear migration suggested by earlier archaeologists, linguists and historians.

CHAPTER 3: RESEARCH PROBLEM AND OBJECTIVES

3.1. Introduction

Historical and anthropological studies completed to date suggest that all of East Africa with the exception of the Kenyan Rift Valley (Cushitic speakers) was dominated by Khoisan-speaking hunter-gatherers until the last few millennia BC (Chittick 1975; Clark 1970:122; Ehret 1998; Olderogge 1981:277-81; Phillipson 1993a:7). These hunter-gatherers are likely represented by the LSA industry reported in several areas in East Africa (Ambrose 1982:139-40; Chittick 1975:17; Cole 1963:332-6; Murdock 1959). It is suggested that in the first millennium BC peoples with a superior technology, equipped with iron tools, ceramics, agriculture, and more complex forms of social organization moved into the region, conquering, absorbing or displacing indigenous LSA hunter-gatherers (Denbow 1990:141; Phillipson 1993a:198-203). The actual mechanism of change, whether conquest, displacement or absorption of hunter-gatherers remains in question (Phillipson 1976a 1977a, 1993a; Vansina 1994-5, 1995). While this uncertainty persists, no detailed research has yet been undertaken to understand the contribution made by LSA groups to the EIA and later cultural developments in East Africa. Recent research suggests that the appearance of IA communities dates to the last few centuries BC (Chami 1994, 1998) and are interpreted as solely the product of Bantu speakers (Chami 1994; Phillipson 1993a). It is argued here that this represents only a partial view of the development of settled communities in East Africa. A fuller picture can only be obtained when the contributions of LSA as well as IA societies are fully explored. This chapter begins by providing a brief introduction of the current theories on the development of settled communities in East Africa and controversies therein. It ends with a discussion of research objectives for this dissertation.

3.2. East African Cultural Interactions During the Formative Period.

The origin of Bantu-speakers is believed to be in the region of modern day Cameroon and eastern Nigeria (Dalby 1975; Ehret 1998:46-7). By the second millennium BC the Bantu spread into northwestern fringes of the southern woodland savanna belt near the confluence of the Congo after which an eastern and western facies developed (Denbow 1990; Ehret and Merrick 1982). The eastern facies proceeded eastwards reaching the Western Rift region of East Africa by about 1000 BC (Ehret 1998:47). On their arrival they encountered at least two linguistically distinct groups namely, Khoisan and Cushitic speakers. The western facies proceeded southward to central and southern Africa (Denbow 1990).

Historical and anthropological studies completed since the 1950s suggest that prior to the EIA, Africa south of the equator was inhabited by groups of hunter-gatherers with no knowledge of iron technology (Murdock 1959; Phillipson 1993a; Sutton 1994-5; Vansina 1984, 1994-5). One group spoke a language similar to modern Khoisan of South Africa (Clark 1970:122; Ehret 1998:47, 183; Olderogge 1981:279-80; Phillipson 1993a:7). Their descendants are represented by the present day Hadzabe of Tanzania, Sanye Boni, Dorobo and Ariangulo of Kenya (Champion 1922; Chittick 1975; Heine and Mohlig 1980; Huntingford 1931, 1963; Murdock 1959:59-60; Phillipson 1993a:6; Prins 1952, 1960; Stiles 1981; Werner 1914). Another group of hunter-gatherers related to the Pygmies of the Congo forest is suggested to have co-existed with Khoisan-speakers

(Vansina 1984). A common theme in East and Central African oral traditions is that when the Bantu arrived they found short-statured people who may have belonged to the Pygmy language group (Clark 1950a:80-4, 1950b; Dundas 1968:37; Stahl 1964:55). However, these oral histories have not been without criticism. For example, Schepartz (1988) states that there is insufficient biological and linguistic data to support the claim that later Pleistocene East African hunter-gatherers were related to Khoisan.

Furthermore, by 5000 BP before the arrival of the Bantu, Afroasiatic speakers (also known as Eastern Sahelians or Southern Cushites) moved into eastern Africa from the northeast (Ehret 1974, 1998:10). Earlier proposals of an ethnic migration into East Africa and the cultural influences (such as civilization) they imposed upon the autochthonous populations led to a controversial assumption known as the Hamitic Hypothesis (Chami 1998; Huntingford 1963; Murdock 1959:196-203; Robertshaw 1990b:84-5). For example, Huntingford (1963) and Murdock (1959:196-203) suggest that Cushitic-speakers were responsible for the first development of East African settled communities. Equipped with a pastoral economy based on lithic technology (PN industry), Cushitic speakers occupied areas to the east of the Great Lakes, central Kenya and northern Tanzania (Murdock 1959: 196-203; Phillipson 1993a:156-7) and may have been responsible for early stone cairn burials in northern Kenya (Stiles and Munro-Hay 1981).

Although it is thought by many authorities that the distribution of PN in East Africa is restricted to the areas east of the Great Lakes, central Kenya and northern Tanzania (Phillipson 1993a:156-7) others have suggested a more extensive distribution. Horton (1984, 1990) and Abungu (1994-5), for example, have suggested that Cushitic speaking peoples extended as far as the East Africa coast where they predate IA industries. However, linguistic and archaeological data support the hypothesis that Bantu-speakers occupied coastal areas before the arrival of Cushitic-speakers. Nurse (1983:127-150) has shown that the language of coastal peoples (Swahili) is wholly Bantu in grammatical structure, with minimal external influence apart from some borrowed Arabic words. Also recent archaeological research by Chami (1994, 1998) has shown that EIA occupations in coastal Tanzania have cultural materials in the lowest levels that have affinities to Bantu cultures (but see Chami and Kwekason 2003). The Bantu are said to have arrived on the coast during the last few centuries BC or earlier after which their languages dominated the region and eventually contributed to the development of modern languages (Chami 1994, 1998, 1999:208; Chami and Kwekason 2003; Nurse 1983:127-150). Recently, Ehret (1998:213-7) has also suggested that Cushites spread as far south as the Zambezi River, an argument based on loan words by Khoisan groups from Cushitic speakers. However, no Cushitic speakers are known south of northeast Tanzania (Chami 2001c:649-50) and no archaeological data are yet available to support Ehret's claim.

While the settled communities (Bantu and Cushites) are said to have continued to flourish and expand dramatically during the last two millennia (Ehret 1998:31-142; Phillipson 1977a, 1993a:187-205), the fate of indigenous hunter-gatherer communities has remained imperfectly understood. Apart from isolated remnant groups of hunter-gatherers such as Hadzabe and Sandawe (who have recently adopted farming, see Newman 1970) who still use traditional languages (Khoisan speakers?), no linguistic study has yet identified any contribution of indigenous LSA peoples to modern spoken languages. In other words in most parts of East Africa, the cultural and linguistic identity of aboriginal LSA hunter-gatherers after the spread of IA and PN industries remain unknown. This uncertainty has led to a proposal of at least three models namely:

displacement, assimilation and acculturation, to describe the fate of LSA hunting-gathering communities at the onset of Bantu dispersal to East Africa.

The displacement model assumes that the spread of Bantu peoples south of the equator resulted in the dislocation or eradication of LSA hunter-gatherers (Denbow 1990:141, Phillipson 1993a:7, 202-3; 170; van der Merwe 1980: 480-82). This model accounts for why original LSA populations are today represented by scattered groups of minorities. The assimilation model suggests that by early first millennium AD most hunter-gatherers were absorbed by more technologically sophisticated EIA herders and farmers, whose presence is identified in the region by pottery and evidence of iron-working (Chittick 1975; Denbow 1990:141, 170; Phillipson 1993a:7, 203; van der Merwe 1980: 480-82). Aspects of these two models are supported by some oral traditions (Clark 1950a:80-4; Rangeley 1963:38). An acculturation model suggests that EIA peoples were descendants of LSA hunter-gatherers. This model does not involve assimilation or displacement but diffusion or borrowing of cultural elements by hunter-gatherers from neighbouring agriculturalists or pastoralists (Vansina 1994-95:19-20, 1995:189-195). Acquiring farming/pastoral technology from their neighbour farmers/pastoralists, the hunters-gatherers became farmers and adopted the language of the farmers (Vansina 1994-95:19-20, 1995:189-195). Vansina's suggestion supports similar conclusions by Marean (1992:110, 123) in his study of the Enkapune ya Muto Rock-shelter along the Kenyan Central Rift Valley where indigenous hunter-gatherers gradually adopted caprine herding culture from their neighbours. Vansina's model is also supported by oral traditions which suggest that when the Bantu moved to the region they found hunter-gatherers in possession of iron, pottery as well as practicing stone technology (Clark 1950a:80-4; Rangeley, 1963:38).

Although these models have been discussed in the archaeological and anthropological literature for some time (Denbow 1990:141, 170; Phillipson 1993a:7, 202-3; van der Merwe 1980: 480-82) there has not been convincing evidence to support such assertions. There is also no adequate data to explain why or how hunter-gatherers were assimilated, eliminated or developed independently into farmers or herders. These issues can be investigated in greater depth by examining the archaeological record with supplemental historical and anthropological data from ethnographic and oral traditions.

The nature of hunter-gatherer interaction with settled communities forms one of the major concerns in this project. Several archaeological projects in central Tanzania (Inskeep 1962; Masao 1979; Odner 1971b) have reported sites with LSA cultural remains underlying or in association with IA materials. Although these data suggested the existence of some kind of interaction or contact between LSA hunter-gatherers and IA people (Masao 1979; Odner 1971b) the nature of this relationship has not been studied in detail. In particular, the cultural and chronological contexts in which the interactions took place are poorly understood. Furthermore, because the nature of the contributions of LSA industries to later cultural development in central Tanzania is unknown, hypotheses about the formation of central Tanzanian settled communities remained based in migrationist, conquest and displacement models. The contributions of indigenous LSA communities to later cultural developments remained unexplored, and while the cultural affinity of IA traditions to those of the Bantu are clear, fundamental questions such as what happened to LSA industries after the Bantu migration, and who were the LSA peoples remain to be answered.

This study aims at investigating the cultural interactions between LSA and IA peoples of central Tanzania. Research involved an understanding of potential opportunities that would have influenced the stability and survival of the two traditions, their coexistence, acculturation or displacement. Changes in environmental potential and technological capacity to adapt to variations in the environment on the part of both LSA and IA communities were instrumental in initiating interaction and cooperation. For example, oral traditions among the Sandawe (formally Khoisan speaking hunter-gatherers) and Turu (Bantu farmers and herders) of central Tanzania narrate how both wandered over the landscape in search of food during a famine leading to exchange of cultural experiences and friendship that ultimately led some Sandawe to settle in the Turu country while some Turu settled in Usandawe (Newman 1970:48; Ten Raa 1986). Furthermore, there is a need for a broader focus on the economic, political and social factors at play in both cultures during initial contact and following the transition period from hunting-gathering to farming. This study uses information from ecological history and anthropological records (Newman 1970) on interaction between hunter-gatherers and farmers of central Tanzania in addition to data from other parts of Africa and the rest of the world as a means of interpreting archaeological data acquired through field research in central Tanzania.

3.3. Research Objectives

The main goal of this project is to examine the cultural context of LSA and IA interactions as evident from the archaeological record in central Tanzania. Kondoa is one of several areas of central Tanzania where several LSA and IA sites have been reported (Figure 3.1 see also Masao 1979; Inskeep 1962; Odner 1971b). In particular, the investigation focuses on outlining the social and economic interactions between LSA and

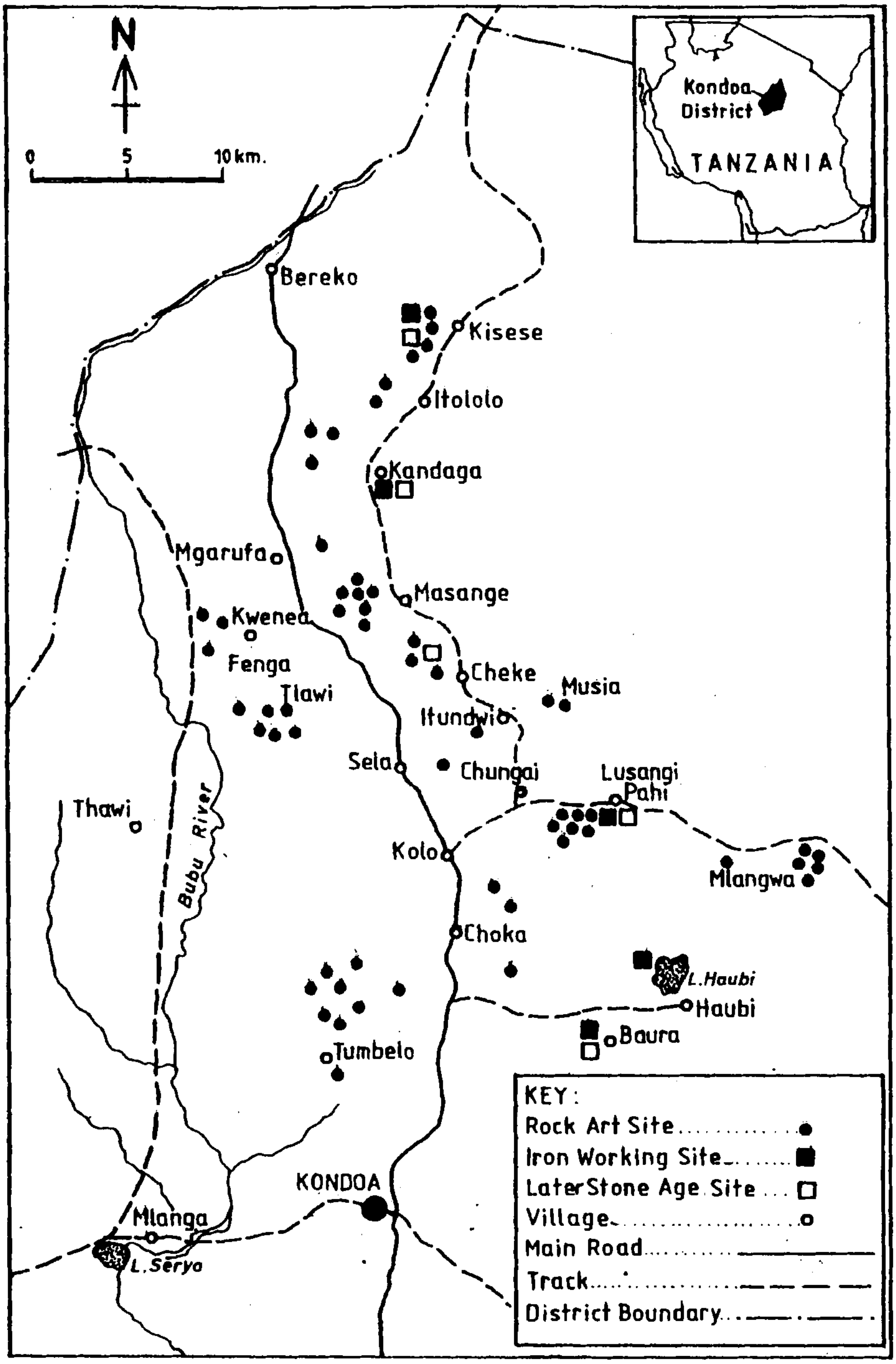


Figure 3.1. Kondoa archaeological sites

IA traditions and to ascertain the role of LSA people in the development of settled communities in central Tanzania.

Data was collected first by conducting systematic surface and subsurface surveys in the Baura and Lusangi areas of Pahi Division to recover sites with LSA and IA remains as well as evaluating patterns of site distribution. Second, excavations were conducted at Baura and Lusangi, to recover *in situ* LSA and IA materials to establish chronology, and examine the remains with a view to establishing the nature of the interaction between LSA and IA cultures. It has been a practice of many archaeologists to locate and excavate isolated sites and draw conclusions about hunter-gatherer/farmer interactions based on this limited data (Miller 1969; Phillipson 1976a). This has been criticized by Vansina (1994-5:20, foot notes) who calls for fuller coverage of sites that manifest interaction between hunter-gatherers and farmers (see also Kent 2002:83-4). In response to Vansina's suggestion, this thesis aimed at examining sites in Baura and Lusangi as a means of understanding in detail the interaction between the LSA and IA cultures in a concentrated and well-defined region. The study therefore focused on an extensive survey and excavation of both rock-shelters and their adjacent open-air sites to fully recover and compare LSA and IA cultural patterns across the landscape.

3.3.1. Investigation into LSA and IA Cultures in Baura and Lusangi

Historical, archaeological and anthropological evidence from East Africa and beyond are instructive for this research. Chapter 2 examined general strategies in archaeological research to characterize cultural developments in East Africa for the past 40,000 years. It may be instructive to summarize the characteristics of the LSA, PN and IA since these are the primary attributes that characterize the Late Pleistocene/Early

Holocene cultural developments in East Africa. As stated earlier, the whole of East Africa was occupied by LSA hunter-gatherers before the introduction of farming and herding in the last few millennia BC. The descendants of these hunter-gatherers are probably represented by Hadzabe, Sanye, Boni, Dorobo and Ariangulo (Chittick 1975; Heine and Mohlig 1980; Huntingford 1931, 1963; Murdock 1959:59-60; Phillipson 1993a:6; Prins 1952, 1960; Stiles 1981). Archaeological research in East Africa has outlined distinctive characteristics that separate LSA hunter-gatherers from IA farmers and Neolithic industries, primarily represented as PN (Robertshaw 1990a). PN industries have been dated to about 3000-1500 BP (Robertshaw 1990a:5-8). They are located around the northeastern Rift Valley of Tanzania and the vicinity of the Central Rift Valley of Kenya. The PN in East Africa is characterized by an animal herding economy based on lithic technology, a distinctive pottery tradition and stone bowls (Bower *et al.* 1977; Robertshaw 1990a). The IA in East Africa is widely distributed and is distinguished from the other two industries by its farming subsistence, a distinctive ceramic tradition, iron-working and animal husbandry (Chami 1994, 1999; Phillipson 1976a, 1993a; Soper 1971a). The IA is associated with Bantu speakers thought to have moved into the East African region in the last millennium BC (Chami 1994, 1998; Phillipson 1993a; Schmidt 1997). In some areas of East Africa remains of IA industries seem to overlay those belonging to LSA (Chami 1998:207).

The LSA industry of Tanzania may have persisted from 40,000 to 1000 BP (Manega 1993; Masao 1979; Mehlman 1989). LSA communities were hunter-gatherers using lithic technology with no knowledge of farming, herding or iron working (Phillipson 1993a). In the sites of central Tanzania, the LSA industry is found underlying and in association with pottery and iron-working remains on the upper levels. With the available knowledge about the status of the LSA, PN and IA industries in East Africa, there is no doubt that the LSA industry of central Tanzania represents similar hunting-gathering communities. However the association of LSA industry with iron-working and pottery at Baura and Lusangi forms the main subject of debate in this thesis and it is specifically on that basis that this study was initiated.

3.3.2. Investigation into the Social and Economic Interactions Between the LSA and EIA.

The main purpose of this study as stated earlier is to address the relationship between LSA and IA industries. It has been demonstrated that the LSA and IA represent two traditions practicing different systems of subsistence. It may be instructive to briefly discuss general theories to explain the transition from hunting-gathering to farming in various parts of the world as a guide to developing interpretive frameworks relevant to this thesis.

Many theories about the transition from hunting and gathering to farming have been developed since the 1950s. One group of theories assume single factor causes including ecological (Childe 1952), demographic pressure (Binford 1968; Cohen 1977), social (Bender 1978, 1985; Hayden 1990) and coevolutionary mechanisms (Rindos 1980) as being prime forces to agricultural adoption. Mono-causal models have been criticised in favour of multi-causal factors (Hassan 1978; Layton, *et al.* 1991, Price and Gebauer 1995) for the adoption of agriculture in different areas of the world. Layton, *et al.* (1991) for example, suggested factors that may render a shift from hunting and gathering to intensive farming to include climatic change, technological innovation, the elaboration of social networks and the appearance of new varieties of animal and plants amenable to intensive husbandry.

However, many archaeologists have concluded that it may be premature to develop general models to explain the introduction of agriculture as a world phenomenon. Instead, the current available data seem to indicate pronounced regional variation in the transition to farming in many areas of the world (Cowan and Watson 1992; Gebauer and Price 1992:3). Alternatively, the incomplete nature of the archaeological record, as it relates to the shift to agriculture in many regions is stressed. It is on this basis that many archaeologists are now concentrating their efforts to explain the adoption of agriculture at the regional and interregional levels.

In Europe for example, farming is said to have spread from the southeast to the west and that the patterns of interaction between foragers and farmers took place in complex situations that are particular to individual regions (Zvelebil *et.al.* 1986). Zvelebil (1986b:167), Zvelebil and Rowley-Conwy (1986:85) suggest that elements of farming were adopted by hunter-gatherers selectively to fit the local needs long after they were aware of farming techniques. Knowledge was not a limiting factor in adoption of farming.

> It would be only after a period of adjustment to the requirements of the farming economy, requirements that are often in conflict with the hunting-gathering mode of production .... that farming fully replaced hunting as the main means of subsistence (Zvelebil and Rowley-Conwy 1986:85).

With this concept in mind it can be assumed that in many circumstances new cultural elements may be accepted when they do not conflict with existing cultural values and norms. However, elements conflicting will tend to be accepted once existing values and norms are in crisis and are no longer conducive to survival. In Ireland for example, the introduction of the potato in the 16^{th} century received a slow acceptance due to culturally innate prejudices. Preference continued to be placed on the traditional subsistence economy based on oats, barley, wheat and animal products. However, later incidents of famine, civil war, drastic changes in land tenure and a desire for cash income deprived the Irish peasants of cereals and cattle that had been their mainstay and resulted in the potato being accepted as a staple (Leach 1999:135).

Investigation of responses of hunter-gatherers to farmers in varying ecological zones in Europe produced very fruitful results (Kozłowski and Kozłowski 1986; Zvelebil 1986b:181; Zvelebil and Rowley-Conwy 1986). In Europe the abandonment of foraging for farming took place earlier among mobile foragers with generalized resource use strategies than among more sedentary hunter-gatherers specializing in the use of aquatic resources (Zvelebil 1986b:181; Zvelebil and Rowley-Conwy 1986:85-89). In Western Europe for example, hunter-gatherers residing along the Atlantic coast seem to have adopted agriculture later than their inland counterparts because Atlantic coastal areas were among the most productive areas in Western Europe providing a stable economy (Perlman 1980; Zvelebil 1986b:181; Zvelebil and Rowley-Conwy 1986:85-89). In general, Zvelebil (1986a:10-13, 1986b:181) and Zvelebil and Rowley-Conwy (1986:78-81) are of the opinion that the transition from hunting-gathering to farming in Europe can be divided into three main phases, namely the "availability", "substitution" and "consolidation" phases. The "availability phase" denotes a period when farming was available in close proximity to hunter-gatherers but not adopted. The "substitution phase" represents a period when cereal cultivation and stock keeping replaced foraging as the principle means of subsistence, while "consolidation phase" denotes a period when the role of farming was dominant. However, Zvelebil (1986b:182) stresses that the transition from hunting-gathering to farming took place in different social and economic contexts for reasons that were particular to individual situations.

In Africa, anthropological, historical and archaeological evidence suggests similar patterns of relationships between hunters and farming communities to that of Europe at the time of contact, however in different social, political, economic and ecological settings (Denbow 1984; Miller 1969; Newman 1970; Phillipson 1976a). Also, it has been suggested there is no single explanation to characterize the nature of interactions between hunter-gatherer/agropastoralist groups in Africa (Brooks 2002:208; Kent 2002). In many regions of sub-Saharan Africa hunter-gatherers and agropastoralists coexisted for a long time after initial contact with very limited influence on each other's subsistence economy (Denbow 1984; Marshall and Hildebrand 2002:114-5). An archaeological example is seen in parts of Zambia where for over eight centuries hunter-gatherers adopted a few items such as pottery from IA farmers but maintained their subsistence economy up to a few centuries ago when population growth resulted in their assimilation into IA farming cultures (Miller 1969; Phillipson 1976a, but see Musonda 1987).

In Tanzania anthropological investigations carried out on Hadzabe hunter-gatherers from colonial times to the present have shown a reluctance by the Hadzabe to change their mode of subsistence even in situations where incentives were provided (Ndagala 1985). Continual availability of ecological resources in the Hadzabe landscape makes them reluctant to shift to farming. In 1927 the British colonial government provided incentives to the Hadzabe to become settled communities based on the belief that they were living an inhospitable way of life. It was thought that if they were provided proper facilities and incentives the Hadzabe would change to settled communities.

The colonial government incentives included the establishment of a camp for the Hadzabe in the Mbulu District of Arusha region in Tanzania in which maize gruel was provided as food (Blurton Jones *et al.* 1992:162; Ndagala 1985, 1988:67). After a few weeks, more than ten Hadzabe died (Woodburn 1962:272) possibly because of infectious disease. The remaining Hadzabe left the camp and returned to the bush. In 1937 the colonial government made a second attempt but after three weeks all had returned to the bush (Ndagala 1985; Woodburn 1962:272). During the post-colonial government in 1964 Hadzabe settlements were established in Yaeda Chini (Ndagala 1988:67). They were taught how to dress in Western fashion and introduced to agricultural activities to replace their traditional subsistence system. By 1967 a total of 768 Hadzabe were living at Yaeda Chini. A second settlement was established in Iramba (Ndagala 1985) where the Hadzabe were provided with better social facilities, such as schools, clothing, tap water, dispensaries, housing, food, hoes, domestic animals, hunting guns, bee hives, tractors and cereal grain. They were also exposed to Christian religious instruction (Ndagala 1985, 1988:67). As time passed the Hadzabe left the settlements and returned to the bush. The main reason for returning to the bush is that "every time the Hadzabe left the bush to live in the settlements they lost their autonomy, their traditional self-reliance and self-sufficient food and lived as "refugees" dependent on government rations (Ndagala 1985:21). Although the government viewed the new directions as a supportive initiative, the Hadzabe viewed this as bitter experiences of drudgery and hunger (Ndagala 1985, 1988:69). According to Ndagala (1985), development should liberate people from ecological, social, political and economic pressures and the limitations of access to better standards of living. Woodburn (1968a:52, 1979:246) reports that before the government interventions, the Hadzabe had no history of famine or food shortages even in times of drought. In 1973 for example, famine in Nyisanzu and Datoga area led agriculturalists to take refuge in the Hadzabe area (Blurton Jones *et al* 1992:178; Woodburn 1968a:54, 1988). They intermarried with the Hadzabe and some of their descendants have remained permanently as hunter-gatherers (Woodburn 1968a:54, 1988:39; see also Bagshawe 1924-25a). Campbell (1985:57) stresses that these people who have a simple technology live well below the carrying capacity of their environment which is facilitated by maintaining low population densities.

The observed resistance of the Hadzabe to acculturation contributes to our understanding of what might have happened at the time of contact between the IA and the LSA hunting-gathering communities in the last few millennia BC. The most important aspect we can learn from the Hadzabe is the relationship between their balance of populations to the resource potential in their environment (Campbell 1985:57; Woodburn 1968a:52). The ecology of the Hadzabe provided them with resources that sustained their mode of subsistence. This is why the Hadzabe were reluctant to change despite incentives and pressure placed on them to become sedentary agriculturists (Blurton Jones *et al.* 1992). However, this does not mean that the Hadzabe community has remained autonomous without borrowing some elements of culture from other surrounding communities. For example, modern Hadzabe acquire clothes and use various products manufactured from modern industries through exchange, yet they maintain an egalitarian, hunting and gathering economy. They also exchange food and provide labour to neighbouring agriculturalists (Blurton Jones *et al.* 1992:176; Woodburn 1988:51-3).

An experiment similar to that of Hadzabe occurred when the Botswana Government attempted to resettle the San hunter-gatherers in the 1960s and 1970s (Brooks *et al.* 1984:297-310, see also Kent 1991:3). In contrast to the Hadzabe case, the

San people settled down and started to cultivate and herd regularly. Several factors are mentioned to be prime in motivating this change. Firstly, unlike the Hadzabe, whose resettlement camps were placed in the government's preferred stations (Marlowe 2001:260), the San were free to establish camps in their area of preference and so they chose where they would reside (Kent 1991:3). In addition, the Botswana Government's call for resettlement was voluntarily accepted by the San in contrast to Hadzabe resettlement schemes which involved a limited amount of force. Secondly, while government support to Hadzabe was cut short after resettlement (Marlowe 2002:260), the San received extensive support from the government (Brooks *et al.* 1984:297-310). Thirdly, favourable rainfall in the 1970s encouraged the change which was already in progress among the San (Brooks *et al.* 1984:308), while drought and crop failure in the Hadzabe area discouraged the process (Marlowe 2002:260).

Vencl (1986:48) contends that it will be an error to regard cultural loans as free circulation of elements. According to Vencl (1986:49) "the economic superiority of food-producing systems, so obvious and acceptable from the point of view of European civilization, does not appear to have been uniformly desirable to hunter-gatherers for their criteria of desirability were not confined solely to economic considerations." This is because every aspect of culture is firmly tied to the economic, social and ideological structures of a society (Vencl 1986:48). As discussed by Haviland (1983:409), people will never borrow all available aspects from one culture but exercise a high degree of selectivity, limiting their choices to those compatible with the existing culture.

Acculturation and general interaction such as exchange of cultural materials between hunter-gatherers and farmers is not only known from ethnographic sources but also from the archaeological record. In Zambia archaeological excavation has indicated coexistence of farming and hunting-gathering communities for more than a millennium (Miller 1969; Phillipson 1976a:196-197). Evidence from Makwe and Nachikufu sites in Zambia (Miller 1969; Phillipson 1976a:196-197) as well as Enkapune ya Muto in Central Rift Valley Kenya (Marean 1992:110), suggest sustained hunter-gatherer/agropastoralist interaction for long periods of time without major modification of the hunting-gathering mode of subsistence. In Zambia LSA people are known to have acquired metal and pottery technology possibly through exchange (Miller 1969:87; Phillipson 1976a) and in later times they produced these items for themselves (Clark 1950a; Fagan 1966:456; Miller 1969:87). The suggestion that hunting-gathering communities might have been producing their own iron comes from the association of iron slag with LSA industries at the Nachikufu. The evidence also supports a continual use of stone simultaneously with iron tools (Miller 1969:87). However, Musonda (1987) presents an alternative explanation. At some sites in Zambia coexistence of pottery or other materials related to farming activities in the LSA sites does not necessarily imply acculturation or exchange between the two communities. At Lunsemfwa Drainage Basin of Zambia, pottery seems to have been brought into hunting sites not through exchange but as a result of curiosity leading to the collection of pottery from sites abandoned by farming communities (Musonda 1987:155-6).

Given the above discussion, it can be hypothesized that incoming IA populations lived side by side with the LSA in East Africa. At the time of initial contact a peaceful coexistence between the two groups could have been caused by a number of factors. First, although IA and LSA societies had different subsistence systems there were some shared features. During the initial occupation of an area the farming communities would have required wild resources obtained through hunting and gathering. This is based on the fact that establishing a new site for farming activities would have required time and effort until the new site was fully established. Considerable effort would have been needed to clear land and for farmers to become accustomed to the new conditions. For example, Schoenbrun (1993) suggests that the EIA in the Great Lakes practiced hunting-gathering, fishing, along with cultivation of root crops, cereal agriculture and livestock keeping. Similar archaeological evidence is reported from Zambia (Miller 1969:86), New Guinea (Lourandos 1980:248) and West Central Asia (Dolukhanov 1986). Vansina (1984:138) suggests that the initial movement and subsequent occupation of the Bantu south of the Sahara was beset with economic difficulties. This would have necessitated the Bantu to seek environmental knowledge from foragers. Lacking knowledge to master newly occupied environments for agricultural activities, incoming people would have temporarily relied on intensive hunting and gathering, learning these from the local LSA peoples. In central Tanzania for example, episodes of drought and famine are reported to have been common and during the colonial period alone about 24 incidents of famine were recorded (Brooke 1967:20-22; Ten Raa 1968:30-9). An unstable environment would have forced IA populations to hunt for meat supply or engage in exchange with LSA communities to cope with crop failure or loss of livestock. As is discussed below the inclusion of hunting-gathering activities in a farming economy could encourage cooperation between hunter-gatherers and farmers. However it is worth noting that subsistence practices sometimes reflect cultural norms and values imposed by a society. For example, Maasai are sometimes grouped into three divisions, those who are pastoralists, a second group dependent on agriculture and animal herding, and a third group subsisting on animal herding and hunting of wild animals. The first group which calls itself "Maasai proper" has strong cultural taboos against hunting-gathering and looks down upon the subsistence strategies of the rest of the Maasai (Galaty 1982).

The inclusion of a hunting-gathering element in farming or herding communities may have lessened the cultural distance between the two communities. This may have encouraged more cooperation and intermingling of the social, economic and political lives of the two peoples. This last point could be very instrumental in the acculturation of hunter-gatherers by settled communities. It has been stated that in areas dominated by one subsistence system, norms and customs are established that discourage new behaviours and practices especially those threatening the survival of the existing ones. This is based on the fact that adoption of new elements may lead to undesirable changes in the structure of the existing system (Vencl 1986:48). For example, the "Maasai proper" "refuse to consume game and look upon those who do so as degenerate" (Galaty 1982:7; Newman 1970:44). This is done to protect existing societal norms and values. If a "Maasai proper" boy becomes a hunter-gatherer it means loosing all qualities and values possessed by the "Maasai proper." When this type of cultural environment exists the results are manifested by a shrinking of social, economic and political cooperation between neighbours with conflicting cultural systems. For example, a "Maasai Proper" (man) can marry a woman from a hunting-gathering community because he is capable of paying the bride price by providing cows. On the other hand a hunter-gatherer (man) cannot marry a Maasai woman because he has no cows to pay (Galaty 1982:7). There also are other restricting aspects that a woman from a hunting-gathering community has to fulfil to qualify being a Maasai.

There are some important differences between hunting-gathering and farming modes of subsistence that would have influenced the interaction between the LSA and IA and encouraged the maintenance of separate cultures. An important assumption here is that the spatial distribution of LSA and IA sites would have differed. For example, Zvelebil (1986b:178-9) has noted that during the dispersal of farming to Europe and Central Asia, areas settled by farmers were precisely those which were poor in resources for hunter-gatherers but rich for farmers. Wilson (1982) has pointed out that nothing is random about the way human beings arrange themselves upon the landscape either within the individual communities or over large geographical areas. This implies that the establishment of a settlement in a particular place is the result of decisions made subject to environmental, technological, social, economic, and political factors. The nature of agricultural activities and long term food security encourages farmers to stay at one settlement for a long time. Ecological factors, such as soil fertility and rainfall reliability are primary factors that affect the survival of a farming system but they are not the most immediate prerequisite for the survival of the hunting-gathering mode of subsistence. For example, two months of failed rains may put a farming system at more risk than hunting-gathering. There are other reasons why farming can be more risky than hunting-gathering. Farmers depend on a narrower range of alternatives in their subsistence than hunting-gathering communities. For example studies of the Hadzabe of Tanzania and !Kung Bushmen of the Dobe area suggest these hunter-gatherers select from an enormous variety of foods and famine is rare (Lee 1968; Woodburn 1968a). As noted previously farmers from the neighbouring regions sought refuge in these hunter-gatherer territories during famine (Lee 1968:39-40; Woodburn 1968a:54). On the other hand hunting and gathering societies have a tendency to follow plant and animal resources in regard to their seasonal distribution (Woodburn 1968b). The different requirements of farming and hunting-gathering would have led farmers to locate themselves in environments best suited to agricultural production while hunter-gatherers could occupy the areas that are marginal to agriculture resulting in little conflict.

In this thesis a cultural ecological approach is employed which is influenced by studies of the Sandawe and Hadzabe of central Tanzania by Newman (1970), Ndagala (1985, 1988) and Woodburn (1962, 1968a & b, 1988). Both archaeological and anthropological studies on the agricultural colonization and interaction between farmers and hunter-gatherers from various parts of the world will be used to supplement my field data and arguments (see for example, Hodder 1982a; Ndagala 1985, 1988; Phillipson 1976a, 1977a, 1993a; Vansina 1990, 1994-5, 1995; Woodburn 1962, 1968a & b, 1988; Zvelebil *et al.* 1986).

3.3.3. Ascertaining the Role of the LSA in Later Development of Settled Communities in Central Tanzania

The cooperation and symbiotic relationship between the LSA and IA at the initial period of contact means that elements of both cultures had an impact on the development of later societies in Tanzania. They lessened ethnic tensions and contributed in the acculturation process. Variation in cultural specialization would have been instrumental in strengthening cooperation and developing symbiosis between the LSA and IA. For example, hunters were probably more efficient in hunting, while farmers had iron technology that produced stronger and more durable tools than those made out of stone. Vansina (1984:143) presents a case study of the relationship that might have emerged between Bantu farmers and Pygmy hunter-gatherers where he suggests trade and intermarriage began to favour the central locations of villages which were larger and more permanent than hunting camps. This type of co-operation would have ultimately brought the two groups together. It is possible that because hunter-gatherers live in smaller communities than farmers, their language may have become underused while that of the Bantu became dominant. In the Congo forest for example, Pygmies lost their original language after coming into contact with Bantu farming communities and today the Pygmy language is unknown (Denbow 1990:142). Vansina (1984:143) suggests: "given the relative former isolation of the hunters it would not be unusual to find several languages of hunters in a district confronting only one Bantu language, which would thus become a *lingua franca.*" In another circumstance, the Pygmies are also said to perform certain rites such as circumcision of boys (a Bantu tradition) to strengthen the relationship with their Bantu neighbours (Coon 1971:322).

These examples suggest that it would be a mistake to attribute the beginning and development of settled communities in central Tanzania solely to Bantu peoples. The development of initial settled communities in central Tanzania was influenced by a combination of people of various economic backgrounds such as hunter-gatherers who were integrated into Bantu cultures. The nature of hunter-gatherers is to live in small isolated communities and may be one of the contributing factors as to why hunters lost their language and identity to those of Bantu. In some instances hunting-gathering groups live side by side with farming communities and acquire their methods of subsistence and developed into autochthonous farmers or herders. In South Africa for example, some of the San hunter-gatherers are said to have adopted pastoralism through a symbiotic lifestyle as serfs or in employment with the Bantu, Batswana and Herero, over centuries (Denbow 1984; Phillipson 1977a:9; Thorp 1997; Wilmsen 1991:248). In central Tanzania the Sandawe were hunter-gatherers until recent times when they became agropastoralists as a result of contacts with their neighbours (Bagshawe 1925b; Newman 1970:25-56; Ten

Raa 1986; Trevor 1947:62). Sandawe have stayed as an autonomous group and have retained their traditional language. This one example of how LSA hunting-gathering peoples could have contributed to the development of prehistoric IA settled communities in Tanzania as an active and independent group.

Although anthropological information may be useful in the process of interpreting the past it may also lead to flawed conclusions if not used cautiously (Hodder 1982b; Wylie 1985). Hodder (1982b:12-15) has raised an alarm over the misuse of formal analogy where unsubstantiated inferences of similarity between the past and present are used as a key for interpreting the past. Formal analogy has always assumed that if two objects have some common properties they also probably share others. Wylie (1985) and Hodder (1982b) categorize such analogies as weak because they are prone to false conclusions. According to Hodder (1982:12)... "if things and societies in the present and past are similar in some aspects, this does not necessarily mean they are similar in others." This is because the observed similarities between objects under investigation may be entirely accidental. Instead, Hodder 1982b:16-24) and Wylie (1985:101) recommend the use of approaches such as relational analogy where stronger inferences can be developed by working on both sides of the analogical equation to establish the contexts and causes of observed similarities and differences between items being compared. In other words, there is a need to account for why the source and subject are similar and different (Stahl 1993; Wylie 1985). This type of analogy is suggested to be a better tool because understanding the principles linking the source and subject will clarify reasons for associated similarities and differences.

While the use of analogy is unavoidable in this work, there are several aspects that are worthy of note. Time and space form the major limiting factors. This is because no society has ever been socially or economically static over any given period in prehistory. The San, Pygmies and the Hadzabe as hunter-gatherers are now living in areas that are marginal to agricultural production (Lee and DeVore 1968:4-5; Ndagala 1988:65; Schrire 1980). In this circumstance the form of subsistence they practice and the ultimate behaviour resulting from their interaction with neighbouring farming communities may not provide an absolute model for the nature of past contacts between LSA and IA peoples. In addition, modern farmers and hunter-gatherers belong to a different historical context with varying social, economic and world views that may not reflect those held by ancient communities. This means ethnographic information about modern hunter-gatherer/farmer interactions can provide only a limited range of possibilities relevant to past situations. This research takes the position that archaeological field data should play the ultimate role in interpreting the possible interactions between the LSA and IA industries. Only after this has been done will it be possible to examine the relationship between the archaeological data and ethnographic accounts of the interaction between hunter-gatherers and farmers.

3.4. Chapter Summary

The relationship between the LSA hunter-gatherers and IA agropastoralists has remained one of the unresolved debates in sub-Saharan studies. This has led to three competing models: displacement, assimilation and acculturation. While these models have prevailed, they have not been fully tested by archaeological data. This study attempts to elucidate the social and economic relationships between the LSA and IA of central Tanzania and thereby test models proposed for other parts of Africa.

Archaeological, historical and anthropological studies from various parts of Africa suggest that, with some exceptions, contacts between hunter-gatherers and farmers may have been peaceful overall. Initial low population and differences in exploitation strategies of available habitats seems to have facilitated peaceful contacts. Subsequent population pressure and climatic instabilities intensified these interactions and this may have ultimately integrated the two cultures.

CHAPTER 4: METHODOLOGY

4.1. Introduction

This research project involved the collection of two main data types: 1) archaeological sites survey and 2) excavations in the areas of Baura and Lusangi in the Pahi Division of Kondoa district. A total of four months spread over three field seasons was spent in the field between October 2000 and September 2001. Part of the data analysis was conducted in between field seasons. This chapter describes the methods and strategies that were involved in data collection at the Pahi Sites.

4.2. Survey Strategies

The survey involved recovery of surface and subsurface artifacts, and focused on establishing LSA and IA settlement patterns. Techniques involved land walkover and shovel test pits (STP) to document occurrences of cultural materials and environmental data at the sites. Data were collected relating to site formation processes influencing the formation of the archaeological record. This helped to assess other information such as the distribution and patterning of IA and LSA sites throughout the study area as well as pinpointing the most promising areas to undertake archaeological excavations.

Two 1:50,000 topographical maps of Masange (series Y742, sheet 104/2) and Kondoa (series Y742, sheet 104/4) were used in the fieldwork. The survey strategy employed systematic sampling. The main reason to adopt this type of sampling was to establish the occurrence and patterning of different sites over the landscape. This means that once the desirable extent of the area was identified it was divided into equally spaced transects. In this regard no part of the selected area was over or under-represented (Figure 4.1 and 4.2.). This also helped to minimize bias in recovering LSA and IA sites. The total

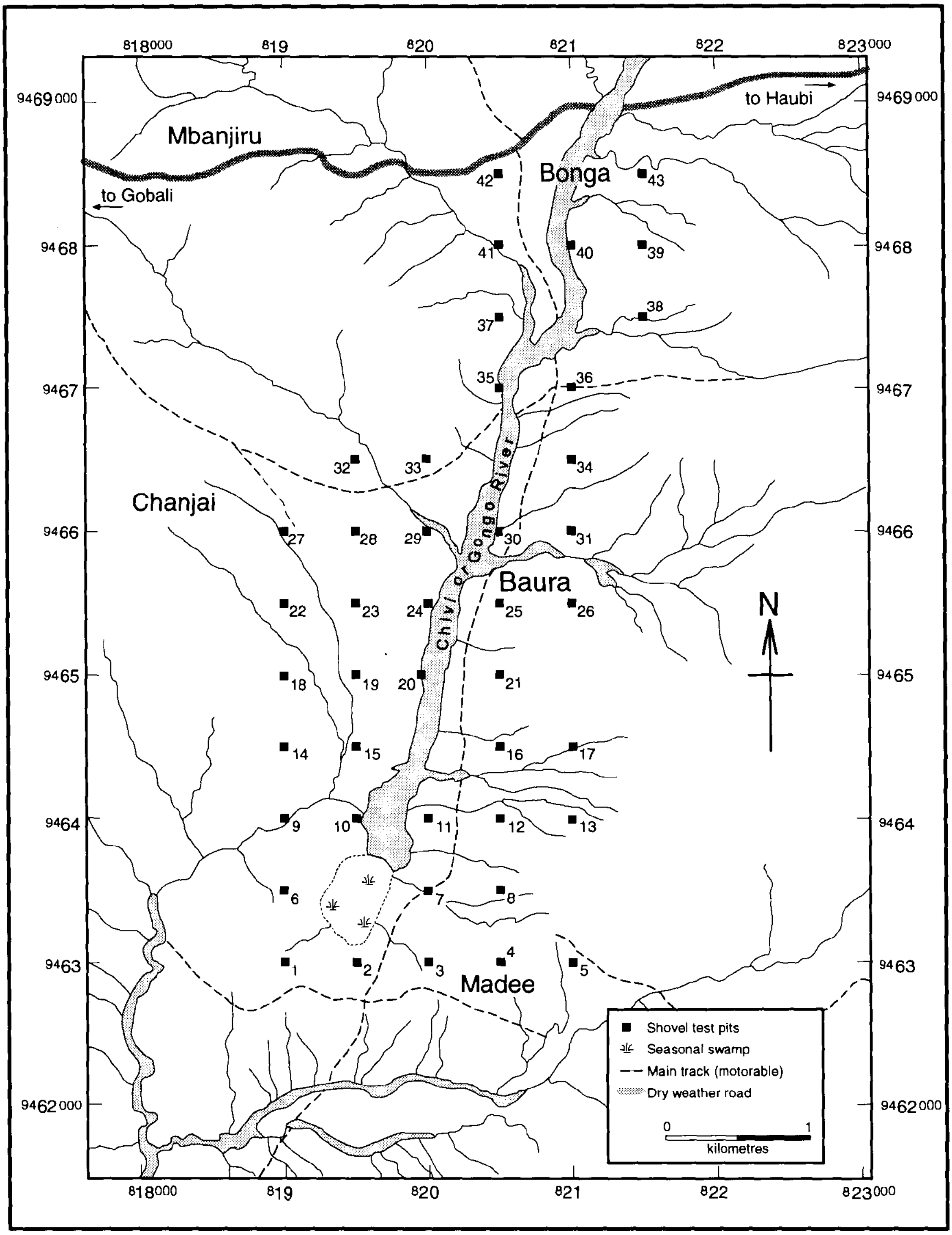


Figure 4.1. Baura survey, location of STPS

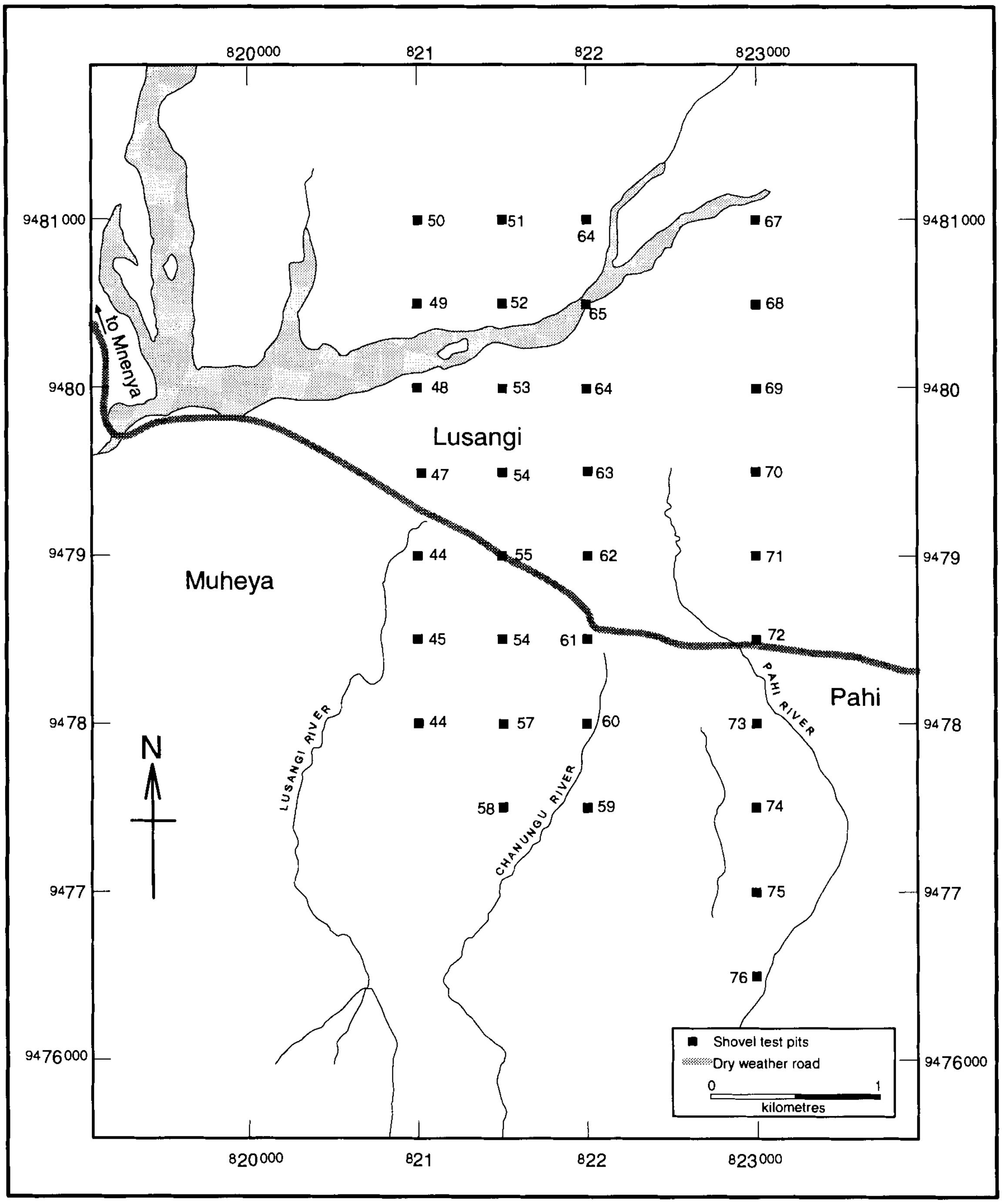


Figure 4.2. Lusangi survey, location of STPS

area covered by the survey was 17.5 km², with 9.5 km² at Baura and 8 km² at Lusangi. However, the entire 17.5 km² area did not receive total surface survey coverage and instead each selected transect for site search was 200 m wide. The survey team consisted of 11 individuals arranged in a line at an interval of 20 m with the person at the centre controlling direction with the aid of a compass. In addition, an extra crew member took measurements of the distance covered using a tape measure. In this respect 8.72 km² received total surface coverage, equivalent to 49.8% of the 17.5 km² survey area. The project excavated 76 shovel test pits (STP), 43 of which were from Baura and 33 at Lusangi (Figure 4.1 and 4.2). The STPs were 50 x 50 cm and completed at intervals of 0.5 km along each transect.

It was more convenient to use exact grid references on the map as bases for transects during the field survey. To locate a grid line, permanent landmarks were selected including natural features such as hills and rivers as well as cultural features such as roads and schools. These landmarks were used as reference points for mapping the transects. After a grid position and the first STP was established the location of the next STP was fixed using a compass and a tape measure. Distance measurements from one STP to another were taken after establishing two aligned points from the last STP to the next to guide the surveyor so that orientation was kept intact.

Sediments from all STPs were sieved using a 5 mm screen and all archaeological materials were placed in bags for laboratory analysis. Environmental data collected for each STP included location of the STPs in reference to landscape, features (such as distance from water sources), and whether the STP was located on flat-lying land or hillslope. Cultural materials were collected from the surface within a 200 x 200 m area around each STP. Materials collected included lithics, bones, slag, tuyeres, daub, metal objects, decorated pottery and all rim sherds. With the exception of decorated pottery and rims, most artifacts found on the surface were recorded and only a few representative samples were retained. However all artifacts excavated from STPs were kept for further analysis. No materials were collected at the survey paths, and instead, sites discovered along the survey transects were recorded. Sites recovered during survey were recorded in notebooks, photographed and mapped to record their location. There were also forms designed specifically for recording the survey findings and STP excavations (Appendix A1 and A2).

4.2.1. Baura Survey

The Baura area was selected for investigation for several reasons. First, an initial visit to the area revealed evidence of archaeological sites with LSA and IA remains. Secondly, the topography of the area is made up of plains surrounded with hills and adequate water resources that can be exploited throughout the year. This kind of environment would have attracted both LSA and IA communities for settlement. Consequently Baura is an ideal location to study the relationship between LSA and IA.

Baura village is located about 15 km northeast of Kondoa town (Figure 1.1). The topography of the area consists of a lowland plain (1585-1646 m asl) surrounded by hills that rise to about 1860 m asl (Plate 1.1). The land is dotted with scattered rock formations some of which could have been used as rock-shelters. One rock-shelter is located to the south of the village (immediately southeast of STP 3, see Figure 4.1), however it has been disturbed by looters. The vegetation of the area is made up of scattered trees, scrubs and grasses that average 50 cm tall. The village is bisected by Chivi (Gongo) River which flows during the rainy season (Figure 4.1). During the dry season most of the inhabitants obtain water by digging shallow pits along the riverbed. In the southern part of the village is located a seasonal swamp that is flooded with water during the rainy season and most likely attracted a variety of fauna in the past. At the present time ducks inhabit the swamp during the rainy season. Current activities at Baura village involve cultivation and animal herding. Most of the flat-lying area is subjected to cultivation except for severely eroded places, while the hillsides are used for livestock grazing especially during planting season.

The first field season took place during mid October to mid December 2000. The dry season ends in November when the rainy season begins. At this time of year, most of the vegetation on fields and grazing lands had been cleared by livestock. This resulted in excellent visibility for archaeological sites. Most trees also shed their leaves at this time of the year facilitating transit and compass use. The first field season at Baura village concentrated on survey and excavation. A total of 9.5 km^2 of systematic land walkover survey was combined with STP sampling. Test pits were set at a distance of 500 m apart (Figure 4.1). A total of 43 STPs were excavated to 50 - 60 cm. In some areas it was impossible to place an STP at every 500 m. For example, the area between STP 6 and 7 is a seasonal swamp which fills with water during the rainy season. The water flows from the Chivi/Gongo River and several streams. As such, the area contained materials washed down from various parts of Baura village so any archaeological materials would not be in a primary context. The areas between STP 5 and 13, 17 and 26, were avoided because they lie within a rocky hill area that is impossible to excavate. The areas between STP 15 and 16, 33 and 34, 37 and 38, 42 and 43 lie within a riverbed (Figure 4.1).

In general the areas selected for survey (see figure 4.1 and 4.2) were located on flat-lying areas and hill slopes, rather than hilltops. This is because most water resources and better soils for agriculture are located on flat-lying areas. In addition, the flat-lying areas were probably the best feeding grounds for wild animals. It was then concluded that the areas would no doubt be the best places in studying the relationship between the LSA and IA industries. This is because they provided resources important for both hunter-gatherers/agropasoralists modes of subsistence. However, visits were made to the hilltops occasionally. For example, small scatters of potsherd were observed at the top of the hill located east of Baura village (east of STP 21) (Figure 4.1). In addition, a rock-shelter with lithic artifacts and a few potsherds was found on top of a hill located to the southeast of STP 3. However, as stated earlier the rock-shelter had already been looted. Based on the resource potential of hill slopes and flat-lying areas for both hunting-gathering and farming activities, they would provide the best areas for studying the relationship between the LSA and IA industries.

4.2.2. Lusangi Survey

The Lusangi area was selected for several reasons. An initial visit found evidence of archaeological sites with both LSA and IA remains. Second, the area provided adequate water resources year round from springs or by digging shallow pits or wells along the riverbed. This is a significant resource because wells would have made the establishment of permanent settlements possible. Third, many open air and rock-shelter sites are found in the vicinity of Lusangi. This region has a high potential for providing excellent data for determining a chronology and offer a range of artifacts for comparison between rock-shelter and the open-air sites. Finally, Lusangi provides comparative data sample for Baura sites.

Lusangi village is located about 25 km north east of Kondoa town and 12 km north of Baura (Figure 1.1). The topography of the Lusangi area is made up of a lowland plain (about 1280-1219 m asl) bordered by the Muheya Hills to the south that rise to approximately 1920 m asl. Rock-shelters are scattered throughout the lower part of the Muheya hillside. The vegetation of the area is similar to that of Baura. At the time of visit most of the rivers were dry. River Pahi (Figure 4.2) is the only permanent river and its water is tapped at the source to provide water for the village.

The Lusangi survey took place during mid May to mid June 2001 and constitutes the second field season in Pahi. As was the case in Baura, the survey concentrated on the plains and bases of hill slopes rather than hilltops. A total of 8 km^2 of systematic foot survey was completed along with the excavation of 33 STPs (Figure 4.2).

4.3. Excavation Strategies

At both Baura and Lusangi study areas, survey was followed by excavations which had three main objectives. The first was to recover LSA and IA artifacts, ecofacts, and to look for evidence of past subsistence practices. The second objective was to recover data to assist in establishing stratigraphic sequences and a chronology of the LSA and IA assemblages. Third, the excavated data could be compared to the survey results. Sites producing evidence of both LSA and IA cultural remains were given the first priority.

In the first field season excavation took place at Baura 1 (Figure 4.3). At this locality four excavation units of 2 x 3 and 2 x 1 m were completed. Baura 1 is an open-air site with evidence of LSA and IA occupations. The second field season took place at

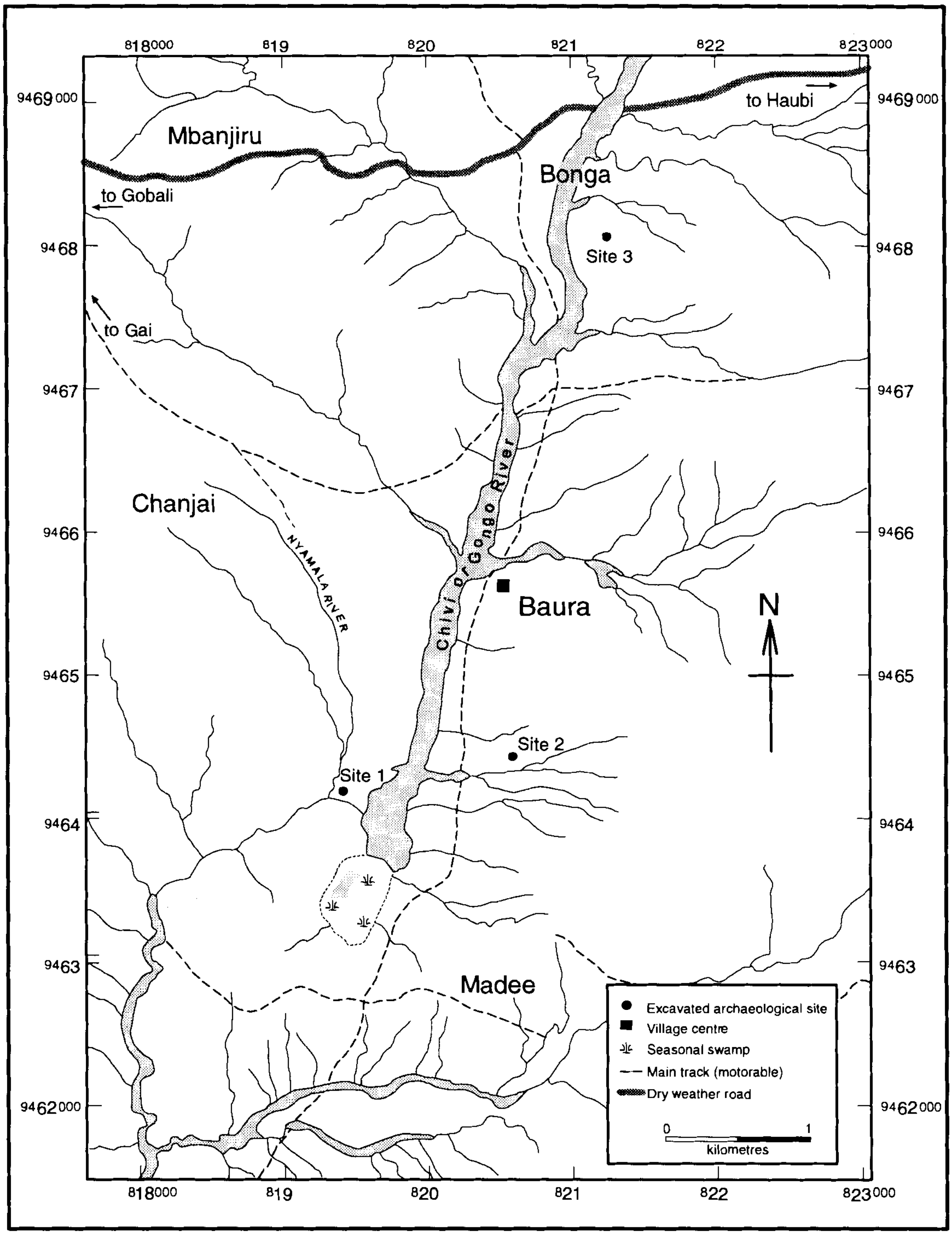


Figure 4.3. Sites excavated at Baura

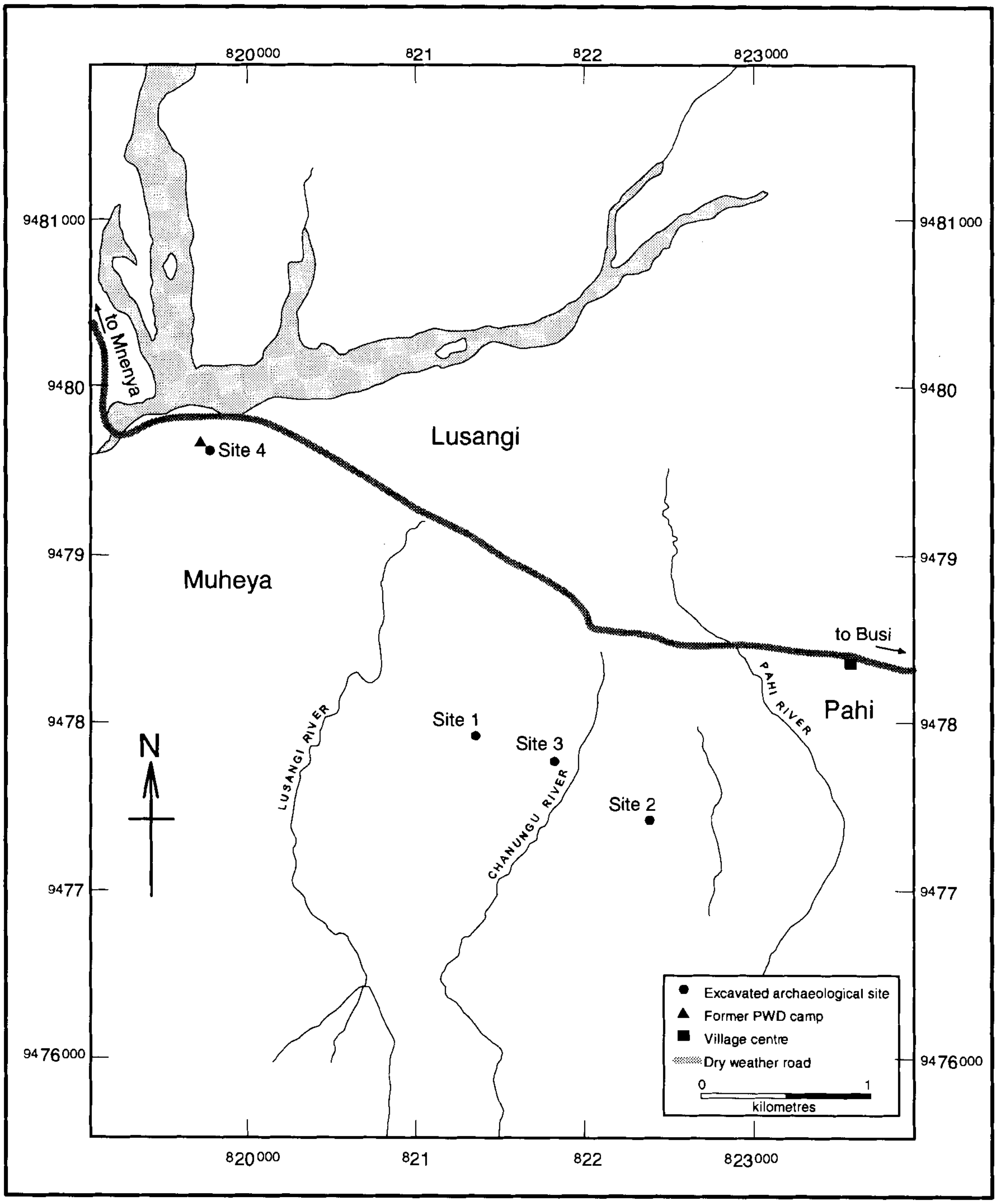


Figure 4.4. Sites excavated at Lusangi

Lusangi where three sites were excavated: Lusangi 1 and 3 and Markasi Lusangi 2 (Figure 4.4). At these sites seven excavation units of 2 x 1 m and 2 x 2 m were opened. The decision to excavate Lusangi was based on the need to obtain comparative data from open-air and rock-shelters sites. Since there are no suitable rock-shelter sites at Baura, Lusangi was the best option.

In the third field season Baura and Lusangi were revisited to obtain more data relating to iron-working industries. At Baura two more iron-working sites Baura 2 and 3 were selected for excavation. At Lusangi three more units were excavated. Two of these were located at iron-working areas at Lusangi 1 and Markasi Lusangi 2 respectively, while the third one was located at a new site of Lusangi 4 (Figure 4.4). At these sites 1 x 2.5 and 1 x 2 m units were opened.

Maps were made for most excavated areas with the exception of Baura 3 unit 1 and Lusangi 4 unit 1. Maps for these two areas were drawn by extracting information from topographical maps (1:50,000) of the area. For Baura 3 unit 1, map series Y742, 104/ 4 – Kondoa and for Lusangi 4 unit 1 map series Y742, 104/2 –Masange were used.

Excavation was carried out using trowels, shovels, buckets, sieves, picks, geological hammers, brushes, line level and tape measures. Hoes, geological hammers and picks were used in a few areas with extremely hard soil. Excavation was done by arbitrary levels of 10 and 20 cm in most of the units. In a rare practice an arbitrary level of 40 cm was used at Baura 1 unit 1 level 5. This decision was reached because few artifacts were recovered and there was no variation in soil colour, texture and structure. In addition, the soil became very hard after 50 cm below datum forcing the use of picks. As a result small interval excavations were difficult to control. Only in one unit (Markasi Lusangi 2 unit 3) did excavation proceed by natural layers. This unit was located on a steep area, so excavation by natural layers was the best option. The depth of excavation units varied from one trench to another depending on the objective of the excavation as well as the nature of the stratigraphy. Most excavation stopped when sterile levels were reached.

Excavated soils were screened using 5 mm wire mesh. All cultural materials and soil samples were collected in plastic bags. Charcoal samples were taken from each level whenever possible. Soils were collected separately and processed using bucket flotation. The volume area from which the samples were collected was recorded. The soil samples were placed in buckets in small quantities and then water was added, stirred by hand in order to bring light materials to the surface. Floating materials were scooped using a tea strainer and the rest of the water was filtered through cloth. Filtered materials were placed in an open place to dry. Water was added to the remaining soil again and the process repeated. The soil residues were thoroughly checked for trapped plant remains and artifacts before being discarded. Photographs were taken for every level in each unit and when features were recovered. Plans were made after the end of each level and on appearance of a feature. At the end of each excavation profile maps were drawn at least from two sides of the unit to show a contour plan of the layers.

4.4. Chapter Summary

The areas of Baura and Lusangi were selected for the research project following discoveries of extensive scatters of LSA and IA remains. A total 8.72 km² was fully searched for sites. This is equivalent to 49.8% of the 17.5 km² area selected for survey. A total of 76 STPs and 16 trenches were excavated during the project. The use of systematic foot survey and STP excavation minimized bias in site recovery. This method proved useful in the overall comparative analysis of the LSA and IA site distributions over the landscape. STP excavation provided stratigraphic sequences which were compared to the results obtained from the excavated trenches. The excavation strategies selectively targeted areas that were more likely to produce specific data to solve the research questions. Through the use of extensive systematic survey and excavation coverage the inherent problem of the past study in central Tanzania and other areas of East and Central Africa will be avoided. In the past only isolated sites were excavated to investigate hunter-gatherer/farmer interactions. This practice may have contributed to inadequate representation of LSA and IA site distribution patterns hence obscuring the real picture of the whole issue of interaction between the two traditions.

CHAPTER 5: RESULTS

5.1. Introduction

This chapter presents survey and excavation results from Baura and Lusangi. Survey results will be summarized for each area rather than describing each shovel test pit (STP) individually. Only those STPs producing unusual cultural materials will be described in more detail. In both areas, STPs are located on flat-lying areas and at the bases of hillslopes, with flat-lying STPs outnumbering those on hillslopes. The term "flat-lying areas" refers to lowlands between the Irangi hills with flat terrain, while "hillslopes" refers to sloped land located at the base of the hills. Hillslopes therefore represent intermediate land between the steep Irangi hills and adjacent flat-lying areas. Although formal survey was not conducted on hilltops, these areas were visited occasionally during fieldwork. They consisted of sparsely distributed artifacts indicating that they were used less intensively than flat-lying areas or hillslopes. For example, on a hilltop east of Baura village (east of STP 21 and 25, Figure 4.1) small scatters of potsherds were evident. Another hilltop located southeast of STP 3 (Figure 4.1) had a rock-shelter with surface scatters of potsherds and two human bones (ulna and skull fragment). The latter location afforded a good view of the surrounding plains, suggesting that it was used as a look-out by groups of hunters.

In general artifact recovery was excellent because of fairly good visibility of surface archaeological materials especially during the early dry season at the initial part of the project (October to November 2000). Although lack of vegetation increases archaeological visibility, materials are unprotected and sites are susceptible to erosion at the onset of the rainy season. Severe plant litter clearance by livestock also means slow stratigraphic build-up. This slow process of stratigraphic formation has persisted for a long time because in all areas surveyed, LSA and IA materials were visible on the surface. In this study, pottery and the byproducts of iron production are used as markers of the IA industry while lithics artifacts indicate LSA or derived LSA elements. Categorization of Pahi artifact industries are discussed in Chapter 7.

Excavation results are described in greater detail on a unit-by-unit basis. Units were selected based on the potential for material evidence relevant to the relationship between IA and LSA. Excavation and survey results were similar in terms of cultural materials recovered and the sequence of deposits. Overall, excavation and survey results both indicate that lower stratigraphic levels consist solely of LSA materials while upper deposits produced mixtures of LSA and IA materials. Excavation was conducted at both open air and rock-shelter sites to obtain cultural materials for comparative purposes.

5.2. Survey Results

5.2.1. Baura

The Baura survey covered a total area of 9.5 km² within which 43 STPs were excavated (Figure 5.1). A 40,000 m² area was surveyed around all STPs. Results of the survey are summarized in Tables 5.1 and 5.2. Thirty two STPs (74.4%) produced cultural remains and of these, 19 (44.2%) yielded subsurface cultural materials and 13 (30.2%) produced only surface finds. A total of 11 STPs (25.6%) produced no cultural materials (Table 5.3).

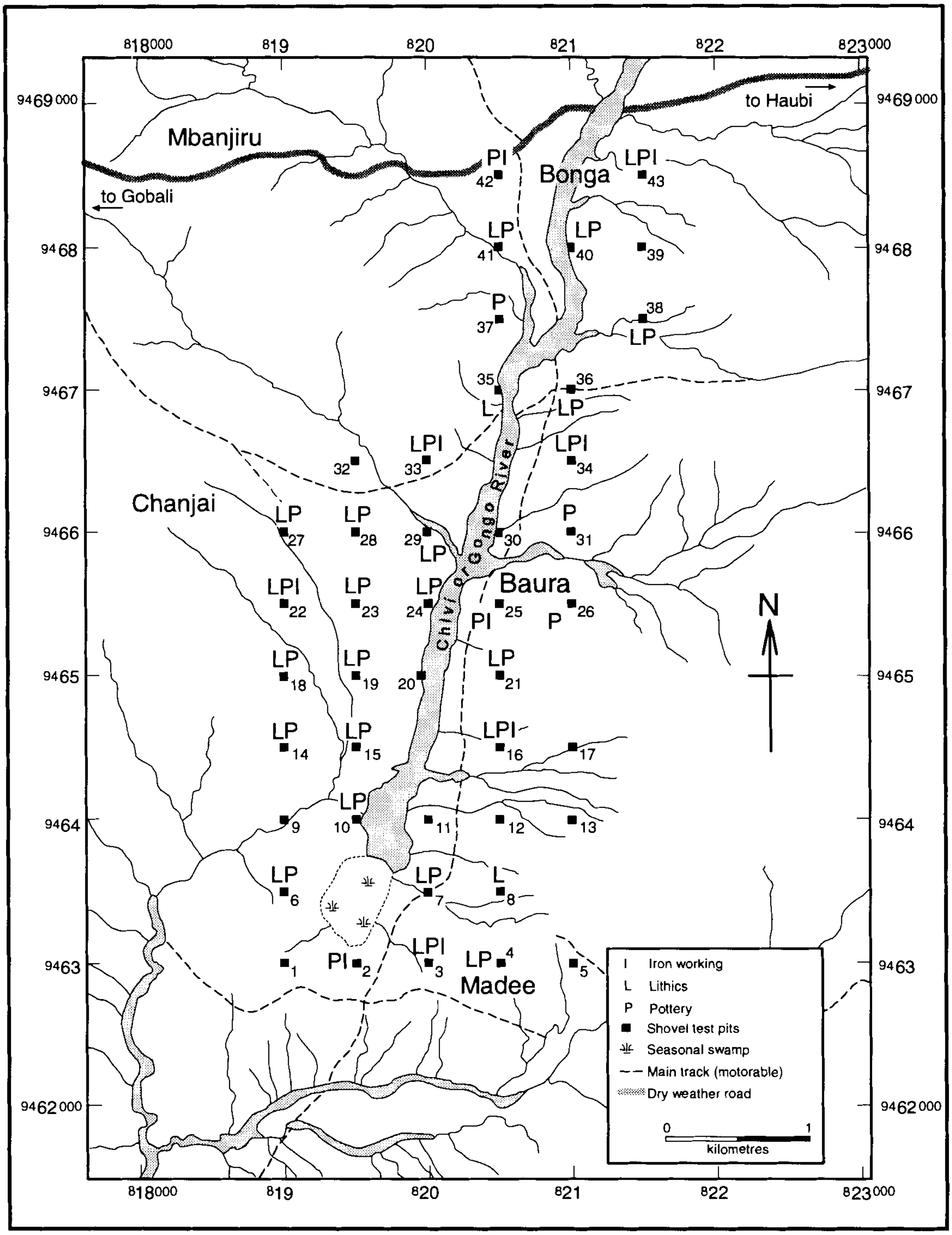


Figure 5.1. Distribution of STPs and types of cultural materials recovered in Baura

Table 5.1. Baura hillslopes STPs results

STP	Maximum depth (cm)	Depth (cm) for artifacts	Excavated artifacts	Surface collected artifacts (40,000 sq. meter per STP)
1	50	-	-	-
5	50	-	-	-
13	50	-	-	-
16	50	0-35	S, T, F	S, P, T, L
17	50	-	-	-
21	50	-	-	P, L
42	50	-	-	S, P, T

S = Slag, F = Furnace, P = Pottery, T = Tuyere, L = Lithics

Artifacts

Table 5.4 is a summary of the frequency of subsurface and surface occurrences for the main artifacts found in the survey. Evidence indicates that all types including pottery, daub, lithics and iron-working remains were found in both surface and subsurface contexts.

At Baura evidence for iron-working was recovered at nine STPs (21.0%) (Table 5.4, Figure 5.1). The term "iron-working" refers to sites with at least one of the following items: slag, tuyere, and furnace remains which are primary indicators of iron production. Iron objects are also included in this list but are not used on their own to define the presence of iron-working. Only STP 16 (Figure 5.1) produced evidence of a furnace and on this basis, an excavation unit was placed there (Baura 2 Unit 1). In addition to the STP locations, evidence for iron-working was found along several survey transects, including the area between STP 10 –15 (slag scatters), STP 37 –38 (slag scatters), and STP 39-40 (slag scatters and a furnace). As a result of these discoveries excavation trenches were

Table 5.2. Baura flat-lying areas STPs results

STP	Maximum depth (cm)	Depth (cm) for artifacts	Excavated artifacts	Surface collected artifacts: (40,000 sq. meter per STP)
2	50	0-20	D	S, D, P, T
3	50	0-15	P, L	S, P, L
4	50	15-20	P, L	P
6	51	0-35	P, L	P, L
7	50	-	-	P, L
8	55	0-49	L	L
9	50	-	-	-
10	50	-	-	P, L
11	50	-	-	-
12	50	-	-	-
14	50	-	-	P, L
15	50	0-45	P, L	P, L
18	60	30-50	L	P
19	50	0-35	D, P, L	L
20	50	-	-	-
22	54	20-30	P, L, I	S, P
23	50	20	D	P, L
24	50	-	-	P, L
25	52	25-30	D	S, D, P
26	50	-	-	P
27	50	34-40	L	P, L
28	50	30	L	P, L
29	50	19-31	P, L	P
30	51	-	-	-
31	51	0-12	P	P
32	50	-	-	-
33	50	-	-	S, P, L
34	50	20-37	S, P, T	S, P, L
35	50	-	-	L
36	50	20-40	P, L	P
37	50	29-40	P	P
38	50	-	-	P, L
39	50	-	-	-
40	50	-	-	P, L
41	50	-	-	P, L
43	50	-	-	S, P, L,

D = Daub, S = Slag, I = Iron, F = Furnace, P = Pottery, T = Tuyere, L = Lithics

Table 5.3. Baura survey results: summary

Level	Hillslopes	Flat-lying Areas	Total STPs
Surface (STPs with exclusive surface finds)	2 (4.7%)	11 (25.6%)	13 (30.2%)
Subsurface	1 (2.3%)	18 (41.9 %)	19 (44.2%)
Subtotal	**3 (7.0%)**	**29 (67.4%)**	**32 (74.4%)**
No artifacts	4 (9.3%)	7 (16.3%)	11 (25.6%)
Total	**7 (16.3%)**	**36 (83.7%)**	**43 (100.0%)**

Table 5.4. Frequency of subsurface and surface occurrences at Baura (based on 43 excavated STPs)

Level	Pottery	Daub	Iron-working evidence	Lithics
Total STPs	30 (69.8%)	4 (9.3%)	9 (21.0%)	26 (60.5%)
STPs with surface evidence	29 (67.4%)	1 (2.3%)	9 (21.0%)	21 (49.0%)
STPs with subsurface evidence	11 (26.0%)	4 (9.3%)	3 (7.0%)	12 (28.0%)

* An STP may be entered twice if an artifact is found on both surface and subsurface. For example, 10 STPs have both surface and subsurface pottery.

placed between STP 10-15 (Baura 1 Unit 4) and between STP 39-40 (Baura 3 Unit 1).

Lithic artifacts were recovered at 26 (60.5%) STP locations (Table 5.4) and of these only two (4.7%) yielded exclusively lithic artifacts (Table 5.5). Apart from the STP locations, many lithic scatters were noted in the survey transects between the STPs. Possible workshops were identified in the vicinity of STPs 3, 9, 10, 14, 15 and 16 (Figure 5.1). Most of these dense lithic accumulations are located near quartz raw material sources. The presence of large numbers of lithics in all stratigraphic sequences and their widespread occurrence on the surface (Tables 5.4 and 5.6) throughout the surveyed area

Table 5.5. Summary of STPs artifact composition at Baura (based on 43 excavated STPs)

Artifact type	Lithics	Exclusively lithics	Pottery	Exclusively pottery	Iron-working	Exclusively iron-working
STPs	26 (60.5%)	2 (4.7%)	30 (69.8%)	3 (7.0%)	9 (21.0%)	0 (0.0%)

Table 5.6. Artifact occurrences by level in STPs at Baura (based on 43 excavated STPs)

Level (cms)	Pottery (number of STPs)	Daub (number of STPs)	Iron-working evidence (number of STPs)	Lithics (number of STPs)
Surface	29(67.4%)	2 (4.6%)	7 (16.2%)	21(49.0%)
0-5	5 (11.6%)	2 (4.6%)	1 (2.3%)	5 (11.6%)
6-10	5 (11.6%)	2 (4.6%)	1 (2.3%)	5 (11.6%)
11-15	6 (14.0%)	2 (4.6%)	1 (2.3%)	6 (14.0%)
16-20	8 (18.6%)	3 (7.0%)	3 (7.0%)	8 (18.6%)
21-25	7 (16.2%)	2 (4.6%)	3 (7.0%)	7 (16.2%)
26-30	8 (18.6%)	2 (4.6%)	3 (7.0%)	9 (21.0%)
31-35	7 (16.2%)	1 (2.3%)	2 (4.6%)	8 (18.6%)
36-40	4 (9.3%)	-	1 (2.3%)	5 (11.6%)
41-45	1 (2.3%)	-	-	3 (7.0%)
46-50	-	-	-	2 (4.6%)

suggests that stone tool production continued from the LSA to recent times. This is best illustrated by excavation results described below where artifact sequences are described in more detail.

Potsherds were recovered at 30 (69.8%) STP locations, suggesting that pottery is the most widely distributed artifact in the Baura survey area (Table 5.4). Three (7.0%) STPs produced pottery artifacts exclusively (Table 5.5). The fact that only a few sites yielded exclusively lithic or pottery artifacts (Table 5.5) indicates that both LSA and IA sites tend to be located in similar areas.

As illustrated in Table 5.6, STP stratigraphy demonstrates an association of LSA and IA artifacts in upper levels. IA artifacts such as pottery, slag and tuyeres were generally obtained above 45 cm and were mixed with lithics, while lower levels produced exclusively LSA lithic artifacts. Only a few STPs (2) produced exclusively lithic artifacts in the lower stratigraphy because STP depths were restricted to 50 – 60 cm. The fact that most areas consist of exclusively lithic artifacts in the lower levels will be later demonstrated by the excavation results. Raw materials for stone tools are readily available in the Baura area and it is unlikely that a site would have been specifically selected based on the availability of raw materials. However evidence suggests a few areas were preferred as quarries because of the high quality of quartz lithic raw materials. Such areas are found in the vicinity of STP 9, 10, 14, 15 and northwest of STP 3 (Figure 5.1).

Hillslope STPs

A total of 7 (16.3%) STPs in the Baura survey area were located on basal hillslopes, including STP 1, 5, 13, 16, 17, 21 and 42 (Figure 5.1). Four of these (1, 5, 13 and 17) did not produce any cultural materials (Table 5.1). The remaining three (16, 21 and 42) revealed cultural materials including lithic, slag, pottery, tuyere and furnace remains. Artifacts from STP 16 and 42 included both slag and tuyere fragments implying that these localities were the focus of iron-working activities. Only STP 16 produced subsurface artifacts. Although this sample is small, there is reason to believe that most sites located on the hillslopes were involved with iron-working. A similarly investigation at Haubi (Figure 1.1) indicates that most IA sites with evidence of smelting are located on hillslopes while more recent sites are located on adjacent flat-lying areas (Mapunda, per. comm.). The hillslopes may have been selected because they were located away from the flat-lying areas where the majority of habitation sites were found. According to Schmidt (1997:191) in many African societies, iron smelting was conducted in secrecy within forests or hinterlands to lessen the interference with the public to ensure a successful smelt.

Flat-lying Area STPs

Thirty six (83.7%) STPs locations were located on flat-laying areas and of these 29 (67.4%) yielded materials while 7 (16.3%) did not produce any cultural remains (Table 5.3). Twenty four (55.8%) STPs had lithics, 27 (62.8%) produced pottery, and 7 (16.3%) yielded evidence for iron-working (Table 5.2). Only 18 (42%) STPs produced subsurface remains. Hillslope STPs had a 1:7 probability for sub-surface artifacts while STPs in the flat-lying areas had a probability of 1:2 (Table 5.7). This indicates that STPs located in flat-lying areas are more likely to produce subsurface remains. This suggests that these areas were more favoured for settlements and certainly more intensively used

Table 5.7. Baura: Artifact predictability

Level	Hillslope STPs (n = 7)	Probability	Flat-lying area STPs (n = 36)	Probability	Total STPs (n = 43)	General probability
Exclusively Surface artifacts	2	1:3.5	11	1:3.3	13	1:3.3
Subsurface artifacts	1	1:7.0	18	1:2.0	19	1:2.3
No artifacts	4	1:1.8	7	1:5.1	11	1:3.9

than hillslopes. Most sites with dense and extensive artifact scatters (*e.g.*, Baura 1) are also located in flat-lying areas. This pattern is different from that observed at Lusangi where most sites with higher densities of artifact scatters are located on hillslopes (see below).

5.2.2. Lusangi

A total of thirty-three STPs were excavated in the 8 km^2 area surveyed at Lusangi (Figure 5.2). At each STP a 40,000 m^2 area was surveyed for surface artifacts. Summary results for the survey are presented in Tables 5.8 and 5.9. Artifacts were recovered at 17 (51.5%) STPs and of these, 9 (27.3%) produced subsurface cultural remains (Table 5.11). Sixteen (48.5%) STPs yielded no cultural materials. This indicates that the Baura (74.4%) survey area had a higher frequency of sites in a given area than Lusangi (Table 5.10). Similar to Baura, lithics tend to dominate in deeper strata at Lusangi (Table 5.12). A difference is noted between Lusangi and Baura in that, while all STPs at Baura with subsurface finds also produced surface finds, some at Lusangi did not (Tables 5.1, 5.2, 5.8 and 5.9).

Artifacts

Table 5.13 indicates the frequency of surface and subsurface finds from the Lusangi survey area. Evidence for iron-working was recovered at 2 (6.1%) STPs (Table 5.13). All iron-working finds were recovered at the surface and none were derived from STP excavations. In addition to the STP evidence of two iron-working sites were

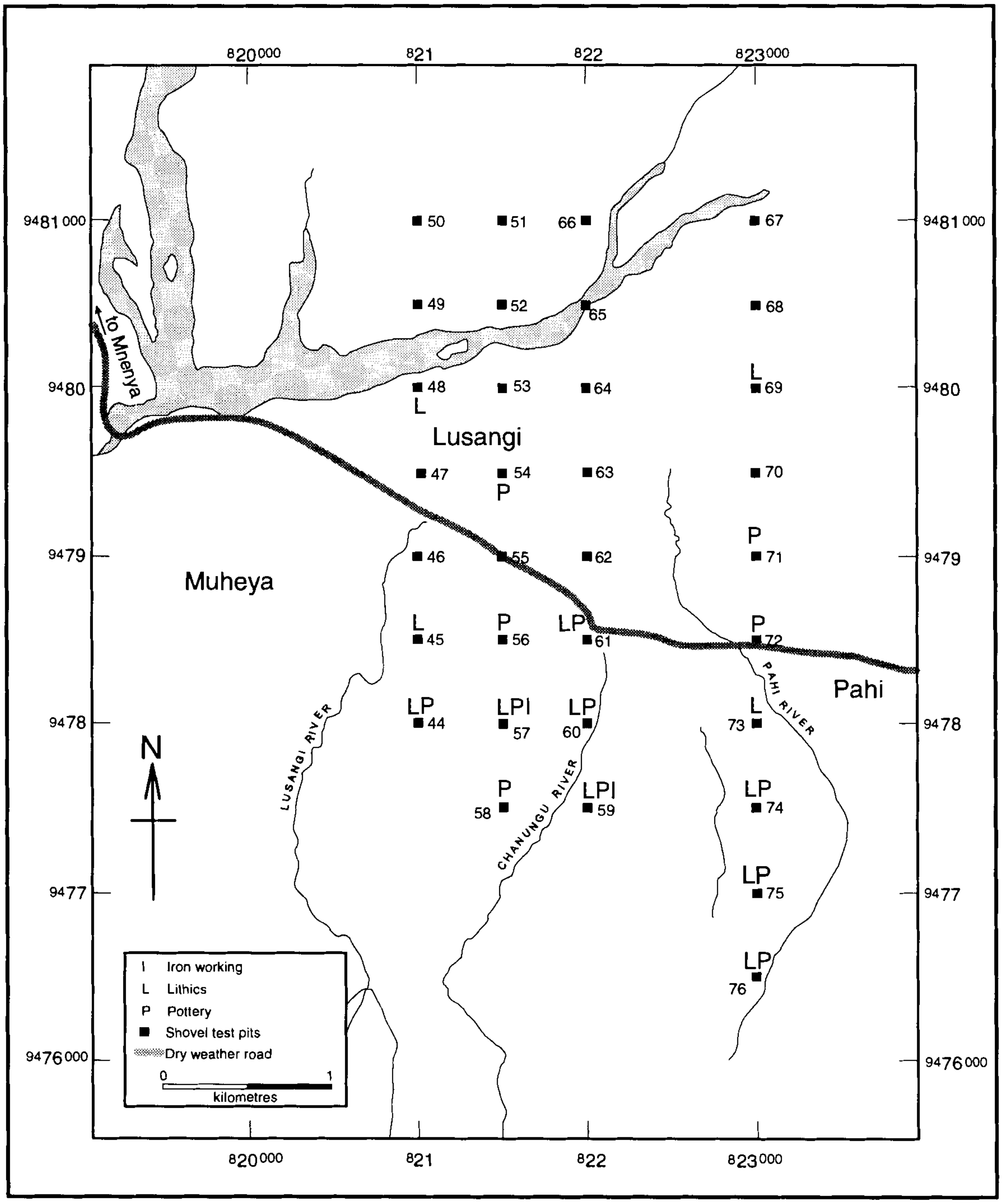


Figure 5.2. Distribution of STPs and types of cultural materials recovered in Lusangi

Table 5.8. Lusangi hillslopes STPs results

STP	Maximum Depth (cm)	Depth (cm) for artifacts	Excavated artifacts	Surface collected artifacts: (40,000 m^2 per STP)
44	55	20-40	P, M	P, L
59	55	22-25	P	P, L, T
60	60	49-60	L	P, L
74	60	45-60	P, L	-
75	60	30	P, L	P, L, B
76	65	-	-	P, L

P = Pottery, T = Tuyere, L = Lithics, M = Metal button, B = Bone

Table 5.9. Lusangi flat-lying areas STPs results

STP	Maximum Depth (cm)	Depth (cm) for artifacts	Excavated artifacts	Surface collected artifacts: (40,000 m^2 per STP)
45	50	-	-	L
46	50	-	-	-
47	55	-	-	-
48	60	-	-	L
49	50	-	-	-
50	50	-	-	-
51	50	-	-	-
52	50	-	-	-
53	50	-	-	-
54	50	-	-	P
55	50	-	-	-
56	50	-	-	P
57	50	10-30	P	S, P, L, B
58	50	-	-	P
61	63	30-63	L	P
62	55	-	-	-
63	-	-	-	-
64	65	-	-	-
65	50	-	-	-
66	50	-	-	-
67	65	-	-	-
68	50	-	-	-
69	60	-	-	L
70	60	-	-	-
71	50	-	-	P
72	50	30-40	P	-
73	60	40-60	L	L

S = Slag, P = Pottery, T = Tuyere, L = Lithics, B = Bone

Table 5.10. Site recovery frequency comparison between Baura and Lusangi

Survey area	Total covered area in sq. km²	STPs with artifacts	STPs with no artifacts	**Total**
Baura	9.5	32 (74.4%)	11 (25.6%)	**43**
Lusangi	8	17 (51.5%)	16 (48.5%)	**33**

Table 5.11. Lusangi survey results: summary

Level	Hillslopes	Flat-lying areas	**Total STPs**
Surface (STPs with exclusively surface finds)	1 (3.0%)	7 (21.2%)	8 (24.2%)
Subsurface	5 (15.2%)	4 (12.1%)	9 (27.3%)
Subtotal	**6 (18.2%)**	**11 (33.3%)**	**17 (51.5%)**
No artifacts	0 (0.0%)	16 (48.5%)	16 (48.5%)
Total	**6 (18.2%)**	**27 (81.8%)**	**33 (100.0%)**

Table 5.12. Artifact occurrences by level in STPs at Lusangi (based on 33 excavated STPs)

Level (cms)	Pottery (number of STPs)	Daub (number of STPs)	Iron-working evidence (number of STPs)	Lithics (number of STPs)
Surface	11 (33.3%)	-	2(6.1%)	10 (30.3%)
0-5	-	-	-	-
6-10	1 (3.0%)	-	-	-
11-15	1 (3.0%)	-	-	-
16-20	2 (6.0%)	-	-	-
21-25	3 (9.1%)	-	-	-
26-30	5 (15.2%)	-	-	2 (6.0%)
31-35	3 (9.1%)	-	-	1 (3.0%)
36-40	3 (9.1%)	-	-	2 (6.0%)
41-45	1 (3.0%)	-	-	3 (9.1%)
46-50	1 (3.0%)	-	-	4 (12.1%)
51-55	1 (3.0%)	-	-	4 (12.1%)
56-60	1 (3.0%)	-	-	4 (12.1%)
61-65	-	-	-	1 (3.0%)

recovered along survey transects and all were selected for later excavation (Lusangi 1 and Markasi Lusangi 2, Figure 4.4). Based on the large quantity and extent of iron slag scatters and tuyere fragments, Markasi Lusangi site 2 represents a significant iron-producing area.

Table 5.13. Frequency of subsurface and surface occurrences at Lusangi (based on 33 excavated STPs)

Level	Pottery	Daub	Iron-working evidence	Lithics
Total STPs where evidence is found	13 (39.4%)	0	2 (6.1%)	12 (36.4%)
STPs with surface evidence	11 (33.3%)	0	2 (6.1%)	10 (30.3%)
STPs with subsurface evidence	6 (18.2%)	0	0	5 (15.2%)

* An STP may be entered twice if an artifact is found on both surface and subsurface. For example, 4 STPs have both surface and subsurface pottery.

Table 5.14. Lusangi: STPs artifact composition: summary

Type of artifact	Lithic artifacts	Exclusively lithic artifacts	Pottery artifacts	Exclusively Pottery artifacts	Evidence for iron-working	Exclusively evidence for iron-working
STPs	12 (36.4%)	3 (9.1%)	13 (39.4%)	5 (15.1%)	2 (6.1%)	0 (0.0%)

Lithic artifacts were recovered at 12 (36.4%) STP locations, three (9.1%) of which consisted of exclusively lithic artifacts (Tables 5.13 and 5.14). Several areas of lithic scatters were noted in the survey transects, for example, a workshop was documented between STP 75 and 76 (Figure 5.2). Quartz is locally available in most areas of Lusangi.

Ceramic artifacts were found in 13 (39.4%) STP locations, five (15.1%) of which produced only ceramic remains (Tables 5.13 and 5.14). Similar to Baura, pottery is the most widely distributed artifact at Lusangi. Again, as was the case of Baura the fact that only a few sites yielded exclusively lithic or pottery artifacts (Table 5.14) indicates that both LSA and IA people tended to locate their habitation sites in similar areas.

Similar to Baura, IA artifacts occur in association with LSA remains in upper levels at Lusangi (Table 5.12). However the stratigraphic break between the LSA and IA assemblages in the upper and lower sequences is less clear in the Lusangi survey area probably because of the limited number of STPs which produced artifacts. STP 74 produced evidence for associated IA and LSA artifacts below 45 cm (Table 5.8), which is below the normal depth recorded for IA artifacts at Baura STPs. A clearer indication of the stratigraphic relationship between the LSA and IA is demonstrated by the excavations conducted at Lusangi and Markasi Lusangi where most units yielded a mixture of LSA and IA artifacts in the upper sequences while the lower levels produced exclusively LSA assemblages (results discussed below).

Hillslope STPs

At Lusangi a higher frequency of sites occur on hillslopes rather than flat-lying areas (Tables 5.11). All six (18.2%) hillslope STPs produced both pottery and lithic artifacts with STP 59 producing the only evidence of iron-working (Table 5.8). Also most of these STPs produced both subsurface and surface cultural materials (Table 5.11). Observations made during the survey (*i.e.*, including sites that are not from STP locations) indicate that most iron-working sites at Lusangi were located on hillslopes. Also the majority of hillslope sites extended beyond the STP survey limit and had higher surface concentration of artifacts than flat-lying area STPs.

Flat-lying STPs

A total of 27 (81.8%) STP locations were located on flat-lying areas and of these 16 (48.5%) did not produce artifacts while 11 (33.3%) yielded cultural materials (Table 5.11). Six (18.2%) STPs yielded pottery and 4 (12.1%) of these produced exclusively pottery artifacts. Six (18.2%) STP locations produced evidence for lithic artifacts and 4

(12.1%) of these yielded exclusively lithic artifacts while 2 (6.0%) produced a mixture of lithics, pottery, slag and bone. The fact that all hillslope STPs yielded artifacts while the majority in the flat-lying areas did not indicates that the hillslope areas were more preferred for settlement than the flat-lying areas. In contrast, most recent settlements are located on the flat-lying areas.

It is not known why most sites at Lusangi occur along the hillslopes. This may be related to the availability of rock-shelters on hillslopes and their absence in flat-lying areas. Apart from the use of the rock-shelters as home bases, most rock-shelters provided platforms for watching game on the plains to the north.

The probability that Lusangi hillslope STPs produced subsurface artifacts is 1:1.2, while that of the flat-lying area STPs is 1:6.8 (Table 5.15). This demonstrates that there is a higher chance for hillslope STPs to produce subsurface remains than flat-lying areas. In addition most sites with highly dense and extensive artifact scatters are located on the hillslopes. This pattern is in contrast with Baura where most sites with high artifact concentrations were located on flat-lying areas. Moreover sites occurred at higher

Table 5.15. Lusangi: artifact predictability

Level	Hillslope STPs: (n = 6)	Probability	Flat-Lying area STPs: (n = 27)	Probability of:	**Total STPs** (n = 33)	General probability
Exclusively Surface artifacts	1	1:6.0	7	1:3.9	8	1:4.1
Subsurface artifacts	5	1:1.2	4	1:6.8	9	1:3.7
No artifacts	0	0	16	1:1.7	16	1:2.1

frequencies on Lusangi hillslopes while at Baura larger numbers of sites were found in flat-lying areas (Tables 5.16 and 5.17). From these observations it can be concluded that hillslopes were preferred locations for site placement at Lusangi while flat-lying areas were favoured at Baura. As stated previously the presence of rock-shelters on Lusangi hillslopes is the likely factor that contributed to differences in site distributions between the two areas.

Table 5.16. Baura: site predictability between flat-lying areas and hillslopes

Type of landscape	Artifact bearing STPs	Non-artifact bearing STPs	Total STPs	Probability for a site occurrence	Probability for no site occurrence
Hillslopes	3	4	7	42.9%	57.1%
Flat-Lying Areas	29	7	36	80.6%	19.4%

Table 5.17. Lusangi: site predictability between flat-lying areas and hillslopes

Type of landscape	Artifact bearing STPs	Non-artifact bearing STPs	Total STPs	Probability for a site	Probability for no site
Hillslopes	6	0	6	100.0%	0
Flat-Lying Areas	11	16	27	40.7%	59.3%

Summary

A total of 76 STPs were completed during the entire survey. Forty three STPs were located in Baura, 36 of which were in flay-lying areas and 7 on hillslopes. Thirty two (74.4%) of the Baura STPs yielded artifacts while 11 (25.6%) produced no cultural remains (Table 5.3). Lithics were recovered in 26 STPs (60.5%), while pottery occurred in 30 (69.8%) locations and iron-working remains in 9 (21.0%) (Table 5.5). Most of the sites at Baura yielded both LSA lithics and IA pottery (Figure 5.1). Thirty three STPs were completed in Lusangi, 27 of which were located in flat-lying areas and 6 on hillslopes (Table 5.11). Seventeen sites (51.5%) yielded artifacts while 16 (48.5%) did not produce artifacts. Lithics were recovered in 12 (36.4%) STPs, while pottery occurred in 13 (39.4%) locations and iron-working remains in 2 (6.1%) (Table 5.14). As was the case at Baura, most sites yielded both lithics and pottery (Figure 5.2)

The stratigraphic position of cultural materials documented in the STPs at the Baura and Lusangi survey areas provided a preliminary chronological sequence of artifacts that can be tested through more extensive excavations. For example pottery, slag and tuyeres are generally obtained at levels between 0 - 45 cm which overlie deposits of exclusively lithic remains. In a few cases, pottery and slag were found at depths greater than 45 cm in some STPs, but always in small amounts. Lithic artifacts assignable to LSA were evident throughout the entire sequence at many STPs. Most sites with a high density of cultural materials at Baura were located on flat-lying areas while at Lusangi they tended to be concentrated along the hillslopes (Tables 5.16 and 5.17). The Lusangi landscape consists of many rock-shelters with cultural remains while Baura landscape lack these important features.

The overall distribution patterns of cultural materials at Baura and Lusangi survey areas suggests that LSA and IA peoples selected similar locations for habitation. Of the 43 STPs excavated at Baura only 2 (4.7%) produced exclusively lithic artifacts, while 3 (7%) produced exclusively pottery artifacts (Table 5.5). Similarly, of the 33 STPs at Lusangi only 3 (9.1%) produced exclusively lithic artifacts, while 5 (15.1%) STPs produced exclusively pottery artifacts (Table 5.14). Many STPs yielded assemblages where lithic and iron technologies were clearly associated.

5.3. Excavation Results

5.3.1. Baura

Baura 1

Baura 1 is located 1.8 km southwest of Baura village at 1584 m asl (Figure 4.3). It covers about 0.25 km², and is bisected by the Chivi/Gongo River. One portion falls on the southern side of the river, towards Kulua village while the other section falls to the north between the Nyamala and Chivi/Gongo Rivers (see Figure 5.3). In general the area is flat-lying cultivated land.

The area was selected for excavation for several reasons. First, during survey, extensive surface scatters of lithic artifacts, iron slag and pottery were identified. The archaeological potential was further revealed by the Chivi/Gongo River which exposed LSA lithic artifacts in strata over 90 cm below the surface. Moreover the presence of IA as well as LSA remains meant that the site had good potential for the study of the relationship between these two industries. Secondly, the site is located near a permanent water source which is the only place in the village with surface running water available during the dry season. The presence of permanent water would make this location attractive for settlement. In the past this locality would have also provided water for wild animals and as such it could have been a favoured hunting location. Four units were excavated at Baura 1.

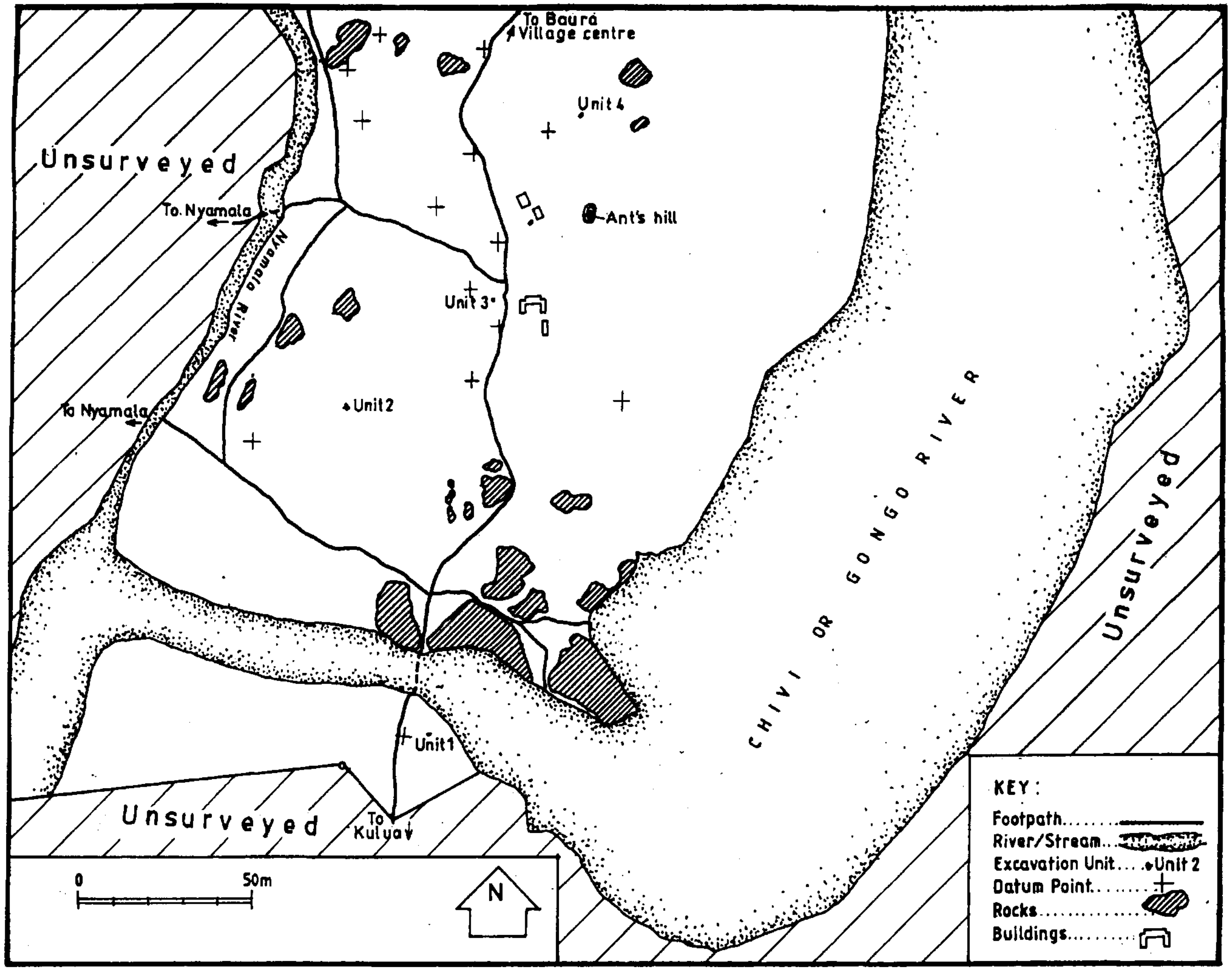


Figure 5.3. Baura 1: Location of excavated units

Unit 1

Unit 1 is located approximately 6m south of the Chivi/Gongo River gorge (Figure 5.3). The adjacent area had been subjected to cultivation as abandoned plots were present. The unit was 1 x 2 m and was excavated in 5 arbitrary levels to 116 cm bd (Table 5.18). Level 1 was 10 cm thick while Levels 2, 3 and 4 were each 20 cm and Level 5 was 46 cm.

Litho-stratigraphy

The stratigraphic profile of Unit 1 consists of three discrete layers illustrated in Figure 5.4. The types, amount, and weights of the recovered cultural materials are described in Table 5.18. Because the area is gently sloping, Layer 1 was 7 – 10 cm thick and ends at 16 cm below surface. It was composed of loose dark reddish brown sandy clay loam and yielded one IA pottery sherd and a few LSA lithic artifacts. While Layer 1 yielded a mixture of IA pottery and LSA artifacts, Layers 2 and 3 produced exclusively LSA artifacts. Layer 2 was 18 - 38 cm thick and was comprised of moderately loose reddish brown sandy clay, while Layer 3 was 45-75 cm thick and characterized by compacted reddish brown sandy clay which required the use of a pick during excavations. The base of Layer 3 was comprised of protruding rocks which made the bottom surface uneven. For example, the deepest portion of the trench at the centre was 110 cm, while the western wall was 116 cm below datum (bd).

Table 5.18 Baura 1 Unit 1: summary of excavated finds in arbitrary levels

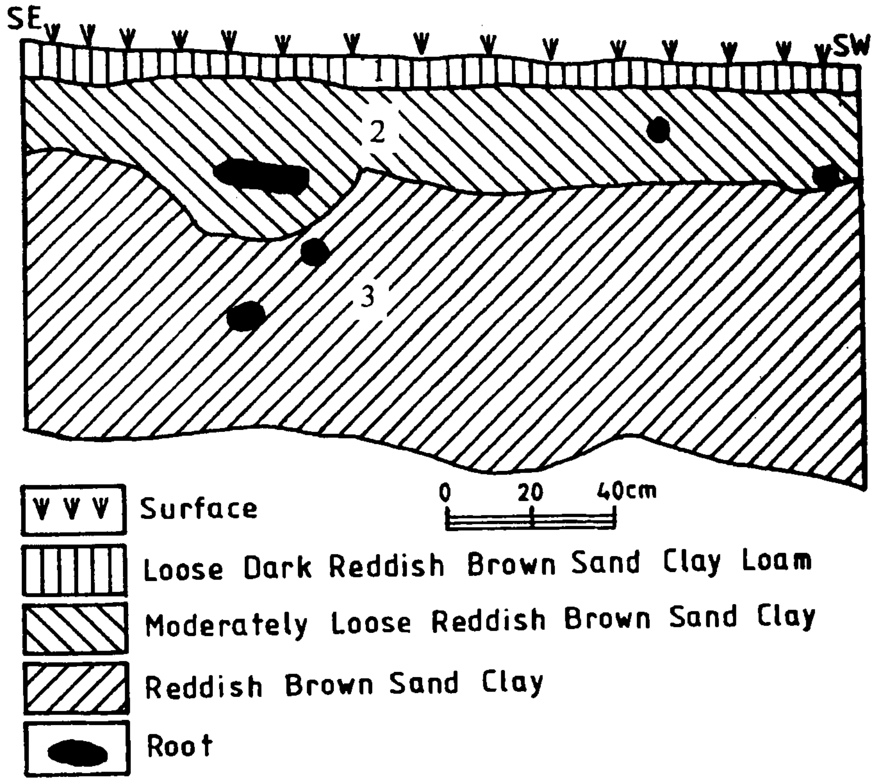
Lithic artifacts	Level						
	1	2	3	4	5	**Total**	%
Tools	1				74	**75**	2.2
Cores	4	9	3	2	501	**519**	15.5
Flakes/ blades	8	11	8	3	1139	**1169**	35.0
Angular fragments					(518.5) 1580	**(518.5) 1580**	47.3
Non-flaked stones				1		**1**	< 0.1
Total	**13**	**20**	**11**	**6**	**3294**	**3344**	**100.0**
%	0.4	0.6	0.3	0.2	98.5	**100.0**	
Non-lithic artifacts							
Pottery	1					1	

*numbers in parenthesis are weight in grams

Unit 1 Cultural Assemblages and Dating

Table 5.18 shows a distinct pattern in the distribution of the artifacts in Unit 1. Lithics form the major component of the recovered materials in all levels except Level 1 where a single potsherd was recovered. Since this assemblage is almost all lithics in content, it is interpreted as a single discrete LSA component. Although a significant quantity of lithics (3344) was recovered from Unit 1 (Table 5.18), they were unevenly distributed in the profile. Upper Levels 1 - 4 (Layer 1 and 2) yielded a very small number of lithic artifacts while almost 99% (3294) of lithics were recovered from the bottom 46 cm of Level 5 (Layer 3) alone. The lithic assemblage was dominated by angular fragments, all of which were recovered from Level 5.

Figure 5.4. Baura 1 Unit 1: Southern wall profile



A single charcoal sample was collected from Layer 3 (Level 5) in association with LSA materials at 83 cm below surface. A date of 2500 ± 40 BP (Beta 176185) calibrated to BC 620 (790 - 420 BC) was obtained (Table 5.19). Of all charcoal samples collected during research this is the only one obtained for a pure LSA horizon (Table 5.18). This date falls well within ranges for LSA in central Tanzania where the majority of LSA deposits date to between 1000 and 3500 BP (Masao 1979:210).

Table 5.19. Summary of C14 dates from Baura

Sample No.	Site, Unit and Level (Depth)	Associated Finds	Conventional Radiocarbon Age	Calibrated (BC & AD) Dates, 2 Sigma, 95% Probability
Beta 176185 (AMS)	Baura 1, Unit 1, Level 5 (83cm)	Lithics	2500 ±40 BP	790-420 BC
Beta 176184 (AMS)	Baura 1, Unit 2, Level 3 (39cm)	Lithics, Daub	460 ±40 BP	1410-1480 AD
Beta 176192 (Radiometric)	Baura 2, Unit 1, Level 5 (50cm)	Lithic, Slag, Tuyere	120 ±50 BP	1660-1950 AD
Beta 176191 (AMS)	Baura 3, Unit 1, Level 1 (10cm)	Lithics, Pottery, Slag, Tuyere, Bone, Land Snail Shell	140 ±50 BP	1660-1950 AD

Unit 2

Unit 2 was located on a farm 98 m northwest of Unit 1 between the Nyamala and Chivi/Gongo Rivers (Figure 5.3, see also Plate 5.1). The vicinity consists of surface scatters of lithic artifacts and pottery. Unit 2 was initially laid out as 1 x 2 m, but later was extended to 6 m² when a notable change in matrix texture was encountered. Excavation was carried out in 10 cm arbitrary levels, except for Level 2 and 5 which were 20 and 5 cm respectively. The maximum depth of Unit 2 was 55 cm below surface.

Litho-stratigraphy

Unit 2 consisted of 5 discrete layers, including a feature and an ant hole disturbance (see Figure 5.5). The types, amounts and weights of the recovered artifacts

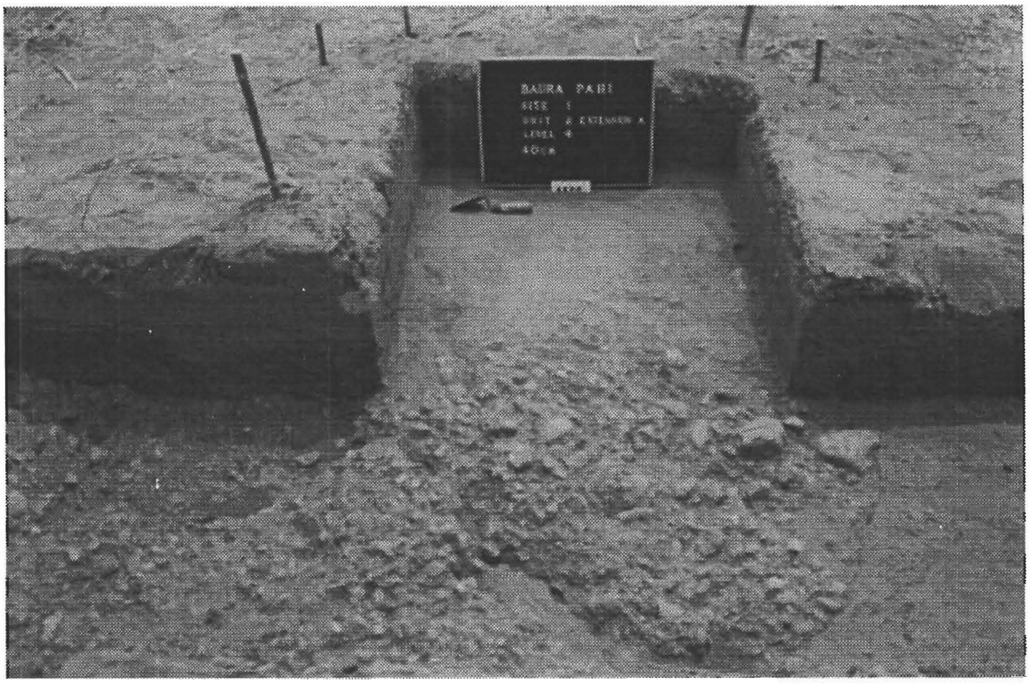


Plate 5.1. A view of an eastern section of Baura 1 Unit 2 (top of Layer 5, "40" cm bd.). Note the gravel which was associated with many lithic artifacts

are described in Table 5.20. A few lithic artifacts were collected at the surface. Layer 1 was 3 – 13 cm thick and ends 19 cm below surface at the western part of the unit. This layer was comprised of very loose grey brown sandy clay and yielded IA pottery, LSA lithic artifacts and bones. Layer 2 was 3 – 21 cm thick and consisted of moderately loose grey brown sandy clay. Materials recovered included IA pottery, LSA lithic artifacts, bones, land snail shells and red ochre. Layer 3 was 8 – 26 cm thick and was comprised of compacted brown sandy clay with gravel. Recovered materials included LSA lithic artifacts and daub. There was a dramatic increase in lithic artifacts in Layers 4 and 5. Layer 4 was 11 - 25 cm thick and consisted of compacted dark brown sandy clay with gravels. This layer covers mostly the southwestern area of Unit 2 and it is absent in the northeast. Materials recovered from Layer 4 included IA pottery and LSA lithic artifacts.

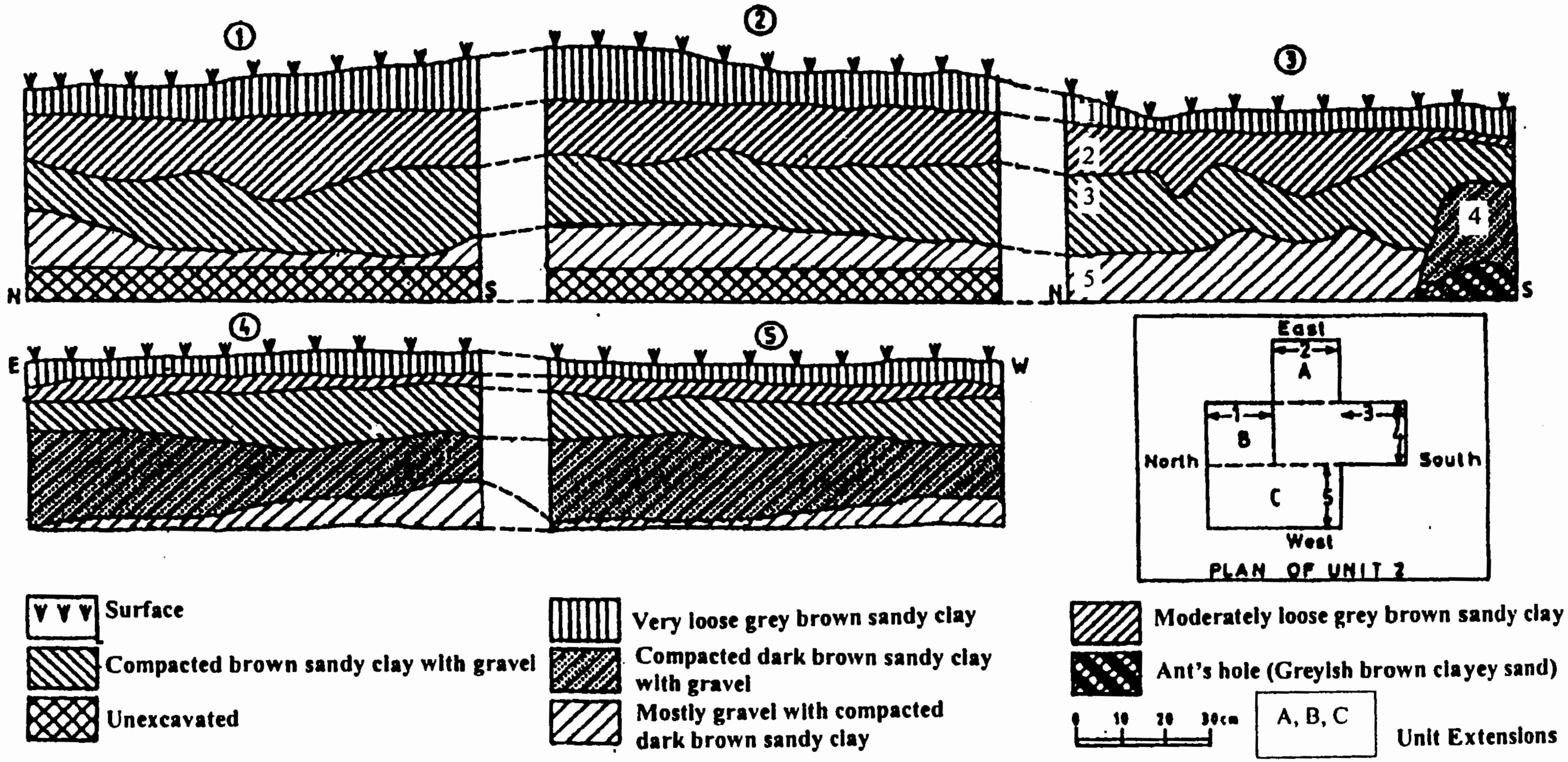


Figure 5.5. Baura 1 Unit 2: profiles

Table 5.20. Baura 1 Unit 2: summary of excavated finds in arbitrary levels

Lithic artifacts	Level								
	Surface	1	2	3	4	Feature 1	5	**Total**	%
Tools		11	27	37	44		23	**142**	2.8
Cores	10	65	108	153	119	4	50	**509**	10.2
Flakes/blades	5	127	159	230	275		75	**871**	17.5
Angular fragments		(98) 430	(66) 251	(372) 1348	(286) 1249	(0.5) 4	(37) 181	**(859.5) 3463**	69.5
Non-flaked stones									
Total	**15**	**633**	**545**	**1768**	**1687**	**8**	**329**	**4985**	**100.0**
%	0.3	12.7	10.9	35.5	33.8	0.2	6.6	**100.0**	
Non-lithic artifacts									
Pottery		25	28		2			**55**	
Bone		4	8					**12**	
Land snail shell			6					**6**	
Red ochre			2					**2**	
Daub				8				**8**	

*numbers in parenthesis are weight in grams

Below Layer 4 on the southern corner of the Unit was a small oval shaped ant hole which was 23 cm in diameter and 9 cm deep. The ant hole was characterized by greyish brown clayey sand built walls with no artifacts. Also noted in Layer 4 was a small feature (Feature 1) which was excavated individually, and its materials bagged separately. Feature 1 was probably formed as a result of a profile crack that allowed soil from the upper layers to percolate downwards. It was made up of fine brown sandy clay soil without gravels and was 5-12 cm thick and 134 cm long. A small quantity of LSA lithic artifacts were recovered from Feature 1 (Table 5.20). Layer 5 was 11 – 17 cm thick and was mostly composed of gravels with compacted dark brown sand clay. An abrupt increase in gravel covering the whole of Unit 2 in this layer led us to assume that Layer 5 was a feature (Plate 5.1). Consequently a decision was made to extend the unit dimension to 6 m² to further expose the feature. However it was later found that Layer 5 was a natural layer covering an extensive part of the stratigraphy. Because of uniformity in soil texture, colour and recovered cultural materials it was later decided to limit the excavation to a 1 x 1 m section in southern part of Unit 2 as a representative sample. Although the upper parts of Layer 5 consisted of many artifacts, the lower section was sterile and the base rock was reached at 55 cm bd. Exclusively LSA lithic materials were recovered from this layer.

Unit 2 Cultural Assemblages and Dating

The summary of excavated finds in arbitrary levels as shown in Table 5.20 indicates a clear break in the sequence of artifacts into two distinct components. A component with a mixture of LSA lithic artifacts and IA pottery is prevalent in the upper sequences including Levels 1 – 4 (Layer 1 – upper Layer 5) while a component of exclusively LSA artifacts dominates the lower stratigraphy (Level 5 or lower Layer 5). The general trend in Unit 2 indicates that the quantity of LSA lithic artifacts increased downward with the highest frequency occurring in Level 3, 4 and 5 (Layer 3, 4 and 5). The number of lithic sub-assemblages such as tools, cores, flakes/blades and angular fragments also increased downward. Most IA pottery was obtained in the upper levels and decreased downward. Unfortunately most pottery did not have diagnostic features. Two small IA pottery specimens from Layer 2 consisted of features identical to category A Figure 6.13a (see Chapter 6). The daubs from Layer 3 possibly indicate a permanent structure was once erected in the site vicinity.

One charcoal sample was collected from Layer 3 (Level 3) at 39 cm below surface. A date of 460 ±40 BP (Beta 176184), calibrated to AD 1440 (AD 1410-1480) (Table 5.19) is consistent with either the upper ceramic bearing component or the break between the upper and lower LSA components. This date provides the earliest known evidence for IA pottery at Baura. As we shall see later this chronology will place the Baura pottery in LIA, a period suggested to have commenced around 1000 BP (Phillipson 1976:212, Huffman 1989:155-6)

Unit 3

Unit 3 was located 52 m northeast of Unit 2 and 7 m west of a farmhouse where a mosque is said to have stood in the past (Figure 5.3). The unit's dimension was 1 x 2 m. Surface scatters of lithic artifacts and pottery were observed in the vicinity, although no artifacts were obtained at the surface of the unit. Excavation was carried out down to 140 cm bd at an interval of 20 cm except for Level 1 and 4 which were 10 and 7 cm respectively.

Litho-stratigraphy

Unit 3 stratigraphy is illustrated in Figure 5.6 (see also Plate 5.2) and consisted of 6 discrete layers. It was a complex stratigraphy, consisting of features (Feature 1 and 3) as well as variations in soil texture within some levels. The amounts and types of recovered materials are shown in Table 5.21. Layer 1 was 16 – 24 cm thick and was comprised of dark brown sandy clay loam with charcoal fragments. The charcoal fragments were numerous in the top few cm of the profile and decreased downwards. They represent rubbish deposited by the nearby farmhouse occupants. Recovered materials include IA pottery, LSA lithic artifacts, bones, land snail shell, a piece of glass

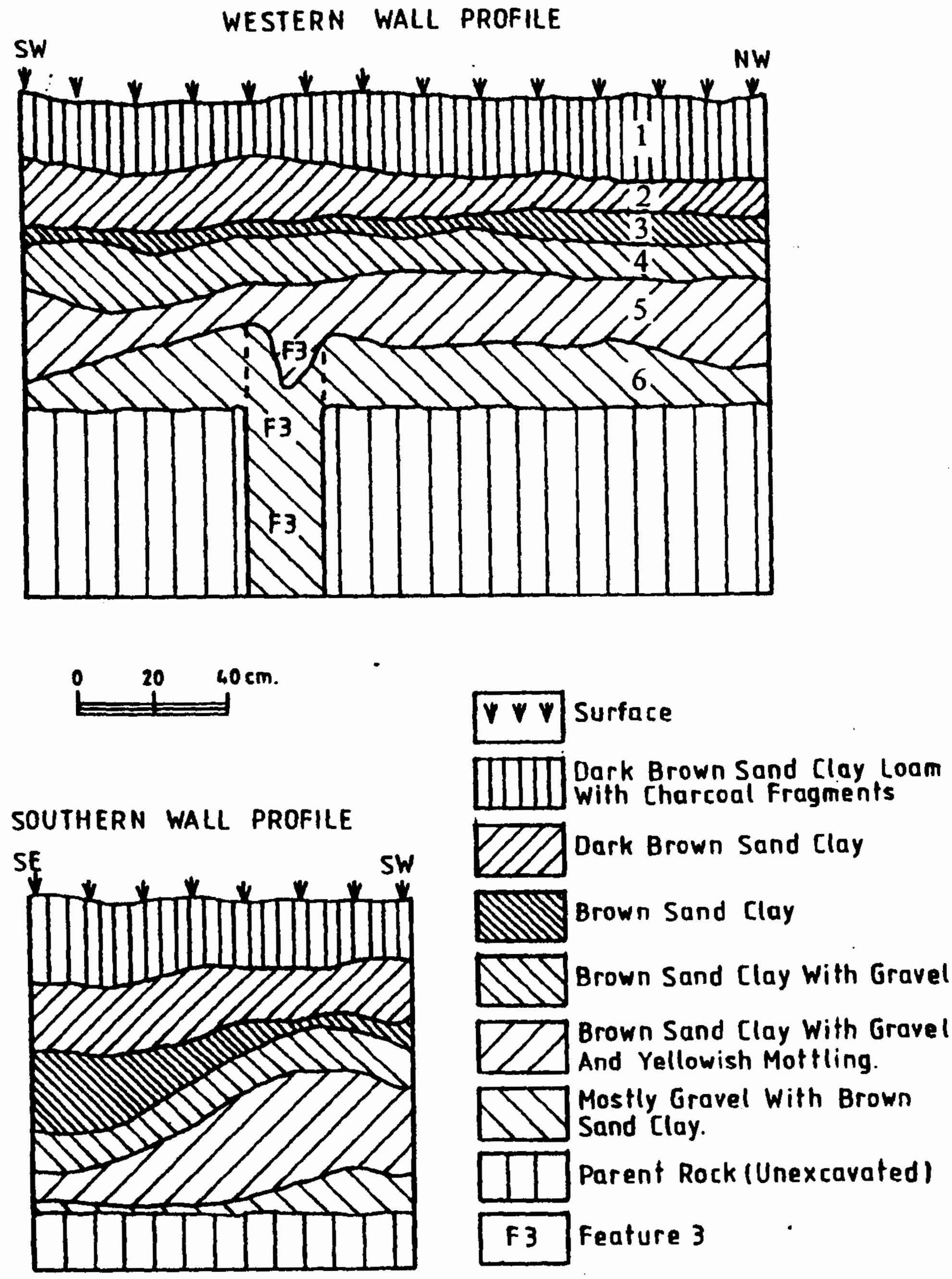


Figure 5.6. Baura 1 Unit 3: Wall profiles

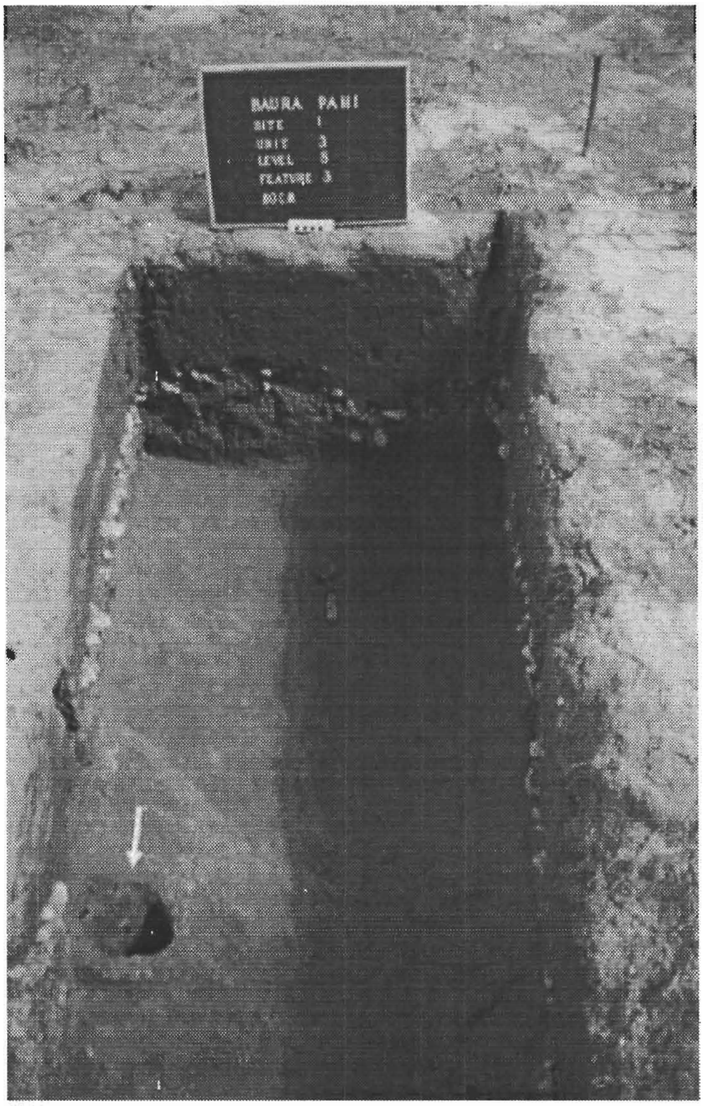


Plate 5.2. A view of Baura 1 Unit 3, Level 5, 60 cm bd. The arrow points at Feature 3

and glass bead. The glass bead and glass fragment were obtained between 14 - 17 cm bd and all are less than a century old. The mixture of these recent objects with LSA lithic artifacts and IA pottery was probably brought about by disturbance from cultivation activities or the mosque construction. Layer 2 was 8 – 18 cm thick and consisted of dark brown sandy clay. Layer 2 yielded IA pottery, LSA lithic artifacts, bones and land

Table 5.21. Baura 1 Unit 3: summary of excavated finds in arbitrary levels

Lithic artifacts	Level									
	1	2	3	4	4a	4b	Feature 3	5	**Total**	%
Tools	9	11	24	23	27	18		18	**130**	2.5
Cores	29	19	16	37	287	12		58	**458**	8.9
Flakes/ blades	54	74	57	107	387	65	2	116	**862**	16.7
Angular fragments	(89) 326	(185) 647	(76) 318	(57) 203	(847) 1886	(27) 105	(3) 11	(55) 216	**(1339) 3712**	71.9
Non-flaked stones			2						**2**	< 0.1
Total	**418**	**751**	**417**	**370**	**2587**	**200**	**13**	**408**	**5164**	**100.0**
%	8.1	14.5	8.1	7.2	50.1	3.9	0.2	7.9	**100.0**	
Non-lithic artifacts										
Pottery	38	73	12	1	2		2		**128**	
Slag			(30) 1						**(30) 1**	
Metal							11		**11**	
Bone		28	4						**32**	
Land snail shell		38							**38**	
Glass		1							**1**	
Glass bead		1							**1**	

*numbers in parenthesis are weight in grams

snail shell. Also embedded in Layer 2 at 28 cm below surface was a hearth designated as Feature 1.

Layer 3 was 2 – 22 cm thick and comprised of compacted brown sandy clay. This layer was complex and had soils of different textures. For example the southeast area of the unit had rocky compacted sand clay soil while loose less rocky sand clay soil was found in the northwest. As a result Layer 3 was divided into two arbitrary levels (Level 3 and 4). Recovered materials included IA potsherds, slag, bones and LSA lithic artifacts. Feature 1, which was located at the bottom of Layer 2 extended to Layer 3. It measured 0.09 m² in horizontal surface coverage and ended at 36 cm below surface. The main constituents of Feature 1 were ash and charcoal. No artifacts were recovered from Feature

1 but soil samples were taken for flotation which yielded no identifiable plant remains. Layer 4 was 8 - 18 cm thick and was composed of brown sandy clay with gravels while Layer 5 was 8 – 28 cm thick and consisted of brown sandy clay with gravels and yellow mottling. In addition, Feature 3, a wooden posthole, was observed at 56 cm bd (Figure 5.6, see also Plate 5.2). As was the case for Layer 3, Layer 4 and 5 consisted of different soil texture where the southeast area had compacted rocky sand clay while the northwest was composed of loose less rocky sand clay. Because of this soil texture layers were divided into two arbitrary levels, namely 4a and 4b where level 4a covered the southeast part of Unit 3 and level 4b the northwest. Layer 4 yielded two IA pottery and LSA lithic artifacts. This layer (in particular Level 4a) produced more lithic artifacts than any other layer (Table 5.21). Layer 5 yielded exclusively lithic artifacts. Layer 6 was 2-22 cm thick and was comprised of mostly gravel with brown sandy clay. This layer ended at 90 cm bd after reaching bedrock and excavation was stopped for most of Unit 3 except for Feature 3. Layer 6 produced exclusively LSA lithic artifacts. Feature 3 was 84 cm long and 20 cm in diameter and protruded into the parent rock (Figure 5.6). Recovered materials from the post hole fill include LSA lithics, IA pottery and iron fragments. This assemblage was re-deposited from upper layers when backfilling the post hole. Feature 3 may have been the result of construction of the mosque alleged to have been built in this area.

Unit 3 Cultural Assemblages

As was the case for Unit 2, Unit 3 stratigraphy shows a break in artifact sequences that divides the unit into two cultural components (see Table 5.21). A component with a mixture IA pottery and LSA lithics appears in Levels 1 – 4a (Layer 1 to upper 5) underlain by a component with exclusively LSA lithic artifacts in Levels 4b and 5 (lower Layer 4 to 6). The highest frequency of lithic artifacts were recovered at the LSA/IA cultural boundary observed at Level 4a (lower Layer 4 and upper 5, see Table 5.21). The increase in lithic production at the LSA/IA transition may be significant. Since this period is associated with IA pottery (a cultural attribute associated with permanent settlement), an increased frequency in site use may be the most likely explanation for escalation in lithic production at that time. A similar increase in lithic artifacts at LSA/IA transition is observed in most units excavated at Markasi Lusangi 2 (see Table 5.29, 5.30, 5.32). Such lithic sub-assemblages are dominated by angular fragments (Table 5.21). Most of the pottery was recovered from the upper levels and potsherds decreased downwards. Unfortunately most of the pottery consisted of non-diagnostic body sherds and therefore the unit could not be dated. Three decorated pottery fragments from Level 1 and 2 (Layer 1) belong to category A Figure 6.13a (Chapter 6).

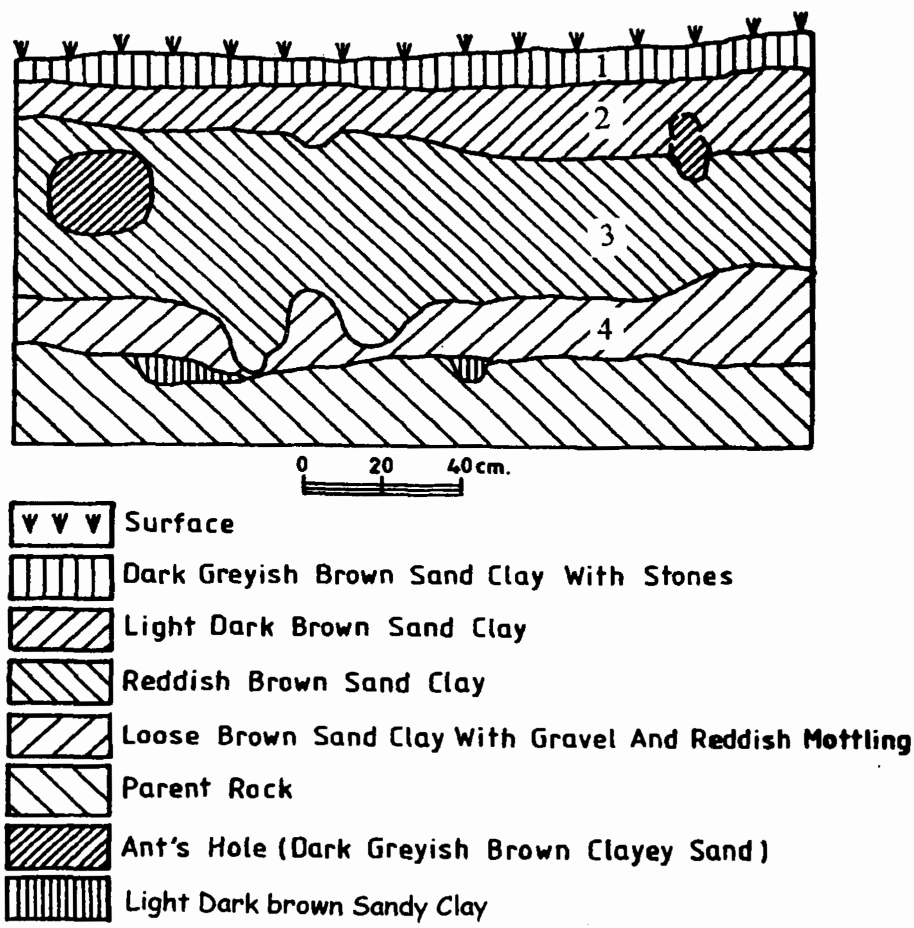
Unit 4

Unit 4 was located on cultivated land about 59 m northeast of Unit 3 and 28 m northeast of a residential compound (Figure 5.3). This unit was 1 x 2 m and was placed there following the discovery of surface scatters of iron slag, pottery and lithic artifacts. According to village informants the area was occupied by an ironsmith a long time ago. Excavation was carried out to 90 cm bd at an interval of 20 cm with exception of Level 1 which was 10 cm thick.

Litho-stratigraphy

The stratigraphy of Unit 4 is illustrated in Figure 5.7 and consists of 4 discrete layers and an ant hole disturbance. The types, amounts and weights of recovered materials are shown in Table 5.22. No cultural materials were recovered from the surface of the unit despite several surface scatters of artifacts in the surrounding vicinity. Layer 1 was 6 – 10 cm thick and was composed of dark greyish brown sandy clay with stones. Recovered materials include IA pottery, slag, metal and tuyere fragments. Layer 2

Figure 5.7. Baura 1 Unit 4: southeast wall profile



was 10- 20 cm thick and consisted of light dark brown sandy clay. An ant hole was found in the southern portion of the unit, but it contained no artifacts. This layer produced IA pottery, slag, metal and tuyere fragments. Layer 3 was 34 – 66 cm thick and was comprised of reddish brown sandy clay. There were two ant holes in the east and south corners of this layer, but no artifacts were found. Layer 3 yielded lithics, slag and tuyere fragments. Layer 4 was 3 – 23 cm thick and was composed of loose brown sandy clay with gravel and reddish mottling. Below this layer were two small pockets of light dark brown sandy clay containing no artifacts. Excavation ceased after encountering sterile parent rock in this level. Layer 4 yielded LSA lithic artifacts and slag.

Table 5.22. Baura 1 Unit 4: summary of excavated finds in arbitrary levels

Lithic artifacts	Level						
	1	2	3	4	5	**Total**	%
Tools			1	1	7	**9**	1.6
Cores			12	22	55	**89**	16.0
Flakes/ blades			28	48	93	**169**	30.2
Angular fragments			(6) 19	(12) 53	(50) 220	**(68) 292**	52.2
Non-flaked stones							
Total			**60**	**124**	**375**	**559**	**100.0**
%			10.7	22.2	67.1	**100.0**	
Non-lithic artifacts							
Pottery	9	15		1		**25**	
Slag	(618) 310	(516) 173	(75) 58	(11) 14	(5) 4	**(1225) 559**	
Metal	2	1				**3**	
Pieces of tuyere	1	2	1			**4**	

*numbers in parenthesis are weight in grams

Unit 4 Cultural Assemblages

The summary of the excavated finds in arbitrary levels as shown in Table 5.22 indicates two distinct components. A component with exclusively IA artifacts (pottery and iron-working remains) appears in Levels 1 and 2 (Layers 1 and 2) and is underlain by a component with a mixture of LSA lithics, pottery and iron-working remains in Levels 3, 4 and 5 (Layers 3 and 4). However this separation is not definitive because the amount of IA materials such as pottery and slag declines sharply after Level 2 leading to a suggestion that these artifacts are intrusive to lithic bearing Levels 4 and 5 (Layer 3 and 4). Ant disturbance may be one of the causes for intrusion of IA materials into lithic bearing levels but this remains tentative because ant nests are restricted to upper and middle levels (see Figure 5.7). The substantial number of slag and tuyere fragments in Unit 4 indicates that this area was definitely an iron-working site. Lithic artifacts tend to increase in number from the middle levels to the bottom of the Unit. Among the lithic sub-assemblages, angular fragments occur in higher frequencies while tools are the least frequent. This is the only unit with levels that produced a component bearing exclusively IA materials at Baura 1.

Summary of Baura 1

In the overall analysis, Baura 1 was occupied from the LSA to IA. Generally, Unit 1 represents a single discrete LSA component. Units 2 and 3 consist of two components in which the upper stratigraphic sequences represent a component with a mixture of LSA lithics and IA artifacts in the upper levels while the lower consists of solely LSA lithic artifacts. Consequently, Units 2 and 3 indicate that LSA lithic artifacts continued to be produced in significant quantities after the introduction of the IA tradition. Unit 4 produced smaller numbers of lithic artifacts than other units, however it had a substantial amount of slag and tuyeres which indicates that iron-working took place in the vicinity. There is no clear component break in Unit 4. As argued earlier the activity of ants could have caused movements of slag from the upper sequences to the lower LSA levels. However based on the artifact distribution detailed in Table 5.22, it can be tentatively concluded that the sequences at Unit 4 consists of two components, one of IA materials in upper levels and a second component with a mixture of IA and LSA lithic artifacts at middle and lower levels. Units 1, 2, 3 and 4 demonstrate low percentages of tools and cores compared to debitage (flakes/blades and angular fragments) suggesting that the areas were used as lithic workshops.

Unit 1 Level 5 is an exclusively LSA lithic component and dates to 2500 ±40 BP. Likewise the date of 460 ±40 BP from Level 3 Unit 2 dates a component with a mixture of LSA and IA materials. The presence of pottery below Level 3 (at Level 4) suggests that ceramics were at use at the site at least before 460 ±40 BP.

Baura 2

Baura 2 is located at the base of a hillslope about 1.2 km south of Baura village and 1.1 km northeast of Baura 1 (Figures 4.3 and 5.8). The site is about 1615 m asl and the vegetation is dominated by acacia shrub. Immediately to the north of the site is an exposed steep gully more than 140 m wide (Figure 5.8). This site was selected for test excavation because during survey several surface scatters of pottery and iron slag were observed. STP 16, which was located at the site revealed pottery, slag and tuyere fragments. In addition, the gully at the northern end of the site had many LSA lithic

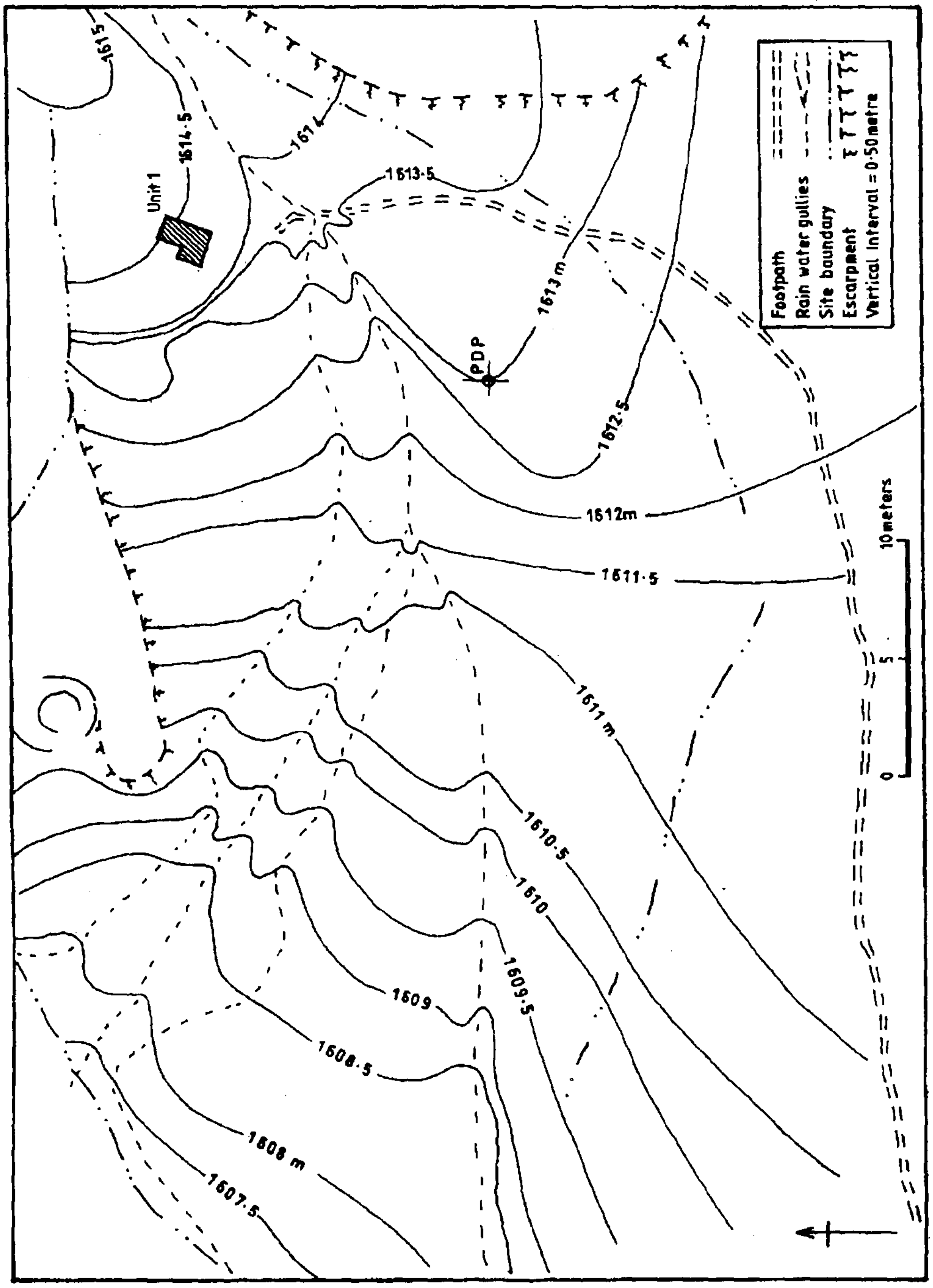


Figure 5.8. Baura 2 site map

artifacts exposed in erosional faces. The presence of slag and tuyere fragments meant that the site could provide evidence for iron smelting and its relationship to the LSA industry nearby.

Unit 1

Unit 1 was 2.33 m² in size (Figure 5.8) and was excavated in five 10 cm levels to a depth of 50 cm (Table 5.23). The location of a bowl furnace at 44 cm bd in Level 5 (Layer 4) led to division of the unit into two separate sections and the furnace was excavated separately as a feature.

Litho-stratigraphy

Unit 1 consisted of 4 discrete layers. The types, frequencies and weights of recovered materials are described in Table 5.23. Layer 1 was 8 – 10 cm thick and consisted of reddish brown sandy clay. Recovered materials included slag, tuyere

Table 5.23. Baura 2 Unit 1: summary of excavated finds

Lithic artifacts	Level							
	1	2	3	4	5	6 (inside furnace)	**Total**	%
Tools								
Cores								
Flakes					1		1	100.0
Angular fragments								
Non-flaked stones								
Total					**1**		**1**	**100.0**
Non-lithic artifacts								
Pottery		3	2				**5**	
Slag	(34) 17	(839) 154	(1681) 105	(3194) 111	(625) 70	(641) 202	**(7014) 659**	
Pieces of tuyere	12	11	9	45	4	1	**82**	
Bone	1						**1**	

*numbers in parenthesis are weight in grams

fragments and a bone fragment. Layer 2 was 10 – 12 cm thick and was comprised of orange reddish brown sandy clay soil. Recovered materials included IA pottery, slag and tuyere fragments. Layer 3 was 9 cm thick and was made up of compacted red brown sandy clay. Artifacts included IA pottery, slag and tuyere fragments. Layer 4 was 19 cm thick and was comprised of brownish red sandy clay. At 44 cm below datum a bowl furnace was recovered (Plate 5.3, see also Figure 5.9) and was excavated separately from Layer 4. Materials recovered from Layer 4 included slag, tuyere fragments and one flake. While Layer 4 ended at 50 cm bd, the furnace continued to 75.2 cm bd. The furnace had a maximum height of 31.2 cm (from top to the bottom of the ritual pit, see below), a diameter of 55-58 cm and width of 4 - 12 cm. A ritual pit is a small depression at the

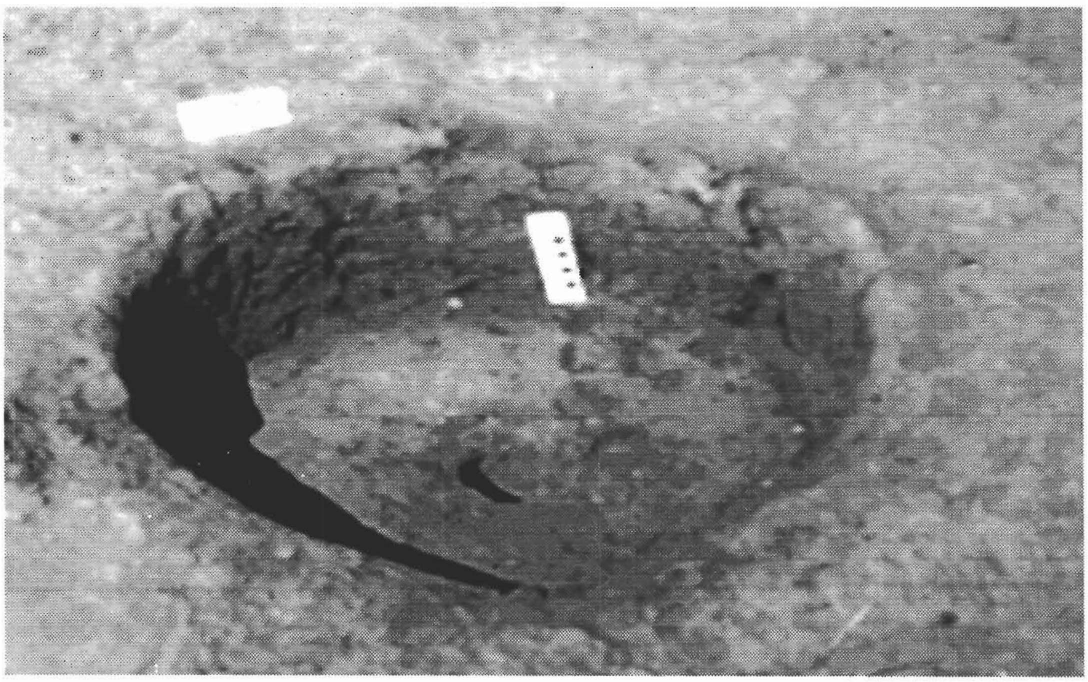


Plate 5.3. A view of the bowl furnace at Baura 2 Unit 1. Note the ritual pit at the centre

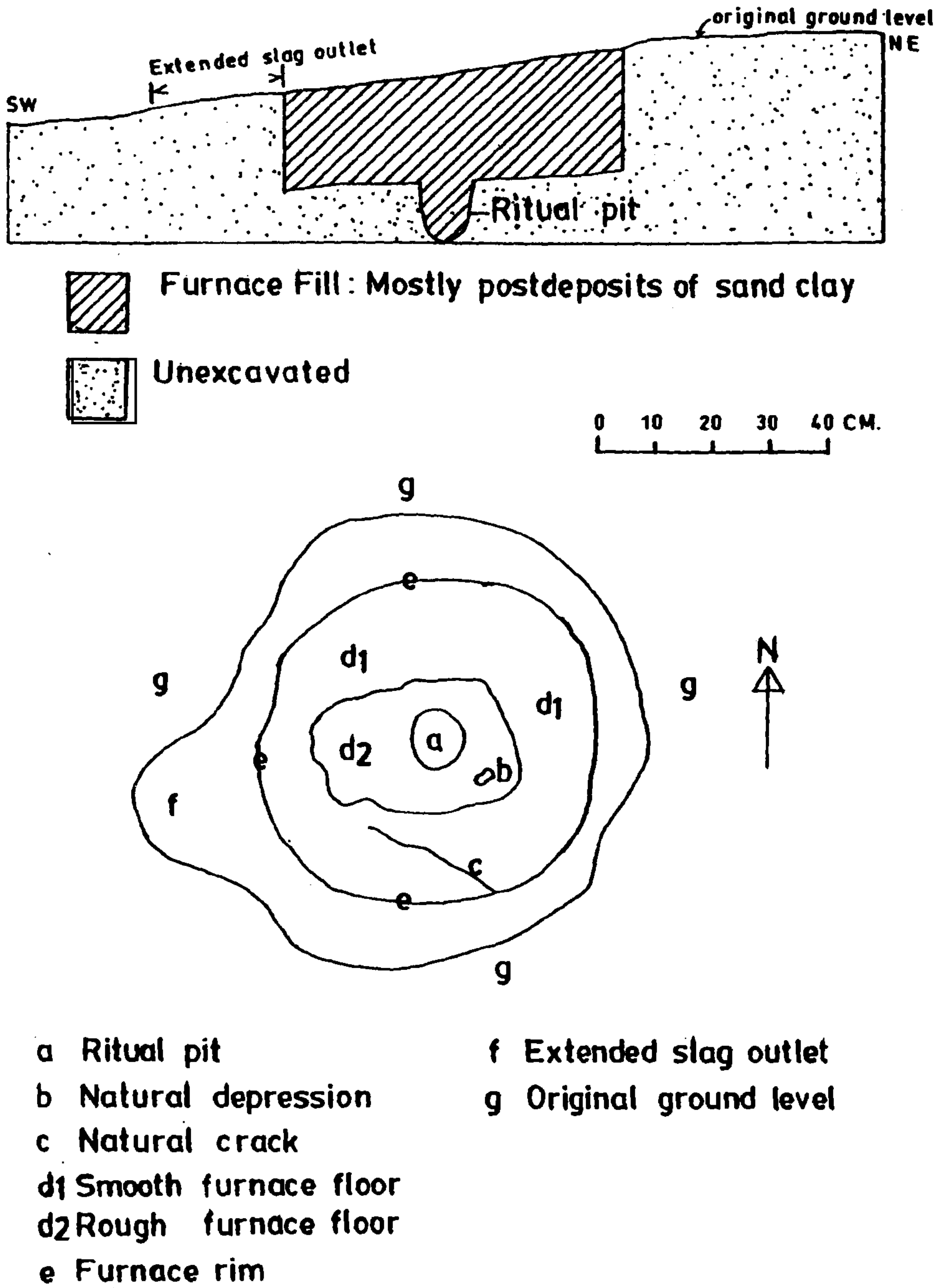


Figure 5.9. The furnace at Baura 2 Unit 1: Above, vertical furnace cross-section. Below, horizontal furnace outline

central bottom of the furnace in which an offering is made to ensure a successful smelt and protect the smelting processes from those who will do it harm (Schmidt 1997:224). It had a diameter of 10 – 8 cm and a depth of 10cm. The soil from the furnace was brownish red/dark grey sandy clay with large quantities of charcoal. Materials recovered from the furnace included slag and a tuyere fragment.

Unit 1 Cultural Assemblages and Dating

The summary of arbitrary levels in Table 5.23 indicates that Unit 1 is dominated by iron-working remains of slag, tuyeres and a furnace, consequently it can be classified as an IA iron smelting area. One of the few pottery sherds recovered in Level 3 (Layer 3) had a decoration pattern resembling those of category A (Figure 6.13a). Most slag was recovered from Level 3 and 4 (Layer 3 and 4). Despite the presence of many lithic artifacts in the gully adjacent to the northern part of Unit 1, only one flake was recovered in Level 5 (Layer 4).

One charcoal sample (Lab. # Beta 176192) was colleted from Level 5 (Layer 4) near the furnace at 50cm bd. It was dated to 120 ±50 BP, calibrated to AD 1810 (AD 1660-1950) (Table 5.19). As we shall see this date is almost contemporary with that of the furnace at Baura 3 Unit 1.

Baura 3

Baura 3 is located at 1646 m asl, about 2.4 km northeast of Baura, 3.6 km north of Baura 2 and 0.27 km east of the Chivi (Gongo) River (Figures 4.3 and 5.10). The site was discovered during the Baura survey and is located between STP 39 and 40. The area is flat-lying and covered with acacia shrubs. Potsherds, slag scatters and part of a bowl

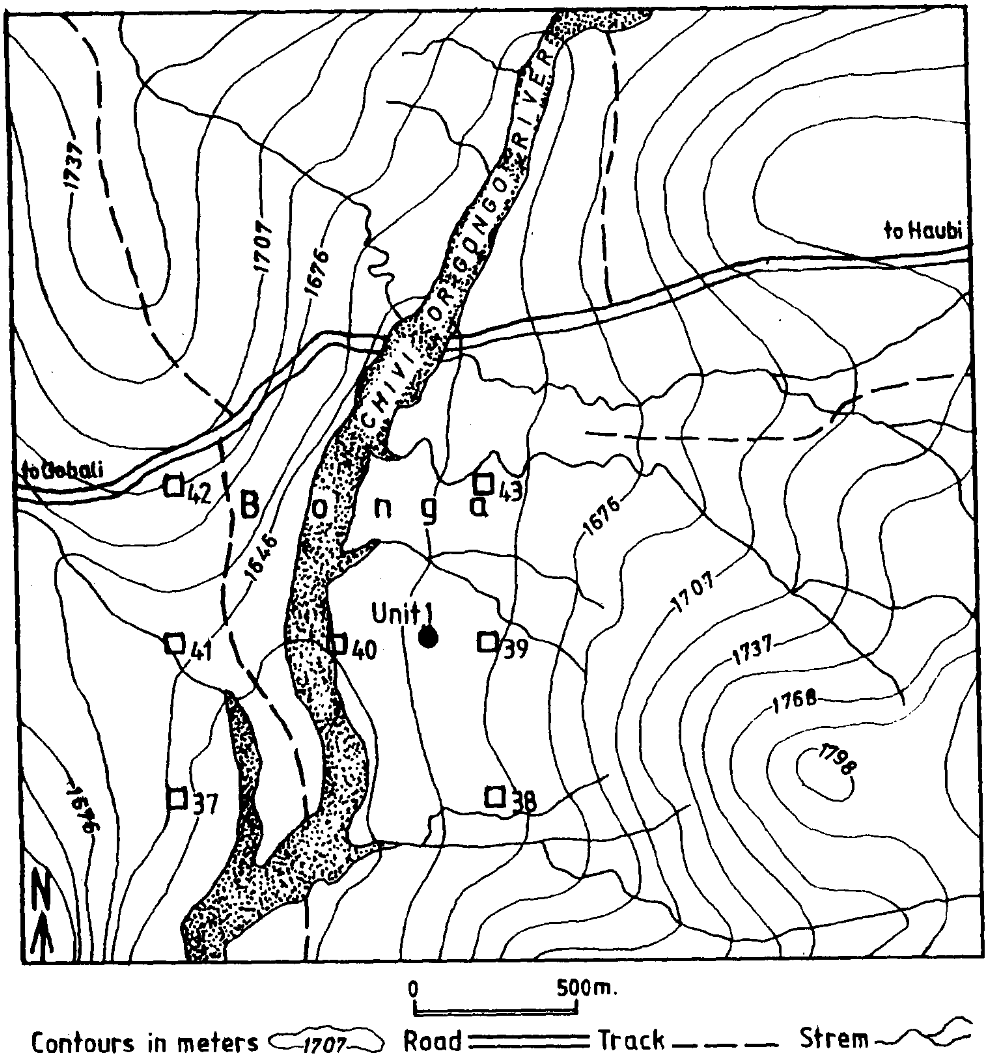


Figure 5.10. Location of Baura 3, Unit 1

furnace were visible at the surface (Plate 5.4, see also Figure 5.11). Compared to Baura 1 and 2, high concentrations of lithics were not found in the vicinity of Baura 3. This site was selected for excavation because of the presence of an iron furnace. In addition, it was concluded that the excavation of Baura 3 would increase the data base on IA industries for comparative purposes.

Unit 1

Unit 1 measured 1 x 2 m which was large enough to encompass the furnace (Plate 5.4). The excavation was divided into two sections: inside and outside the furnace. A total of four 10 cm levels were excavated outside the furnace while the inside was excavated in two levels of 5 and 8 cm respectively.

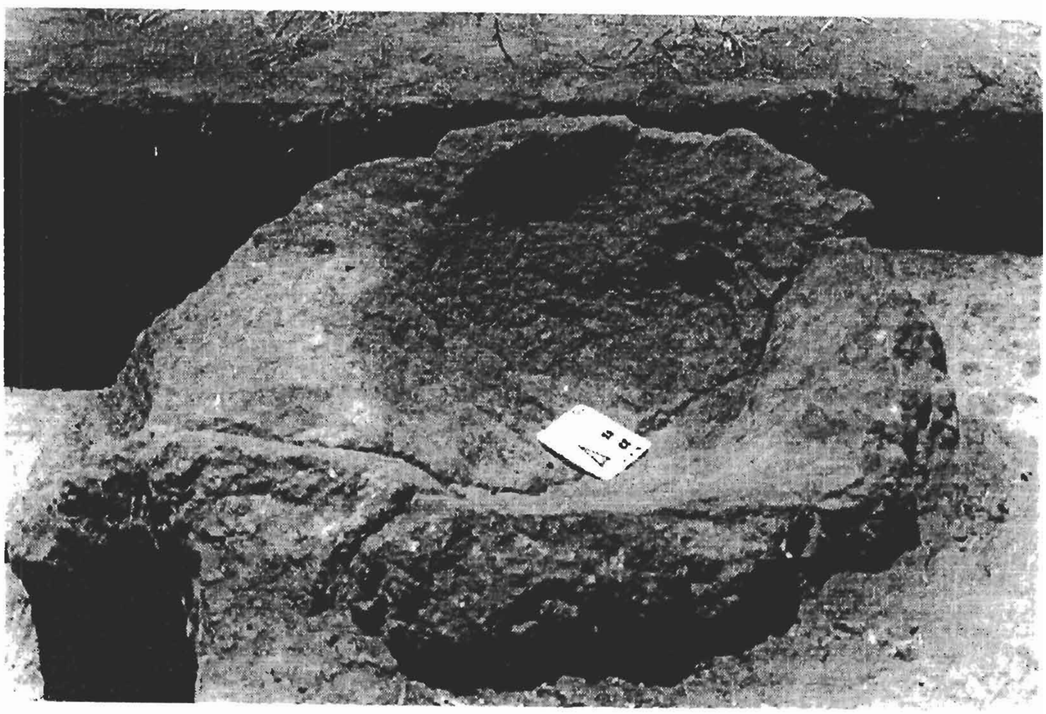


Plate 5.4. A view of the bowl furnace at Baura 3 Unit 1. Note the mud-built walls and contrast with the dugout pit bowl furnace in Plate 5.3

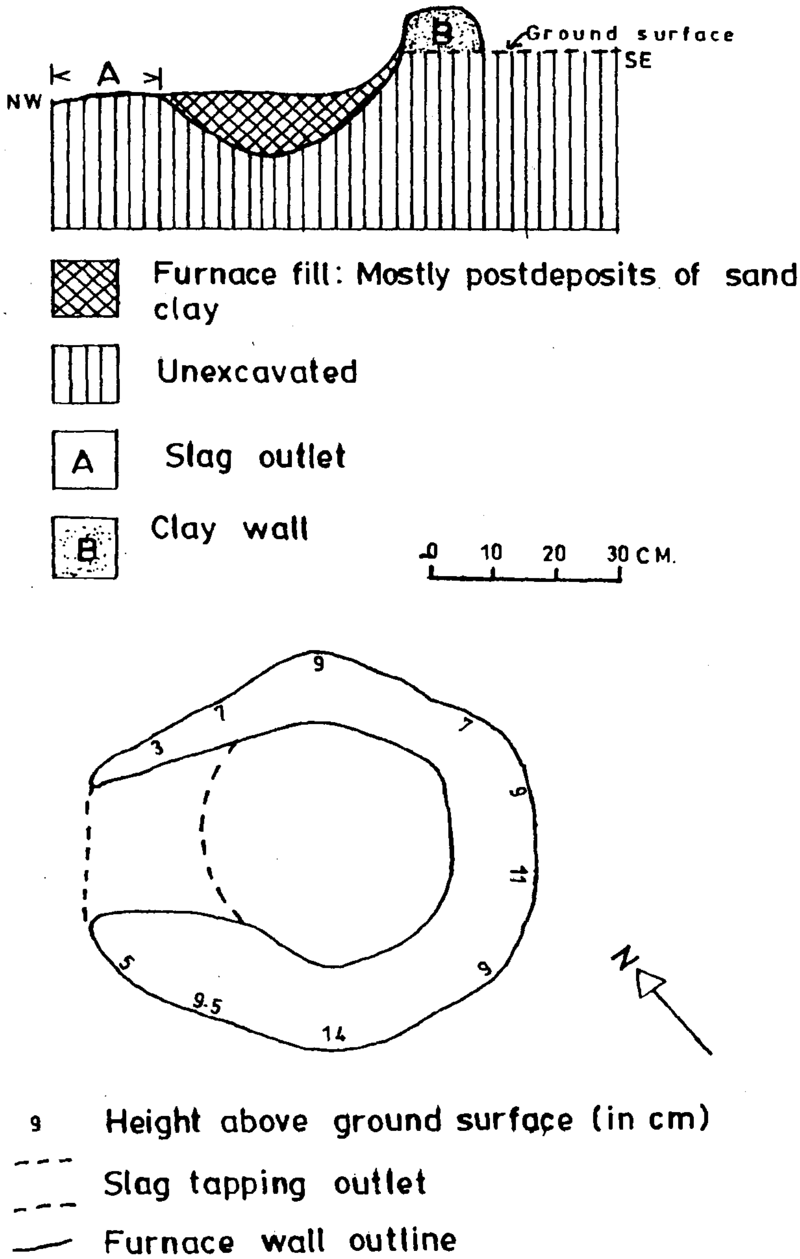
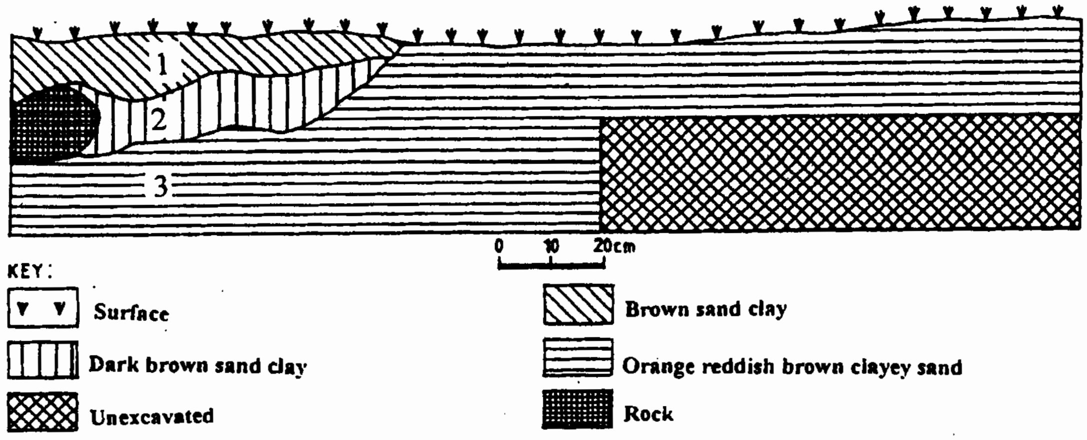


Figure 5.11. The furnace at Baura 3 Unit 1: Above, vertical furnace cross-section. Below, horizontal furnace outline



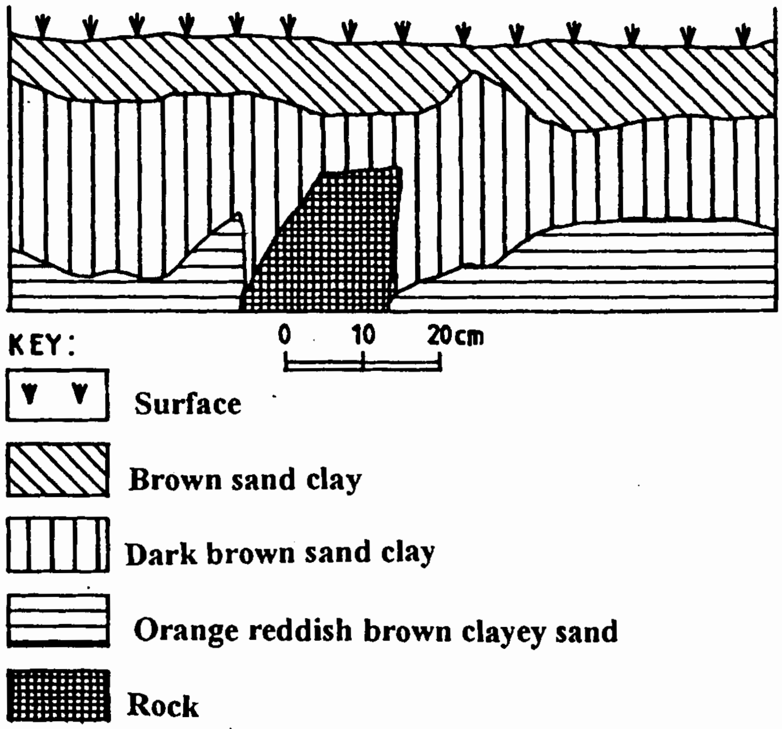


Figure 5.12. Baura 3 Unit 1: Above, eastern wall profile. Below, northern wall profile

Litho-stratigraphy

The excavation outside the furnace consisted of 3 discrete layers. The stratigraphy of Unit 1 is illustrated in Figure 5.12. Details of recovered materials are represented in Table 5.24. Layer 1 and 2 covered only the northern one third section of the Unit. Layer 1 was 4 – 13 cm thick and was comprised of brown sandy clay. Artifacts include LSA lithics, IA pottery, slag, tuyere fragments, bone and land snail shells. Layer 2 was 2 – 25 cm thick and consisted of dark brown sandy clay. Recovered materials include LSA lithic artifacts, IA pottery, slag, a piece of iron, tuyere fragments and land snail shell. Layer 3 was 2 - 40 cm thick and was composed of orange reddish brown sandy clay. As illustrated in Figure 5.12 this layer runs from the surface to the bottom of the trench, and is particularly clear in the southern half. Pottery, slag and one charred

Table 5.24. Baura 3 Unit 1: summary of excavated finds in arbitrary levels

Lithic Artifacts	Inside the Furnace			Outside the Furnace					
	Level			Level					
	1	2	**Total**	Surface	1	2	3	**Total**	%
Tools									
Cores					3	1		**4**	66.7
Flakes/blades					1	1		**2**	33.3
Angular fragments									
Non-flaked stones									
Total					**4**	**2**		**6**	**100.0**
%					66.7	33.3		**100.0**	
Non-lithic artifacts									
Pottery	1		**1**	5	20	7	1	**33**	
Slag	(28) 10	(7) 13	**(35) 23**	(37) 13	(2077) 672	(2137) 1620	(113) 92	**(4364) 2397**	
Metal						1		**1**	
Pieces of tuyere	12	2	**14**	4	38	30		**72**	
Furnace wall		1	**1**						
Bone					11		1	**12**	
Land snail shell					1	1		**2**	

*numbers in parenthesis are weight in grams

bone were recovered from the top 30 cm while the lower 10 cm was sterile. The association of charred bones with slag probably suggests that an animal was brought to the site for sacrifice. Animals including goats (Schmidt 1996b) and chickens (Barndon 1996) are occasionally slaughtered at smelting sites to provide sacrificial blood to ensure a successful smelt.

The walls of the furnace protruded 3-14 cm above the ground level (Figure 5.11, see also Plate 5.4). Total furnace height was 24 cm, with a diameter of 39-42 cm and a wall width varying from 4-18 cm. The presence of a clay wall and the absence of a ritual pit at this furnace differentiate it from that of Baura 2 (see Figures 5.9 and 5.11, also compare Plate 5.3 and 5.4). Note also that the Baura 2 furnace has a vertical wall while that of Baura 3 is curved. The furnace consisted of two discrete layers. Layer 1 was 5 cm and was comprised of reddish brown sandy clay. It produced pottery, slag and tuyere fragments. Layer 2 was 8 cm thick and consisted of orange reddish brown sandy clay. Recovered materials included slag, tuyere and furnace wall fragments.

Unit 1 Cultural assemblage and Dating

The summary of the excavated finds in arbitrary levels as shown in Table 5.24 suggests that Baura 3 consists of a single component made of a mixture of LSA lithics and IA artifacts. However this association is not consistent throughout the Unit. For example the associated mixture of LSA lithics and IA artifacts is confined only to Layer 1 and 2 (Level 1 – 3) restricted to the northern one third section of the Unit, while Layer 3 (Level 1 - 4) yielded only slag. Clearly, Layer 1 and 2 were formed during and after the construction of the furnace. That this may have been the case is demonstrated by the fact that layer 1 and 2 are restricted to the slag tapping side of the furnace. The slag in some sections of Layer 3 may therefore be intrusive. Lithic artifacts including four cores and two flakes were found outside the furnace. With the exception of one potsherd all artifacts recovered inside the furnace were by-products of iron-working. The sherd from the furnace may represent a fragment of a pot probably used to place ritual medicines during smelting instead of dug up ritual pit as it was the case for the furnace at Baura 2. In south-western Tanzania pots with ritual medicine were placed at the base of the furnace to protect it from evil intentions during smelting (Mapunda 1995:205). However the Baura case remains inconclusive because the evidence represents only a single small sherd. The sherd had no features similar to other sherds found outside the furnace. Five of the recovered pottery specimens from outside the furnace were decorated (Figure 6.19: b-f, Chapter 6).

One charcoal sample was obtained from Level 1 at 10 cm (Layer 1) bd and has been dated to 140 ±40 BP (Beta 176191), calibrated to AD 1810 (AD 1660-1950) (Table 5.19). The charcoal sample attached to slag was collected at the slag-tapping side of the furnace. On that basis the date 140 ±40 BP is indicates the time when smelting activities were taking place at the site. The evidence for iron-working at this site is contemporaneus to that of Baura 2. It is noteworthy that although iron-working activities are contemporaneus, the furnace at Baura 2 has a ritual pit while that Baura 3 does not (compare Plate 5.3 and 5.4). This difference may signify the presence of different ritual practices at Baura.

5.3.2. Lusangi

While most Baura sites are open-air, several at Lusangi and Markasi Lusangi are rock-shelters or sites adjacent to them. In addition, the majority of excavated sites at

Lusangi and Markasi Lusangi are associated with hill-slopes as opposed to Baura where most were found on flat lying areas (Figure 5.13). Similar to Baura, most excavated trenches at Lusangi and Markasi Lusangi were comprised of exclusively LSA lithic artifacts in their lowest levels.

Lusangi 1

Lusangi 1 is located northeast of the Muheya Hills about 2.2 km southwest of Pahi town (Figure 4.4). The site is 1288-1312 m asl and covers about 0.06 square km. We were referred to it by the Antiquities officer from Kolo and it is also well known to local residents for its rock art (see Plate 5.5). The site was selected for investigation for several reasons. First, there were several scatters of lithics, pottery and iron slag on the surface. Secondly, investigation at the rock-shelters would provide data for comparison to open-air sites. Finally three of the rock-shelters had art depicted with red, white and black paints that previously had been recorded by Leakey (1983:60-1). This offered an opportunity to associate the rock art with discrete archaeological deposits. Two of the rock-shelters are overhang boulders while one was formed as a result of a rock slide. Most of the paintings occur in white and black and a few in red on the ceilings of the rock-shelters. Red paints are often overlaid by black and white. The most common type of representation involves symbols and geometrics depicted in white and black. An example of this type from the eastern-most rock-shelter is demonstrated in Plate 5.5. Rock-shelter P44 overhang had an excavated pit in its western corner suggesting it had been looted. Treasure hunting is common in rock-shelter sites in central Tanzania (see also Masao 1979:24) because of rumours that the rock art was drawn by white people to indicate where treasures were buried upon their departure during World War I and II.

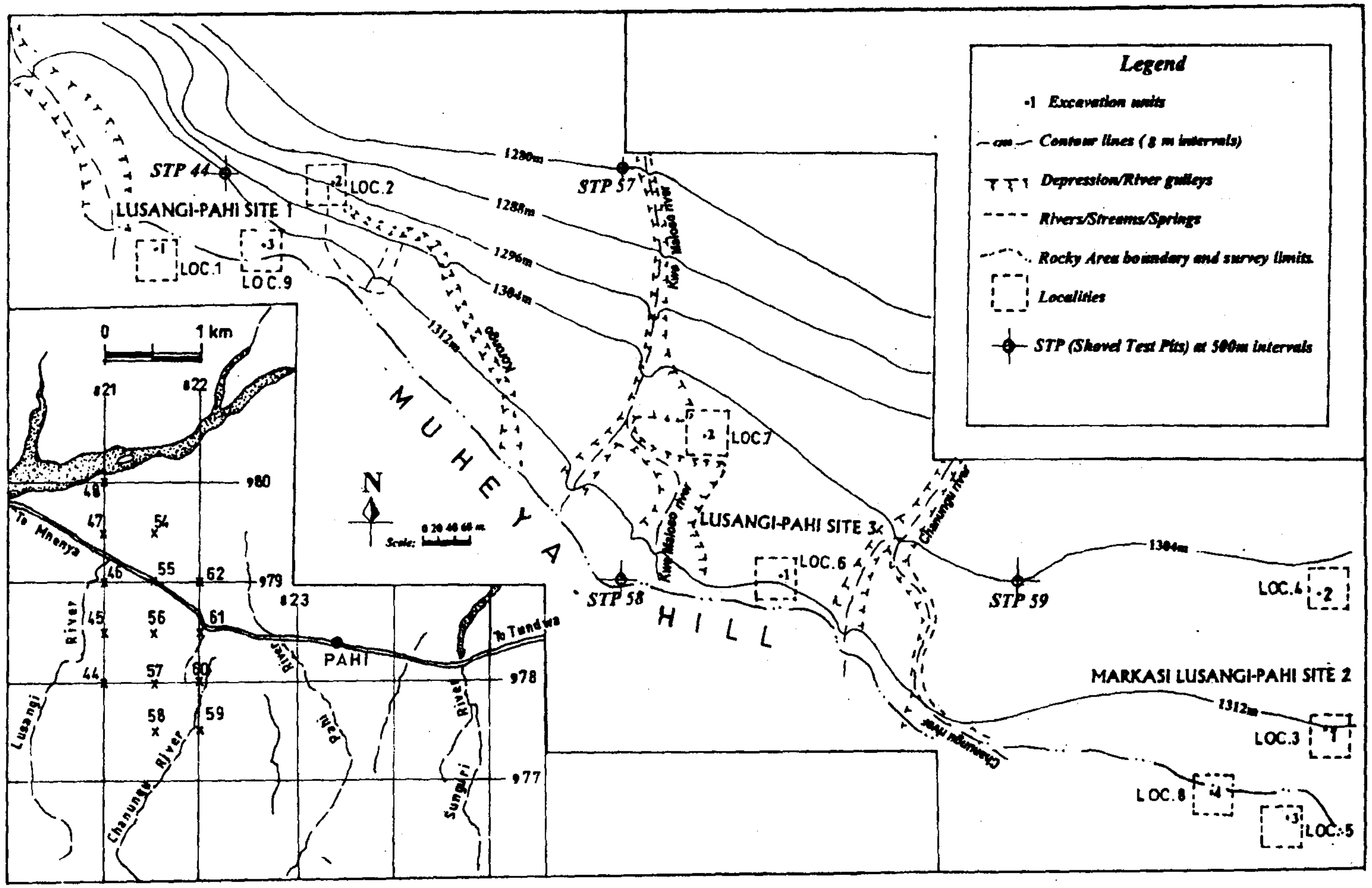


Figure 5.13. Location of excavated units at Lusangi

Plate 5.5. White and black paints from Lusangi 1. (This picture was taken from a rock-shelter (roof) located to the adjacent southeast of Rock-shelter P44

This illusion had been reinforced by the fact that white people were the first to excavate and document the rock art.

The Lusangi rock-shelters were originally inventoried by Louis and Mary Leakey in the 1950s (Leakey 1983). Some shelters have double inventory numbers which may have been re-assigned by Mary Leakey during a second visit in the 1980s. It was impossible to obtain definitive inventory numbers for all rock-shelters at Lusangi 1, but the one selected for excavation is inventoried as Rock-shelter P44. Leakey (1983:61) reports to have excavated Rock-shelter P40 to a depth of 3 m and although some LSA artifacts were recovered, overall the results were disappointing. An attempt to relocate

Rock-shelter P40 failed but the inventory order suggests that it should not be very far from Lusangi 1, as the P in the inventory system stands for Pahi.

Unit 1

Unit 1 was 1 x 2 m half of which cross cuts the drip line of Rock-shelter P44 (Figure 5.14, see also Plate 5.6 and 5.7). The shelter is located at a high elevation (1372 m asl) on the northeast slope of Muheya Hill overlooking the Lusangi flatlands to the north (Figure 5.13 and 5.14). Forest cover is found to the south and west of the shelter. Judging from its position, the rock-shelter would have provided a strategic position to view game and movement of people on the lowlands. On the roof of Rock-shelter P44 is depicted a figure of a slender body in white outline with a wide end on one side probably symbolizing a snake. The shelter was not large but could have provided two to three sleeping spaces. Several scatters of lithic artifacts, bone and burnt clay were observed on the surface at Rock-shelter P44. The area immediately north of Unit 1 is covered with charcoal pieces suggesting that a charcoal pit was present. Excavation was carried out by arbitrary levels to 1.4 m below surface at an interval of 10 cm.

Litho-stratigraphy

Unit 1 consisted of 5 discrete layers and as illustrated in Figure 5.15. Lithic artifacts, bone and burnt clay were collected at the surface (Table 5.25). Most of the cultural deposits were dominated by LSA lithic artifacts (Table 5.25). Layer 1 was 6 – 22 cm thick and was comprised of very dark brown sandy clay with charcoal inclusions and rock fall. Recovered materials include LSA lithic artifacts and bone fragments. Layer 2

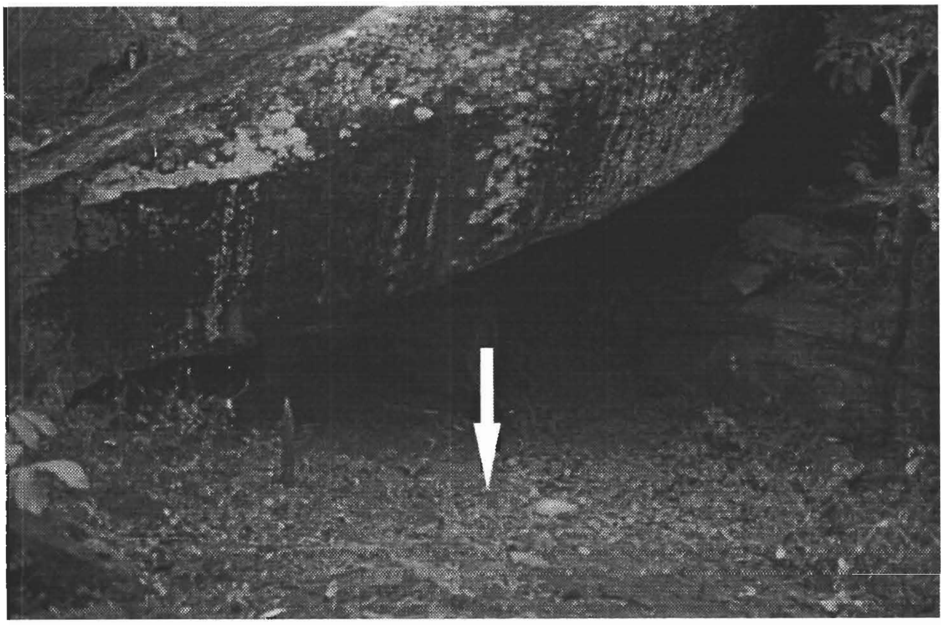


Plate 5.6. Rock-shelter P44 (northern view). The arrow indicates where Unit 1 was placed

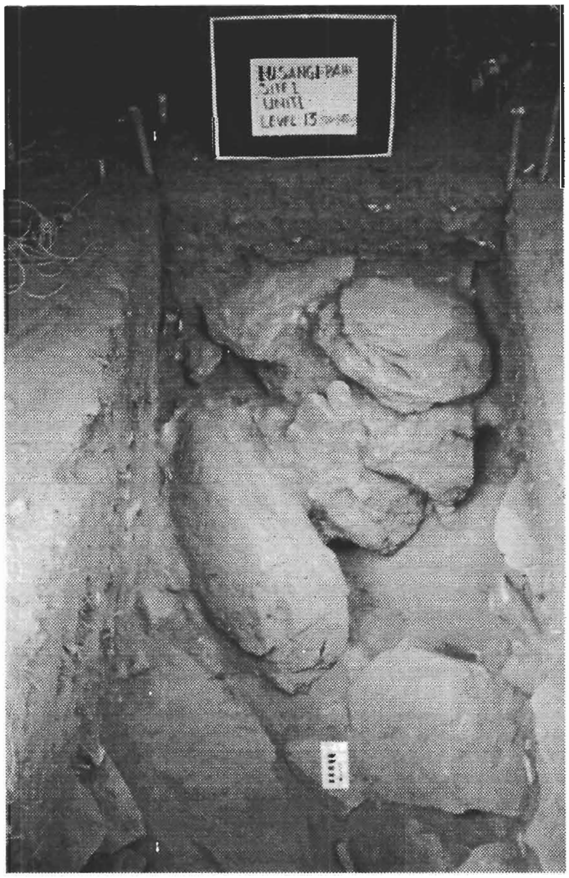
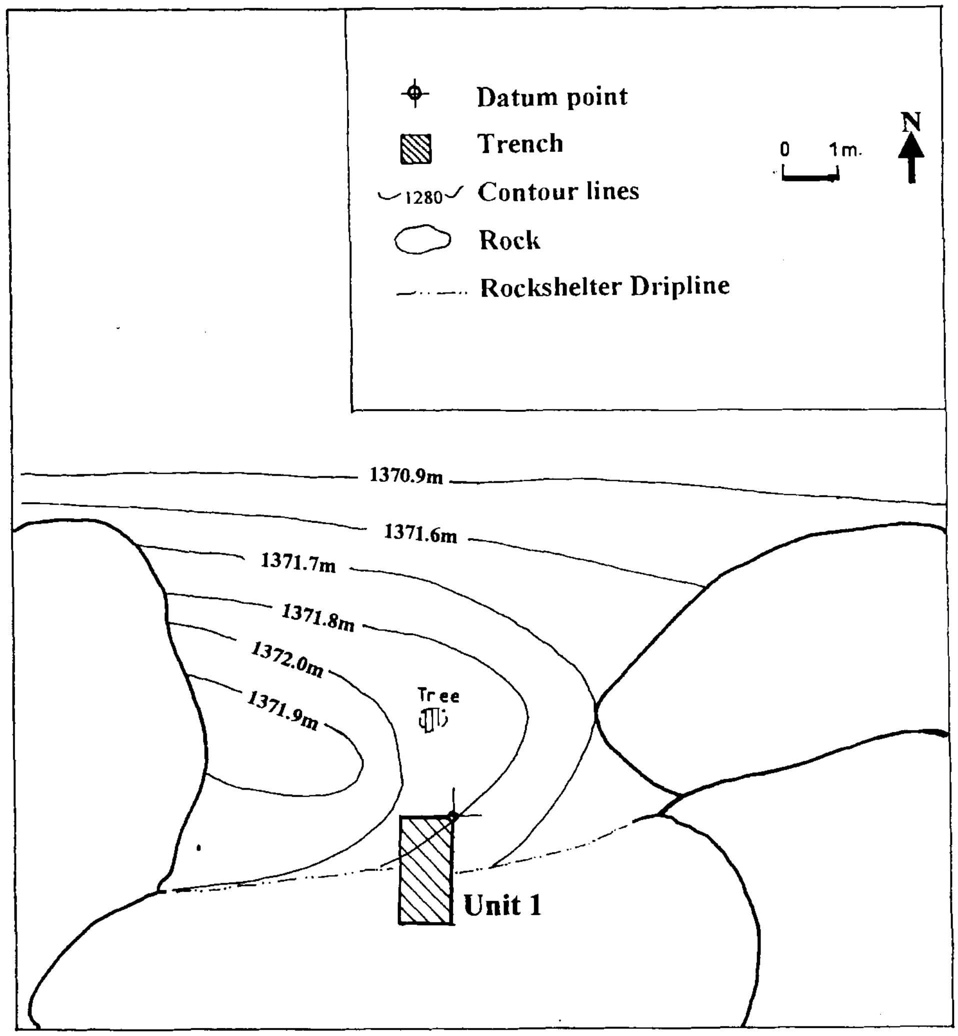


Plate 5.7. Lusangi 1 Unit 1 (At Rock-shelter P 44). A view of Level 13 (140 cm bd). Note the boulders within

Figure 5.14. Locality 1: Lusangi 1 Unit 1



was a lens imbedded between Layer 1 and 3 that was 28 cm in diameter in the eastern part of the unit (Figure 5.15). The lens was comprised of dark grey brown sandy clay and yielded a few LSA lithic artifacts. Layer 3 was 16 – 44 cm and was comprised of greyish brown sandy clay with more rock fall compared to Layer 2. Recovered materials included LSA lithics, IA pottery, bone, land snail shell and white chalk. The latter probably represents white pigment or chalk used to execute the rock paintings found on the roof

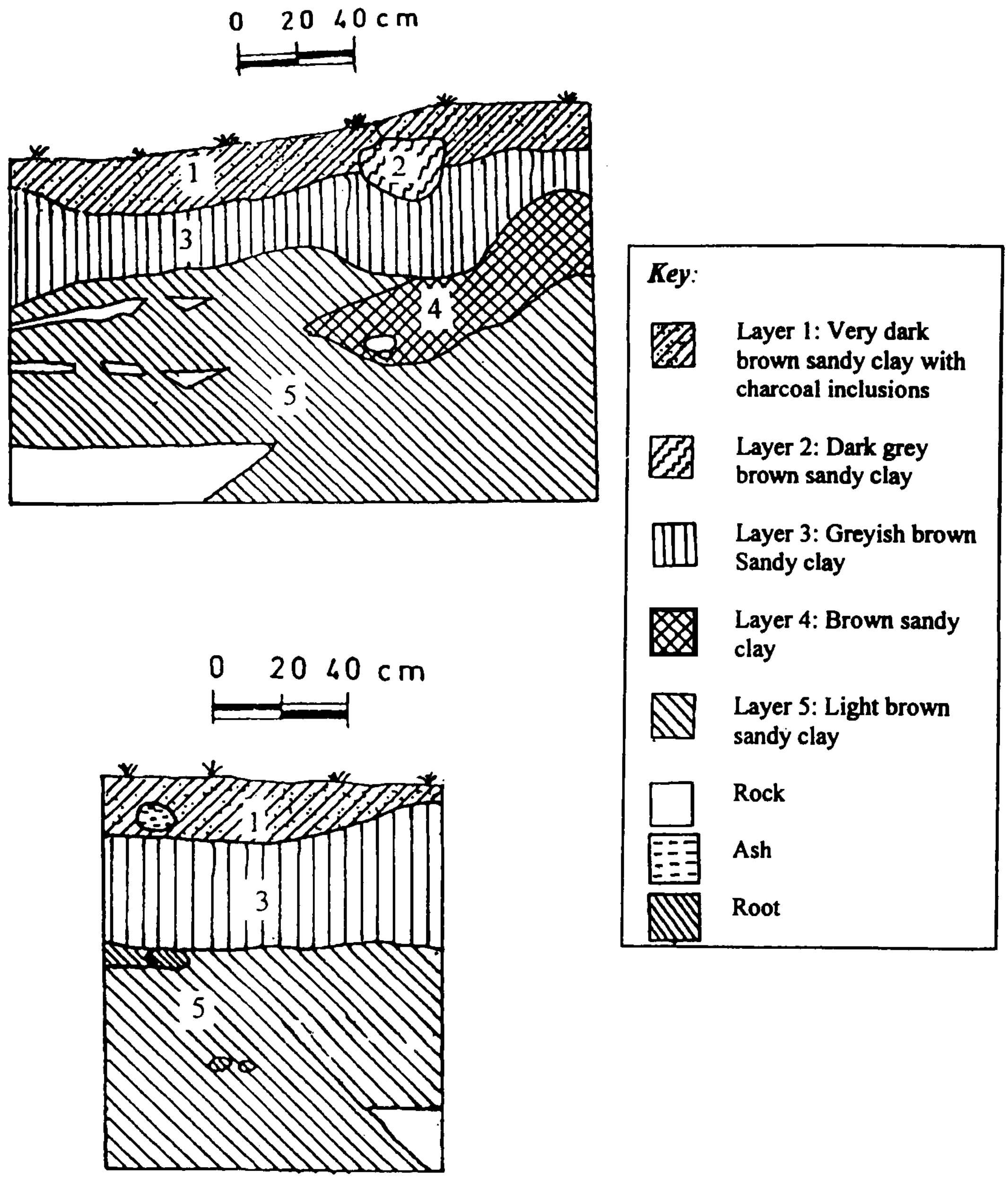


Figure 5.15: Lusangi 1 Unit 1: Above, eastern wall profile. Below, northern wall profile

Table 5.25. Lusangi 1 Unit 1: summary of excavated finds in arbitrary levels

Lithic artifacts	Level															
	Surface	1	2	3	F. 1	4	5	6	7	8	9	10	11	12	13	**Total**	%
Tools			1		3	28	22	16	13	21	20	13	19	14		**170**	4.4
Cores		5	20	19	8	87	101	26	56	77	30	32	15	31	16	**523**	13.7
Flakes/ blades	1	4	15	25	2	89	118	83	205	207	185	229	149	175	100	**1587**	41.6
Angular fragments	(2) 5	(3) 12	(15) 69	(5) 25	(1) 6	(23) 101	(13) 57	(17) 88	(49) 207	(50) 220	(42) 156	(42) 170	(25) 98	(67) 281	(10) 44	**(364) 1539**	40.3
Non - flaked stones																	
Total	**6**	**21**	**105**	**69**	**19**	**305**	**298**	**213**	**481**	**525**	**391**	**444**	**281**	**501**	**160**	**3819**	**100.0**
%	0.2	0.6	2.7	1.8	0.5	8.0	7.8	5.6	12.6	13.7	10.2	11.6	7.4	13.1	4.2	**100.0**	
Non-lithic artifacts																	
Pottery				1	7	8										**16**	
Bone	2	2				1			1							**6**	
Land snail shell						18										**18**	
Red ochre												1				**1**	
White chalk				1												**1**	
Burnt clay	1						1		6							**8**	

*numbers in parenthesis are weight in gram of Rock-shelter P44. The term "white chalk" is used here for convenience and does not denote a specific chemical element. Although the chemical constituents of the material used for white paintings in Kondoa are not yet known, in South Africa they are believed to have been made by using silica, China clay and gypsum (Rudner (1983:19). With the exception of Feature 1, Layer 3 is the only level that produced IA pottery. Moreover it is the only layer that yielded land snail shells and white chalk. Feature 1 was embedded in the northern part of Layer 3 and extended from 25 – 30 cm below surface. It covered 0.64 sq m at the surface and was characterized by larger quantities of charcoal compared to Layers 1, 2 and 3. The charcoal inclusions in Feature 1 are probably related to the charcoal pit described above. Recovered materials included LSA lithics and IA pottery. Layer 4 was on average 20 - 30 cm thick and was comprised of brown sandy clay with a few rock falls. As the case of Layer 2, Layer 4 did not cover the entire unit but only the eastern half. Only LSA lithic artifacts were recovered from this layer. Layer 5 was 70 - 90 cm thick and was comprised of light brown sandy clay with substantial rock fall. Recovered materials included LSA lithic artifacts, bone, burnt clay and red ochre. Apart from having the largest amount of rock fall, this layer also produced the highest frequencies of LSA lithic artifacts. The bottom of this layer was composed of large slabs of rock fall where excavation was halted (Plate 5.7.)

Soil Samples

Three soil flotation samples were taken from levels 0 – 20 cm, 20 – 40 cm and 40 - 60 cm at the southeast corner of Unit 1. Most samples did not produce organics, however, one seed of Solanaceae (*cf. Solanum*) and one unidentifiable seed came from the 40-60 cm sample.

Unit 1 Cultural Assemblages and Dating

The summary of excavated finds from Unit 1 is presented in Table 5.25 in which two basic cultural components are identified. One component with a mixture of LSA lithics and IA pottery appears in the upper stratigraphical sequences, specifically Level 3, 4 and Feature 1 (Layer 3), while the second, dominated by LSA lithic artifacts, is found in the lower sections in Levels 5-13 (Layer 4 and 5). With the exception of a few levels, the frequency of lithic artifacts increases from upper to lower levels. There was almost an equal balance of flakes/blades and angular fragments in lithic artifacts overall (Table 5.25). Unit 1 demonstrates low percentages of tools and cores compared to debitage (flakes/blades and angular fragments) suggesting that the area was used as a lithic workshop. The white chalk remains from Level 3 (Layer 3) and red ochre from Level 10 (Layer 5) supports the established relative sequences of the rock art tradition in east and central Africa. It has been suggested by many archaeologists that white paints were of later traditions than red pigments (Phillipson 1976a, Masao 1979). As will be observed similar archaeological sequences are observed in Markasi Lusangi 2 Unit 3 (Rock-shelter P1). The significance of these rock art paintings is discussed in detail in Chapter 7.

One charcoal sample collected from Level 3 at 27 cm bd (Layer 3) has been dated to 1660 ±100 BP, calibrated to AD 400 (AD 130 - 620) (Beta 176186) (Table 5.26). As has been noted above (Table 5.25), pottery was collected in Level 4 which predates this age. Analysis of the Baura –Lusangi pottery indicates that most belong to later periods probably the LIA (Chapter 6 and 7, see also Masao 1979 for Kandaga A9). Consequently, the date of 1660 ±100 BP may be too early for the Baura - Lusangi pottery indicating that the context may have been disturbed.

Table 5.26. Summary of C14 dates from Lusangi sites

Sample No.	Site, Unit and Level (Depth)	Associated Artifacts	Conventional Age	Calibrated (BC & AD) Dates, 2 Sigma, 95% Probability
Beta 176186 (Radiometric)	Lusangi 1, Unit 1, Level 3 (27 cm)	Lithics, Pottery, White Chalk	1660 ±100 BP	130- 620 AD
Beta 176187 (AMS)	Lusangi 1, Unit 2, Level 5 (97 cm)	Lithics, Pottery, Ostrich Eggshell	140 ±40 BP	1660-1950 AD
Beta 176188 (AMS)	Markasi Lusangi 2, Unit 2, Level 4 (70 cm)	Lithics, Pottery, Slag, Bone, Daub	1030 ±40 BP	960-1040 AD
Beta 176190 (Radiometric)	Markasi Lusangi 2, Unit 3, Layer 2 (97 cm)	Lithics, Pottery, Slag, Iron, Tuyere, Bone, Land Snail Shell, Red Ochre, White Chalk, Burnt Clay	4510 ±70 BP	3370-2930 BC
Beta 176193 (Radiometric)	Markasi Lusangi 2, Unit 4, Level 2 (32 cm)	Lithics, Slag, Tuyere, Bone	760 ±60 BP	1180-1300 AD

Unit 2

Unit 2 is located 233 m northeast of Unit 1 on cultivated land, with extensive scatters of ceramic found nearby (Figure 5.13). This is an open-air site selected as a comparison with Rock-shelter P44. Unit 2, a 2 x 1 m trench, was excavated in seven 20 cm levels to a depth of 1.4 m (Figure 5.16).

Litho- stratigraphy

Unit 2 consisted of 7 discrete layers as illustrated in Figure 5.17. The types, amount and weights of the recovered artifacts are listed in Table 5.27. Layer 1 was

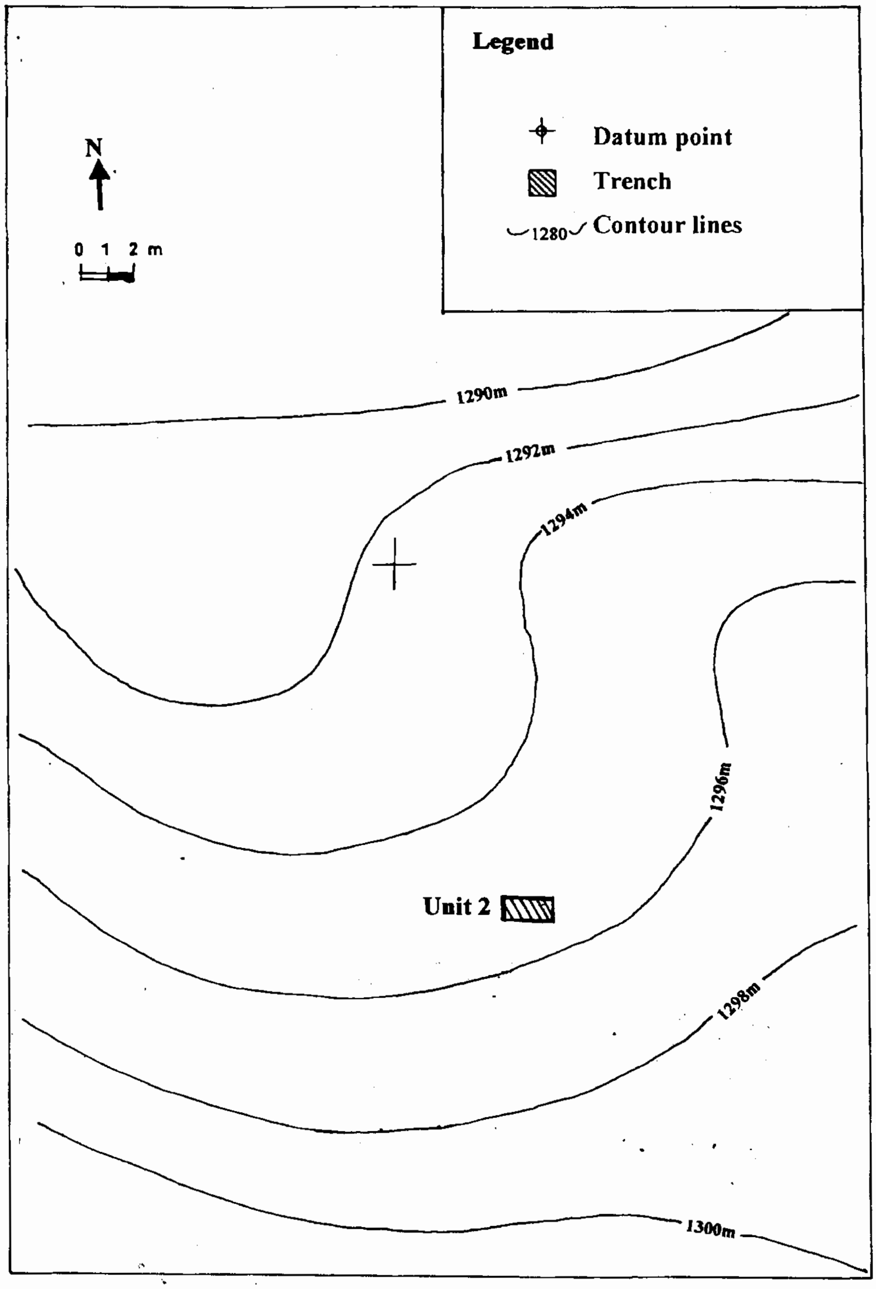


Figure 5.16. Locality 2: Lusangi 1 Unit 2

Figure 5.17. Lusangi 1 Unit 2: Northern wall profile

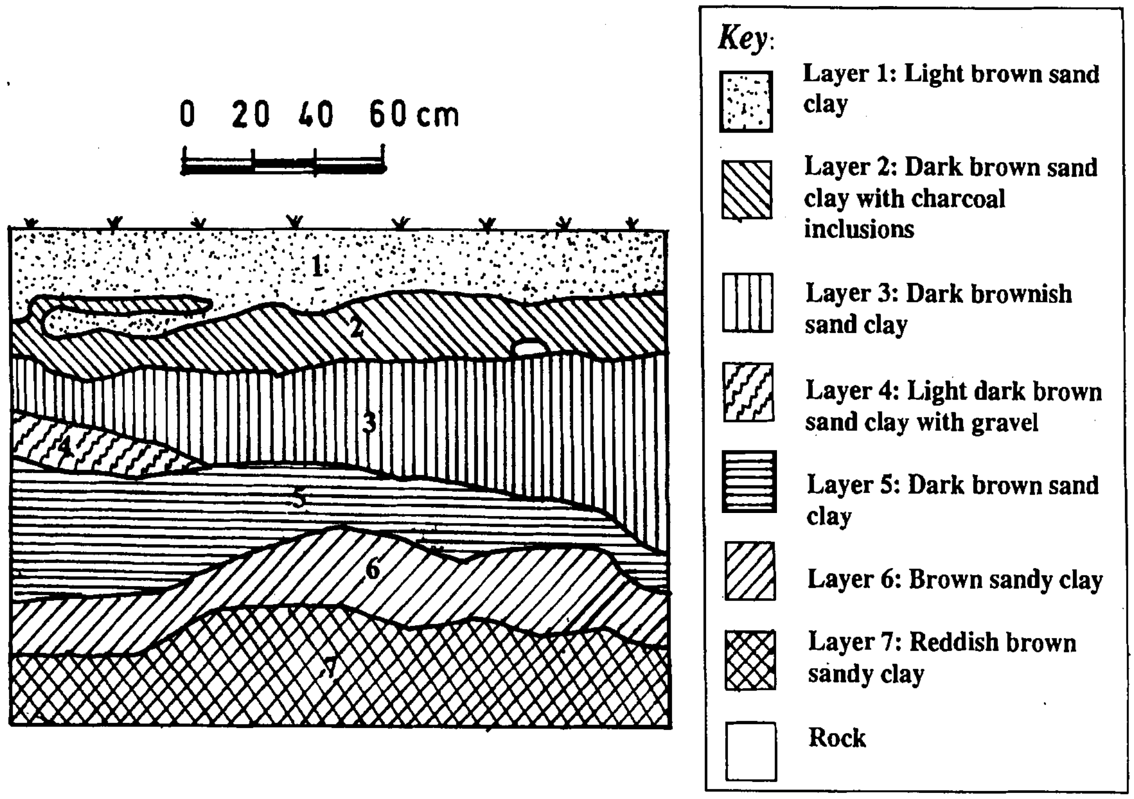


Table 5.27. Lusangi 1 Unit 2: summary of excavated finds in arbitrary levels

Lithic artifacts	Level							
	1	2	3	4	5	6	**Total**	%
Tools								
Cores			1	8	5		**14**	31.8
Flakes	2	2	1	7	6		**18**	40.9
Angular fragments					(2) 8		**(2)** **8**	18.2
Non-flaked stones				4			**4**	9.1
Total	**2**	**2**	**2**	**19**	**19**		**44**	**100.0**
%	4.5	4.5	4.5	43.2	43.2		**100.0**	
Non-lithic artifacts								
Pottery	16	44	12	3	4		**79**	
Bone		4	6	2			**12**	
Ostrich eggshell					1		**1**	

*numbers in parenthesis are weight in grams

18 – 26 cm thick and was composed of light brown sandy clay. Recovered materials include IA pottery and LSA lithic artifacts. Layers 2, 3 and 4 yielded similar types of cultural deposits including IA pottery, LSA lithics and bones. The main difference between them is that Layer 4 yielded more than four times the lithic artifacts than Layer 2 and 3 combined, while Layer 2 and 3 each produced higher frequencies of pottery than Layer 4. In addition at the base of Layer 4 a hammer, anvil, pestle rubber and ground stone were found *in situ*. Layer 2 was 8 – 20 cm thick and consisted of dark brown sandy clay, while Layer 3 was 14 – 58 cm thick and was comprised of dark brownish sandy clay. Layer 4 was on average 14 cm thick and was composed of light dark brown sandy clay with gravel. This layer was less extensive, only covering the northern one third of the unit. Layer 5 was 12 – 40 cm thick and was comprised of dark brown sandy clay. Recovered materials included IA pottery, LSA lithic artifacts and an ostrich egg shell. Layer 6 was 10 – 24 cm thick and consisted of brown sandy clay. Only one IA pottery fragment and a few lithic artifacts were recovered from this layer. All artifacts were restricted to the few upper cms. Layer 7 was 19 – 30 cm thick and was composed of sterile reddish brown sandy clay, hence excavation was stopped.

Unit 2 Cultural Assemblage and Dating

The summary of excavated finds from the arbitrary levels as shown in Table 5.27 indicates that Unit 1 consisted of a single cultural component made up of a mixture of LSA lithic artifacts and IA pottery. This unit represents one of the few exceptions in the Pahi project, where a single component with a mixture of LSA and IA artifacts is distributed throughout the stratigraphic sequences. Pottery was the most commonly encountered artifact in Unit 2 of which almost 50% was recovered from Layer 2.

However there was a tendency for LSA lithic artifacts to increase downward in the profile while IA pottery decreased (Table 5.27). Shaped lithic tools were nonexistent while flakes were the most frequent. Only two decorated pottery sherds were obtained from this unit. The two specimens are described in Chapter 6, (Figure 6.19g & h) and unfortunately they can only be classified as a miscellaneous type. Similar specimens were also obtained from the upper Layers (Levels 1 and 2).

One charcoal sample collected from Level 5 at 97 cm (Layer 5) was dated to 140 ±40 BP, calibrated to AD 1810 (AD 1660-1950) (Beta 176187) (Table 5.26). The depth of these deposits in comparison to the available date indicates that they were formed rapidly. Since Unit 2 is located at the base of Muheya Hill it is possible that sediments accumulated there through slope wash. The presence of a stream that terminates in the vicinity of the unit supports this explanation (Figure 5.13).

Unit 3

Unit 3 is located 133 m east of Unit 1 and 100 m southwest of Unit 2 in a field with surface scatters of iron slag and pottery (Figure 5.13). It was a 2 x 1 m trench and was excavated in five 20 cm levels to a depth of 1 m.

Litho stratigraphy

Unit 3 consisted of three discrete layers and the stratigraphy is illustrated in Figure 5.18. The types, amount and weight of the recovered artifacts are typed in Table 5.28. Layer 1 was 20 - 30 cm thick and was comprised of loose grey sand clay.

Figure 5.18. Lusangi 1 Unit 3: southwest wall profile

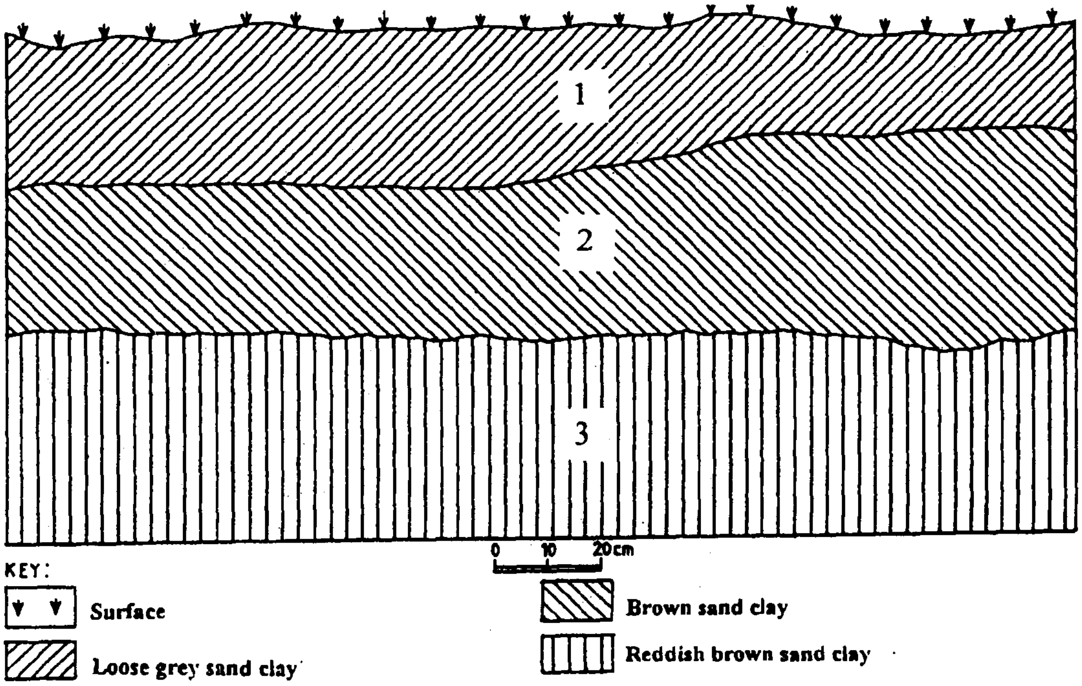


Table 5.28. Lusangi 1 Unit 3: summary of excavated finds in arbitrary levels

Lithic artifacts	Level						
	1	2	3	4	5	**Total**	%
Tools							
Cores	4	7				**11**	24.4
Flakes/blades	2	3	6	1	1	**13**	28.9
Angular fragments	(3.5) 10	(1.3) 10			(1) 1	**(5.8)** **21**	46.7
Non-flaked stones							
Total	**16**	**20**	**6**	**1**	**2**	**45**	**100.0**
%	35.6	44.4	13.3	2.2	4.4	**100.0**	
Non-lithic artifacts							
Pottery	8	9				**17**	
Slag	(1367) 796	(947) 543	(2.8) 1			**(2316.8)** **1340**	
Furnace wall	2					**2**	
Bone		3				**3**	

*numbers in parenthesis are weight in grams

Recovered materials include LSA lithic artifacts, IA pottery, slag and furnace wall fragments. Layer 2 was 28 – 42 cm thick and was comprised of brown sandy clay. Artifacts recovered include LSA lithics, IA pottery, slag and bone fragments. Layer 3 was 35 – 40 cm thick and was comprised of reddish brown sandy clay. A small number of LSA lithic artifacts was recovered from this stratum.

Unit 3 Cultural Assemblages

The summary of excavated finds in arbitrary levels as shown in Table 5.28 indicates a clear break in artifact sequences into two components. The upper sequence consists of a mixture of LSA and IA artifacts mainly slag, pottery and tuyeres while the lower is made up exclusively of LSA lithic artifacts. The component with a mixture of LSA and IA artifacts is restricted to Level 1, 2 and 3 (Layer 1 and upper 2), while that with exclusively LSA lithics is restricted to Level 4 and 5 (lower Layer 2 and 3). No lithic shaped tools or non-flaked stone artifacts were recovered from this trench. Two decorated pottery sherds of category A were recovered from Level 1 and 2.

Summary of Lusangi 1

The most significant difference between Lusangi 1 Unit 1 (Rock-shelter P44), 2 and 3 (open air) is the quantity and types of materials recovered. Rock-shelter P44 (Unit 1) produced approximately 43 times the quantity of lithic artifacts recovered from Units 2 and 3 combined (Tables 5.25, 5.27 and 5.28). A similar patter was observed at Markasi Lusangi 2 (see below). This relationship is more pronounced in lithic artifacts than pottery. The presence of white chalk and red ochre at Rock-shelter P44 and their absence in the open air sites supports an interpretation that they were used in the production of rock art. Higher concentrations of lithic artifacts in Rock-shelter P44 may reflect a preference to use rock-shelters as lithic workshops. In addition Rock-shelter P44 reflects more in the way of localized lithic knapping activity compared to open-air sites where these activities were scattered. It is probable that rock-shelters acted as visible permanent landmarks where people visited and camped regularly as opposed to open-air sites where camping locations varied. The by-products of iron-working (slag and furnace wall fragments) are only found in Unit 3. The date of 1660 ±100 BP Level 3 (Layer 3) at Unit 1 remains tentative since it was associated with pottery of younger age. If the date of 140 ±40 BP from Unit 2 Level 5 (Layer 5) is accurate, Lusangi 1 was occupied until recent times.

Markasi Lusangi 2

Markasi Lusangi 2 is located 1.5 km southwest of Pahi town and 1.4 km southeast of Lusangi 1 on the northeastern slope of Muheya Hill (Figure 4.4 and 5.13). It is 1304 – 1372 m asl and covers about 0.092 km². The site was directed to us by an officer from the Kolo Antiquities office and is well known for its rock art. Nearby is Rock-shelter P1 which bears rock paintings and surface scatters of LSA and IA artifacts (Plate 5.8 and 5.9). As in the case of Lusangi 1, this site was selected to establish the relationship between open-air and rock-shelter deposits. Four excavation trenches were placed at the site, one of them at Rock-shelter P1.

Unit 1

The area surrounding Unit 1 is now covered by stands of acacia trees but once was cultivated. Several surface scatters of lithics, pottery, slag, bones and ostrich eggshell

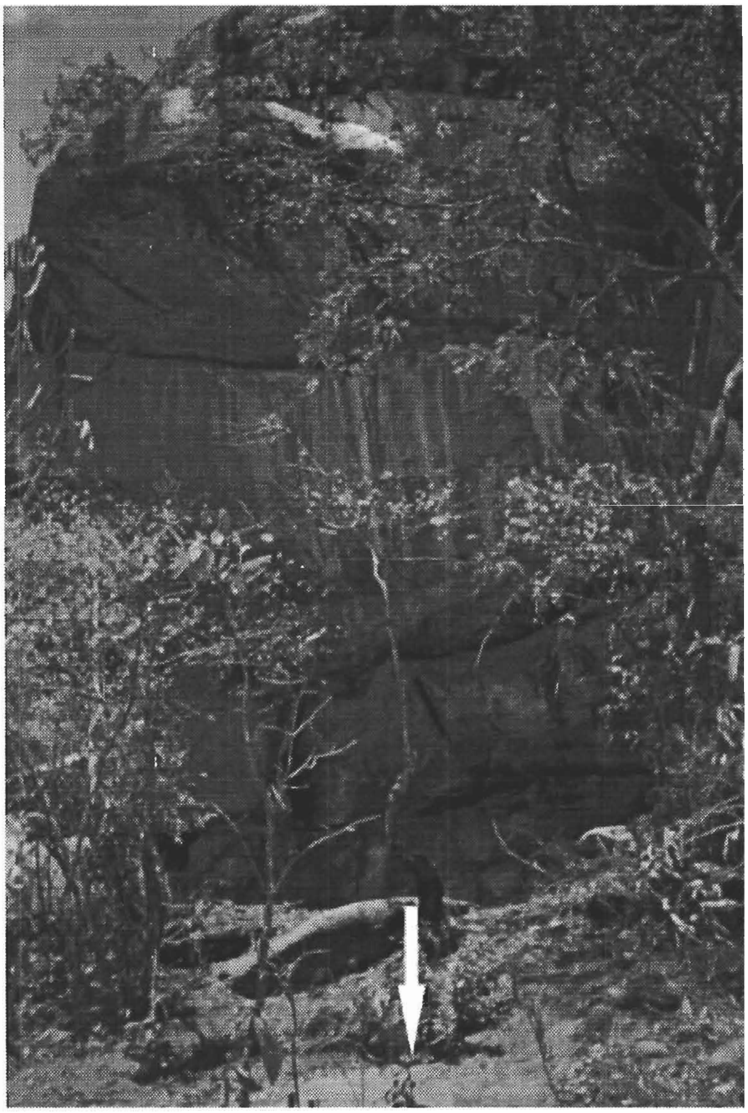


Plate 5.8. Markasi Lusangi 2, Rock-shelter P1. The arrow indicates the place where Unit 3 was located (see next section)

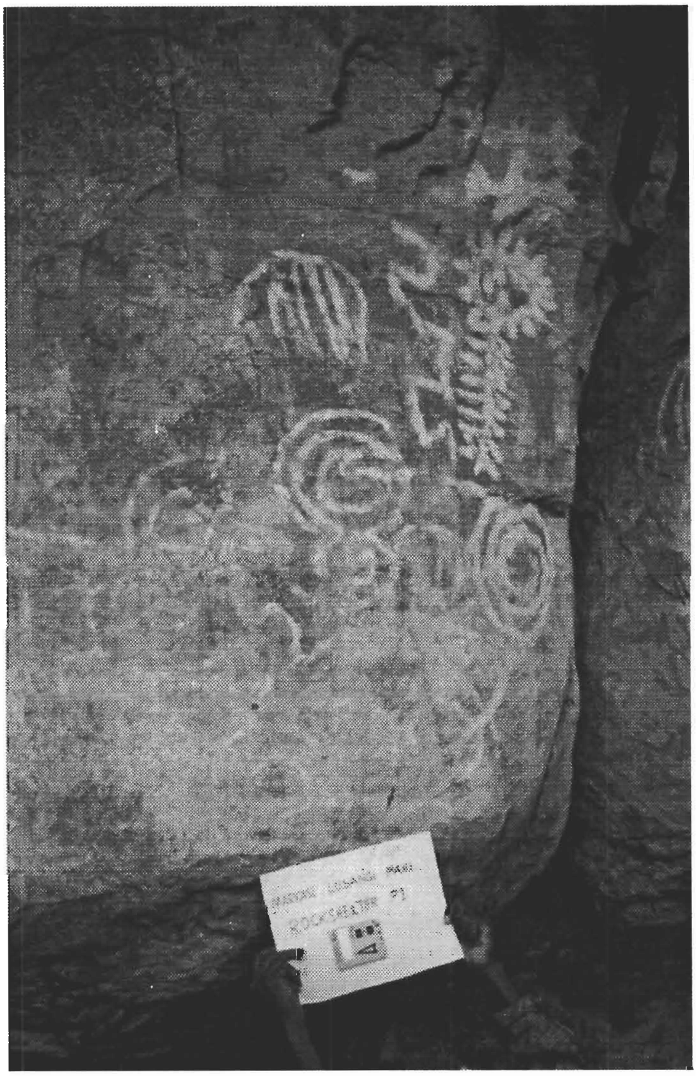


Plate 5.9. Red, yellow and white paintings at Rock-shelter P1. (Most red and yellow have gone faint and hardly can be seen)

fragments were observed in the area. Unit 1 is 1 x 2 m and was excavated to 1.8 m at an interval of 20 cm levels (Figure 5.19).

Litho stratigraphy

Unit 1 consists of three discrete layers illustrated in Figure 5.20. The types, quantity and weights of the recovered materials are described in Table 5.29. Pottery, bone

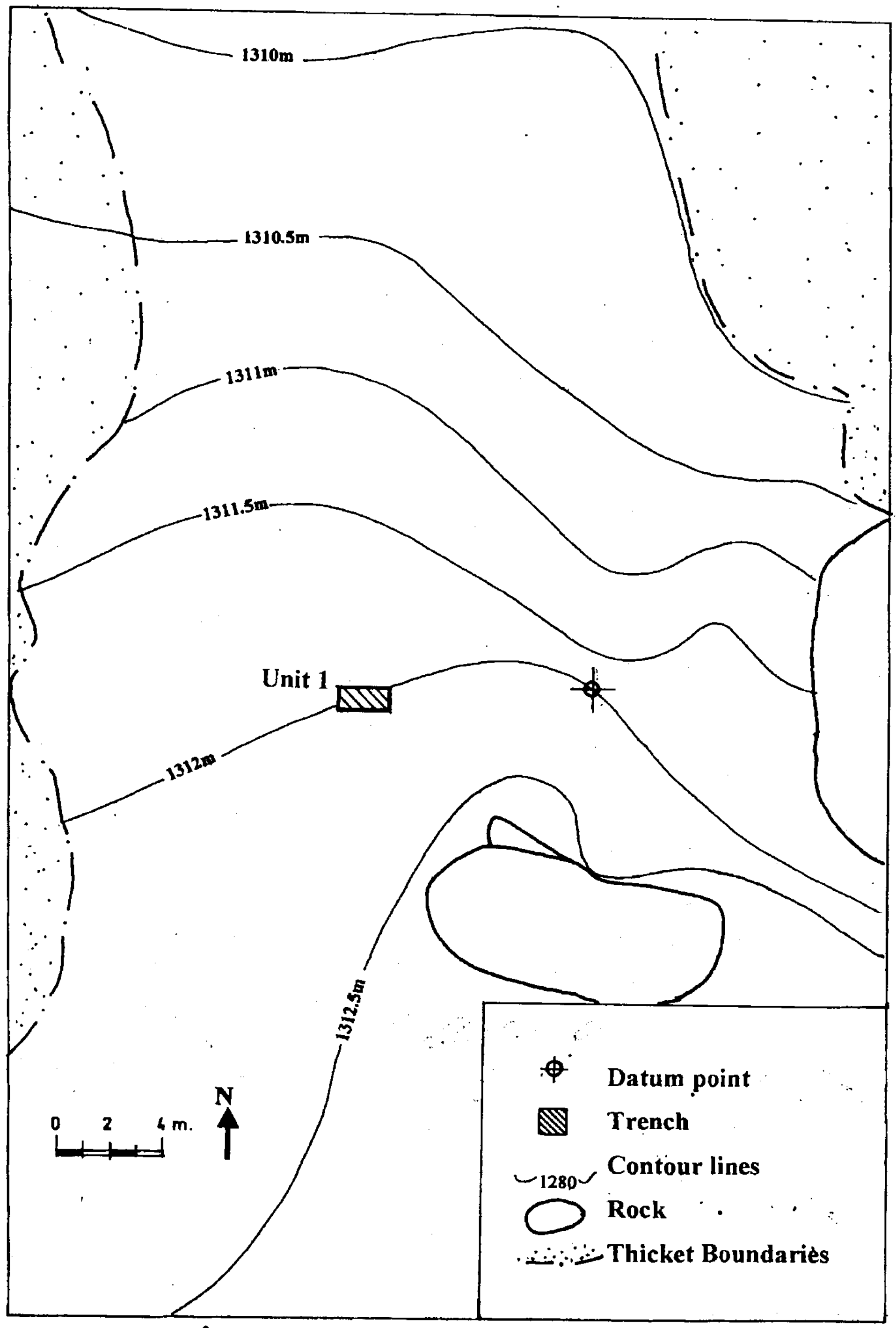


Figure 5.19. Locality 3: Markasi Lusangi 2 Unit 1

Figure 5.20: Markasi Lusangi 2 Unit 1: southern wall profile

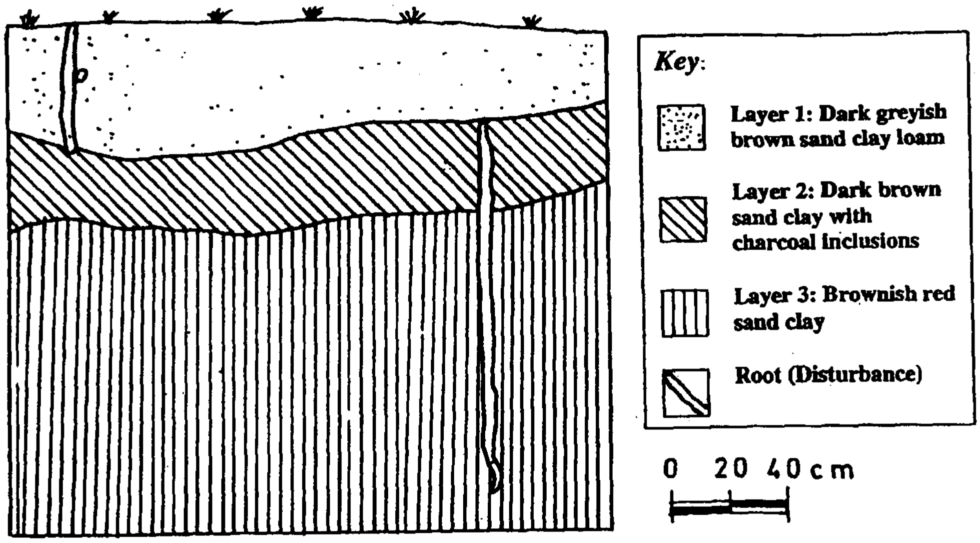


Table 5.29. Markasi Lusangi 2 Unit 1: summary of excavated finds in arbitrary levels

Lithic artifacts	Level											
	Surface	1	2	3	4	5	6	7	8	9	**Total**	%
Tools												
Cores	1		6		4	1		2	4		**18**	15.4
Flakes/ blades		3	8	11	20	4	1	9	7	1	**64**	54.7
Angular fragments			(2) 5	(3) 16	(1) 6			(1) 4	(0.3) 3		**(7.3) 34**	29.1
Non-flaked stones			1								**1**	0.8
Total	**1**	**3**	**20**	**27**	**30**	**5**	**1**	**15**	**14**	**1**	**117**	**100.0**
%	0.8	2.6	17.1	23.1	26.6	4.3	0.8	12.8	12.0	0.8	**100.0**	
Non-lithic artifacts												
Pottery	14	74	104	2							**194**	
Slag		(194) 7	(14) 3								**(208) 10**	
Bone	4	34	31	1							**70**	
Ostrich eggshell		4									**4**	
Land snail shell		1									**1**	

*numbers in parenthesis are weight in grams

and one lithic artifact were collected at the surface. Layer 1 was 20 - 46 cm thick and consisted of dark greyish brown sandy clay loam with a few root disturbances. Recovered materials included LSA lithic artifacts, IA pottery, slag, bone, ostrich egg shell and land snail shell. Layer 2 was 23 – 36 cm thick and was comprised of dark brown sand clay with charcoal inclusions and some root disturbances. Artifacts include LSA lithics, IA pottery and bone. Layer 3 which formed the base of the cultural deposits was 102 – 120 cm thick and was characterized by brownish red sandy clay. This layer yielded exclusively LSA lithic artifacts.

Unit 1 Cultural Assemblages

Table 5.29 is a summary of the excavated finds from arbitrary levels. The levels indicate a clear break in the sequence of artifacts into two distinct cultural components. A component with a mixture of LSA lithics and IA artifacts, particularly pottery and slag occurs in the upper Levels 1, 2 and 3 (Layer 1 and 2) while a second component with exclusively LSA lithic artifacts dominates the lower section of the profile including Levels 4 - 9 (Layer 3). The distribution of LSA artifacts among the levels seems uneven (Table 5.29). However there is a significant increase in lithic artifact production at the middle levels (2, 3 and 4) just before and after the introduction of pottery and a decline again in the upper levels. Flakes/blades were the most frequent lithic artifacts while no shaped tools were recovered from Unit 1. Although pottery was restricted to the upper layers, they outnumber any other artifact (Table 5.29). Only a small number of sherds were diagnostic some of which were from the surface and layer 1 (level 1 and 2). The sherds are described in Figure 6.19: j-l and m-o in Chapter 6. The age of the cultural materials remains uncertain because dates were not obtained from this unit.

Unit 2

Unit 2 is located 160 m north of Unit 1 in a region covered by acacia trees (Figure 5.13 and 5.22). The area was under cultivation in the past and 50 m to the north was a farm which grew maize, beans and sorghum. In the vicinity are several surface scatters of potsherds, ground stones, pestle rubbers, daub, pieces of tuyere, iron slag, bones and ostrich eggshell fragments. Unit 2 is 1 x 2 m and was excavated in 20 cm intervals to 2.4 m below surface (Figure 5.22).

Litho-stratigraphy

Unit 2 consisted of three discrete layers as illustrated in Figure 5.21. In general the stratigraphic layout of the sediments, texture and soil colour in this unit resembles that of Unit 1 possibly because of the proximity of the two units. The types, quantity and weight of the recovered materials are described in Table 5.30. Layer 1 was 67 – 76 cm thick and was characterized by dark greyish brown sandy clay. It produced LSA lithic artifacts, IA pottery, slag, tuyere fragments, bones, and daubs. Layer 2 was 44 – 58 cm thick and consisted of dark brown sandy clay. Recovered materials include LSA lithic artifacts, IA pottery, slag, bone and daubs. Layer 3 was on average 120 cm thick and was comprised of brownish red sandy clay with black mottling. This layer yielded exclusively LSA lithic artifacts.

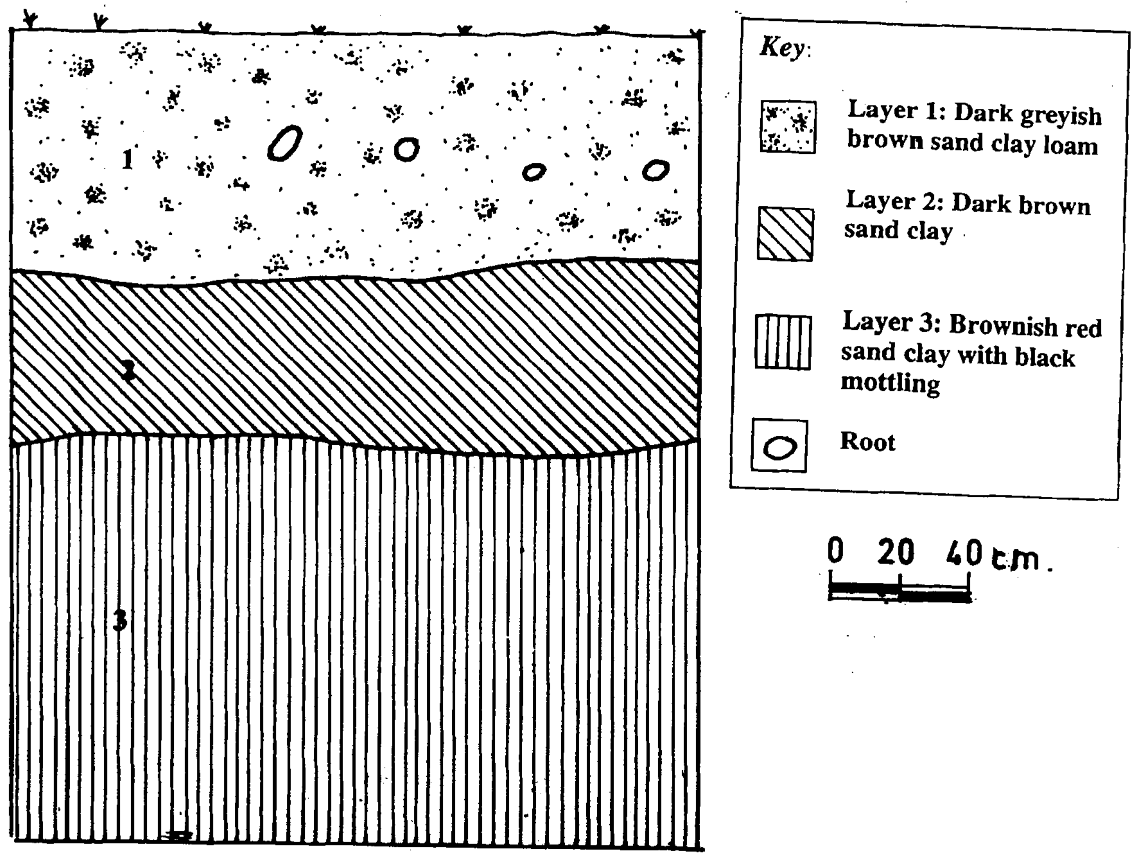


Figure 5.21. Markasi Lusangi 2 Unit 2: southern wall profile

Unit 2 Cultural Assemblages and Dating

Table 5.30 is a summary of excavated finds from Unit 2 arbitrary levels. As was the case in Unit 1, artifact sequences show a clear break into two cultural components. The upper sequences including Levels 1, 2, 3 and 4 (Layer 1 and upper 2) consist of a mixture of LSA lithics and IA artifacts (pottery tuyeres and slag), while lower sequences

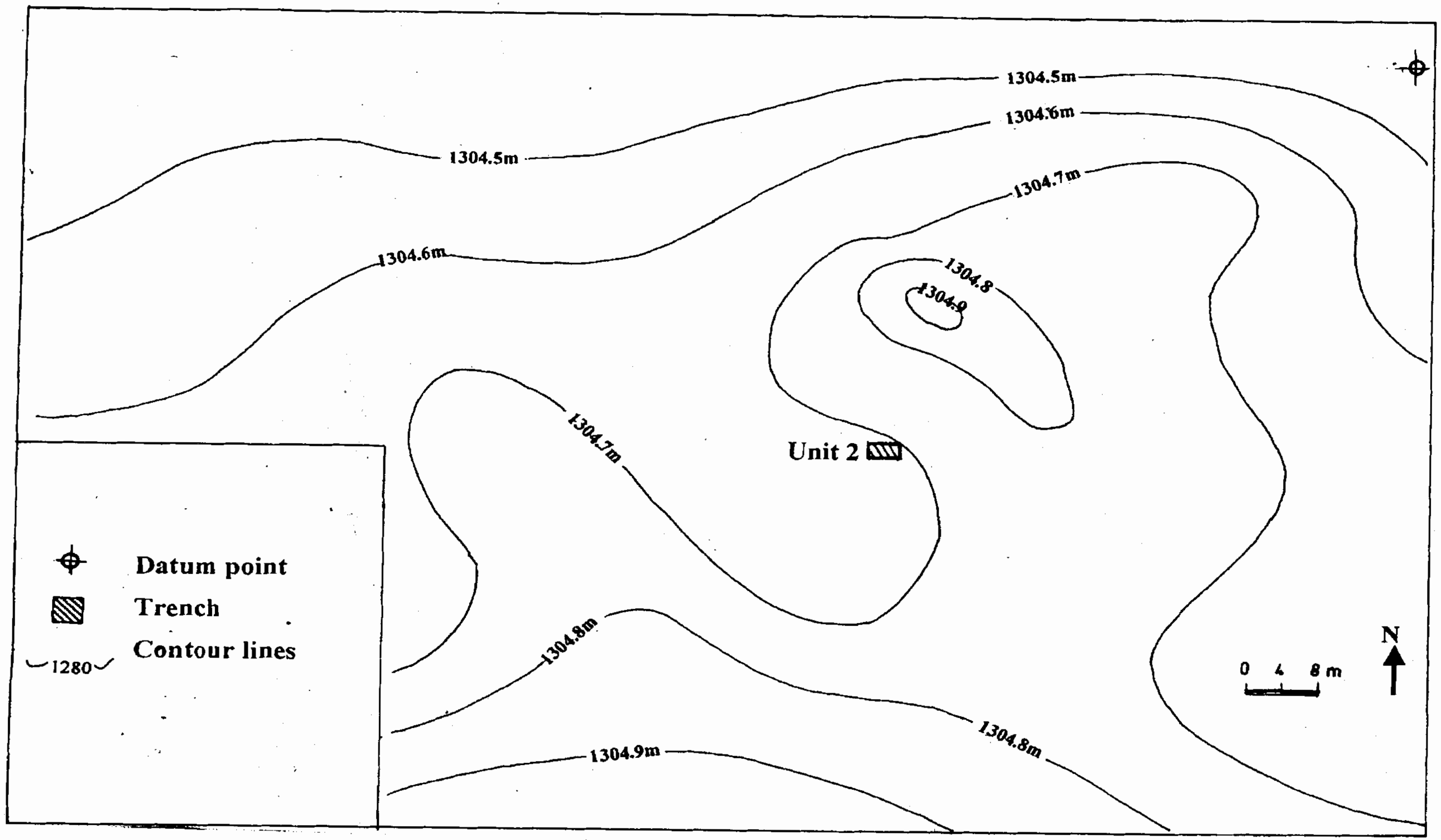


Figure 5.22. Locality 4: Markasi Lusangi 2 Unit 2

Table 5.30. Markasi Lusangi 2 Unit 2: summary of excavated finds in arbitrary levels

Lithic artifacts	Level													
	1	2	3	4	5	6	7	8	9	10	11	12	Total	%
Tools												1	**1**	0.4
Cores	2	2		4			1	4	8	2	8	4	**35**	15.6
Flakes/blades	3	9	2	26	12	7	3	16	26	2	4	12	**122**	54.2
Angular fragments				(3) 16	(0.1) 2	(0.5) 5	(0.7) 4	(1.1) 4	(1.5) 7	(1) 8	(1) 7	(1.8) 11	**(10.7) 64**	28.5
Non-flaked stones				2					1				**3**	1.3
Total	**5**	**11**	**2**	**48**	**14**	**12**	**8**	**24**	**42**	**12**	**19**	**28**	**225**	**100.0**
%	2.2	4.9	0.9	21.3	6.2	5.3	3.6	10.7	18.7	5.3	8.4	12.4	**100.0**	
Non-lithic artifacts														
Pottery	12	48	19	14									**93**	
Slag	(37) 2	(243) 24	(599) 50	(77) 10									**(879) 86**	
Pieces of tuyere	1	4	5										**10**	
Bone	1	2		1									**4**	
Daub	2	22	35	42	2								**103**	

*numbers in parenthesis are weight in grams

including Level 5 – 12 (Layer: lower 2 and 3) yielded exclusively LSA lithic materials. Only one shaped tool was recovered while flakes/blades dominate the lithic assemblage (Table 5.30). In general lithic artifacts occur in higher frequencies in the lower levels. The largest number of lithic artifacts occurred in Level 4 (Layer 2) just immediately after the introduction of pottery prior to their decline in the upper levels. A small amount of decorated pottery was recovered from Layers 1 and 2 (Level 1 - 4) and described in Chapter 6 (see Figure 6.20a-c). With a few exceptions, most slag fragments are small, rough and porous, and were probably the by-products of forging rather than smelting activities. Daub was the most common non-lithic artifact (Table 5.30). The fragments were very small and their association with iron slag suggests that they resulted from forging activities.

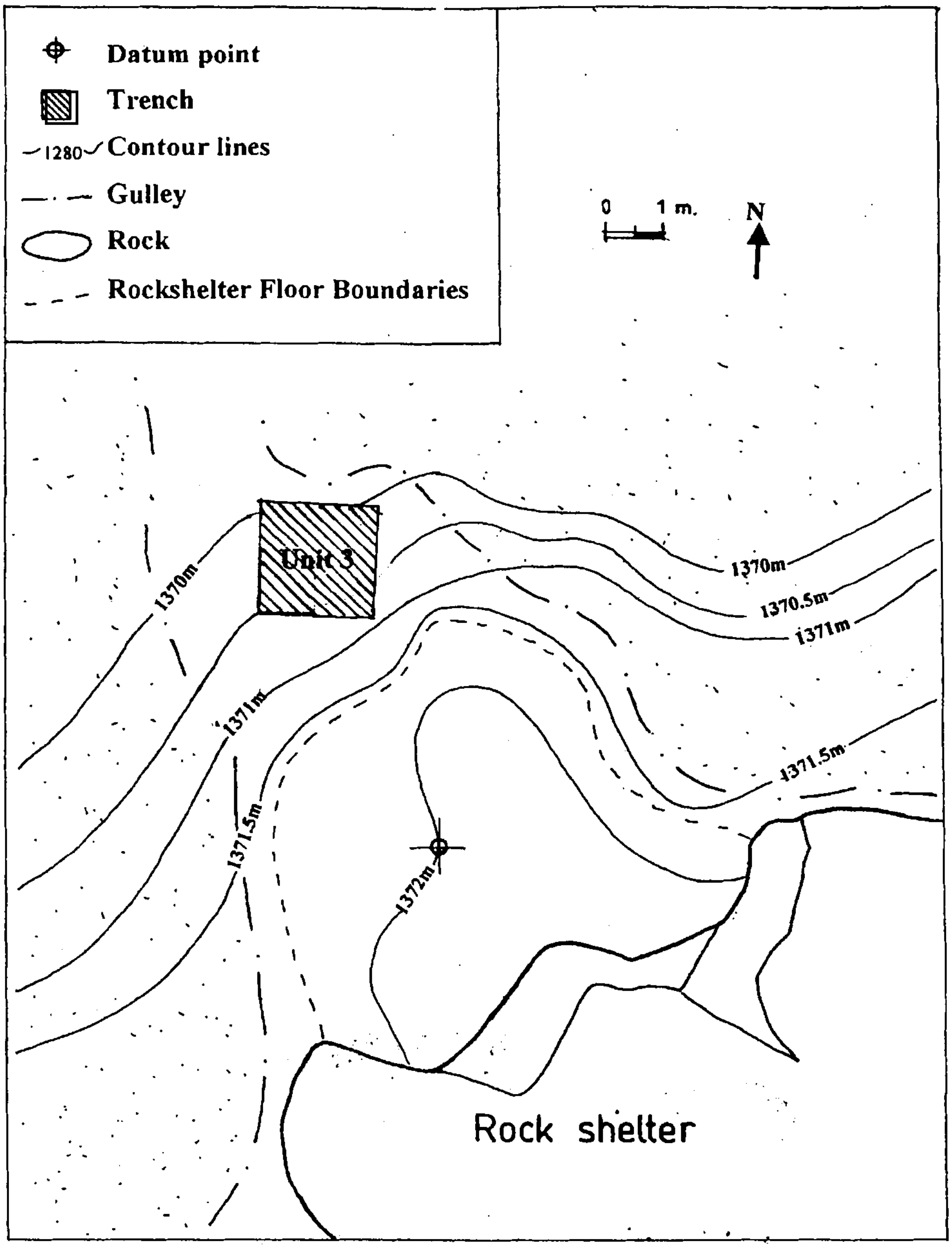
One charcoal sample collected from Level 4 at 70 cm below surface, (lower part of Layer 1) has been dated to 1030 ±40 BP, calibrated to AD 1010 (AD 960 -1040) (Beta 176188) (Table 5.26). This date coincides well with the beginning of LIA in east and central Africa (Huffman 1989; Phillipson 1976a:212-4, 1977a) and its association with LIA pottery (Chapter 7) and iron-working remains confirms this determination. The pottery associated with this date is described in Figure 6.20b, Chapter 6. Throughout the entire Pahi project this is the only diagnostic pottery where an undisputed date was obtained. As shall be discussed later the association of pottery and iron-working remains suggests that the two technologies were introduced to the area at more or less the same time. Moreover, the artifacts associated with this date, including lithics, pottery, slag and daub constitute evidence for the beginning of the transition from dependency on stone to iron tools in the Pahi region. As will be demonstrated in Chapter 7 lithic production was not abandoned immediately after the introduction of iron-working but both continued to be used side by side until recent times.

Unit 3

Unit 3 is located in a rock-shelter that was inventoried by Leakey (1983) as P1 or Pahi 1 (Plate 5.8). Rock-shelter P1 is situated on the northeastern slope of Muheya Hill at about 1372 asl overlooking the Pahi flatlands to the north and northwest. To the immediate south, east and west of the shelter is the forest that covers the slopes of Muheya Hill. The rock-shelter is 125 m and 285 m southwest of Unit 1 and 2 respectively (Figure 5.13). It is formed by an overhang boulder that is several meters high (Plate 5.8). Similar to Rock-shelter P44, P1 is located on a high plain, providing a good overview of the lowlands. On the rock-shelter walls are paintings depicting animals, a human, human hands, and a sun. Most of the drawings were executed in red and white outline and a few were painted in a yellow wash (Plate 5.9). The white images are geometric and abstract in form. Animals were depicted mostly in red with a few in yellow and they include rhinoceros, eland, giraffe and antelope. Additional details on the drawings can be found in Leakey (1983). The rock-shelter affords protection from the elements and can accommodate more than ten people.

The purpose of excavating the rock-shelter was to obtain comparative data for open-air sites. Unit 3 was placed at 7.5 m northwest of the rock-shelter (Figure 5.23), assuming that a midden area would be present. The relatively high quantities of bone collected from this Unit supports this assumption (Table 5.31). Unit 3 was located on steeply sloping ground and consequently excavation by natural layers was the best option. The unit was 2 x 2 m in dimension.

Figure 5.23. Locality 5: Markasi Lusangi 2 Unit 3



Litho-stratigraphy

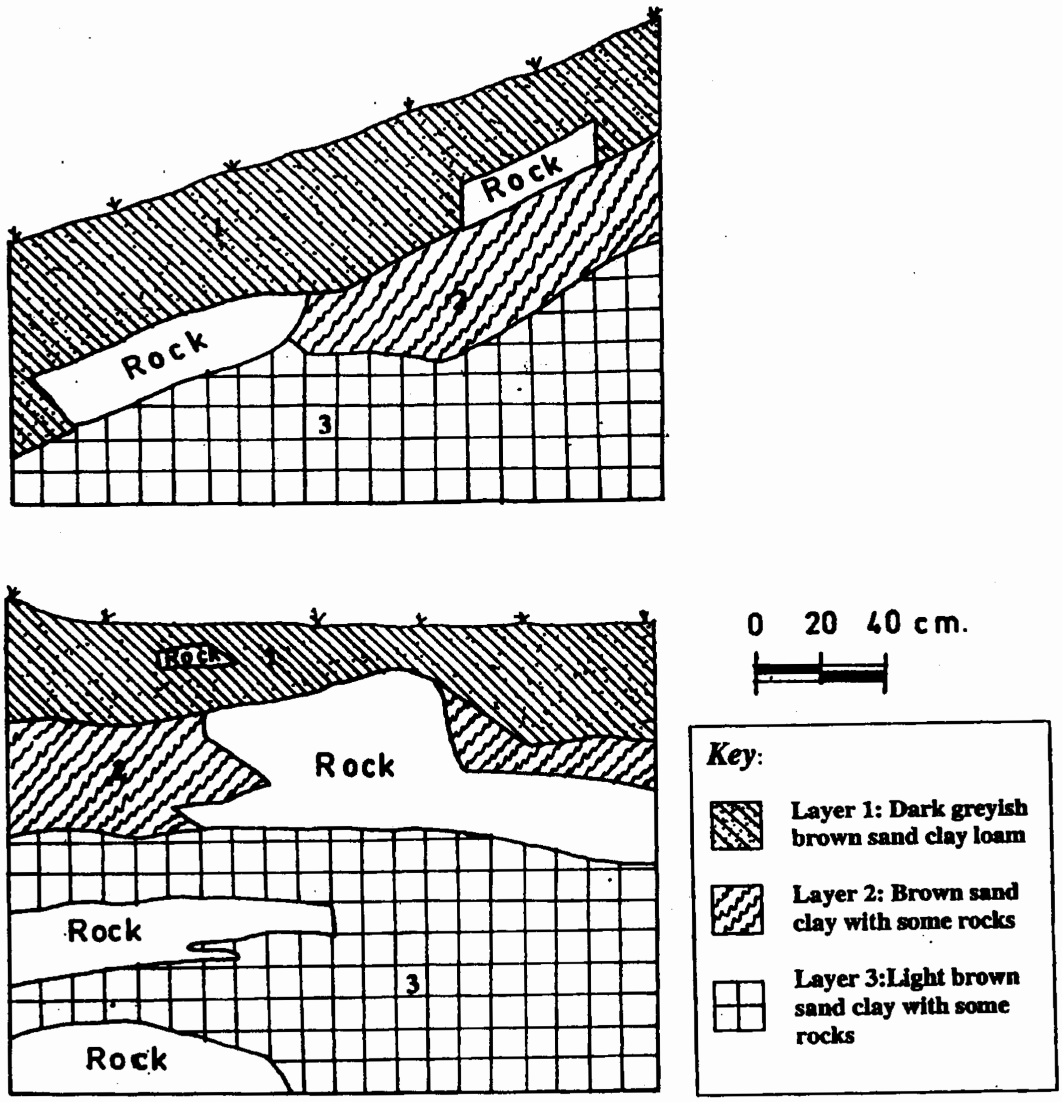
Unit 3 consisted of 3 discrete layers as illustrated in Figure 5.24. The types, amount and weight of recovered cultural materials are described in Table 5.31). The first layer was comprised of a 38-68 cm thick dark greyish brown sandy clay loam and produced lithics, bone, pottery, slag, white chalk, land snail shells, pieces of red ochre, tuyere fragments and ostrich eggshell. The second layer consisted of 18 - 36 cm thick brown sandy clay with some rocks. Recovered materials included lithic artifacts, bone, burnt clay, pottery, slag, white chalks, pieces of iron, and single occurrences of red ochre,

Table 5.31. Markasi Lusangi 2 Unit 3 (Rock-shelter P1): summary of excavated finds in natural layers

Lithic artifacts	Layer				
	1	2	3	**Total**	%
Tools	54	71	31	**156**	1.4
Cores	137	299	67	**503**	4.6
Flakes/blades	1868	2840	506	**5214**	47.9
Angular fragments	(351) 1575	(608) 3132	(65) 316	**(1024)** **5023**	46.1
Non-flaked stones		1		**1**	< 0.1
Total	**3634**	**6343**	**920**	**10,897**	**100.0**
%	33.4	58.2	8.4	**100.0**	
Non-lithic artifacts					
Pottery	238	81	1	**320**	
Slag	(370) 98	(58) 15		**(428)** **113**	
Metal		2		**2**	
Pieces of tuyere	2	1		**3**	
Bone	1789	1660	87	**3536**	
Ostrich eggshell	2			**2**	
Land snail shell	3	1	1	**5**	
Red ochre	3	1	5	**9**	
White chalk	14	15		**29**	
Burnt clay		136		**136**	

*numbers in parenthesis are weight in gram

Figure 5.24. Markasi Lusangi 2 Unit 3: Above, eastern wall profile. Below, southern wall profile



tuyere and land snail shell. The third layer was 14 - 80 cm thick and was composed of light brown sandy clay with some rocks. This layer produced lithics, bone, pieces of red ochre, pottery and land snail shell. The quantity of cultural remains dropped dramatically on reaching a depth of 153 cm bd and excavation was stopped after reaching bedrock at a depth of 163 cm.

Soil Samples

Three soil samples for flotation were taken from levels 0 – 20 cm, 20 – 40 cm and 40 - 60 cm at the northern wall of Unit 3. Only 1 unidentifiable seed (?*Rosaceae*) was recovered from the soil sample at level 0-20 cm.

Unit 3 Cultural Assemblages and Dating

The summary of excavated finds by Layers is shown in Table 5.31 and indicates a break in sequence of artifacts into two cultural components. Layers 1 and 2 consist of a mixture of LSA lithics and IA artifacts including pottery, slag and metal fragments. The second component is found in Layer 3 which is dominated by LSA lithic artifacts, with a single IA potsherd. Relative to the sequence of the artifacts Layer 1 and 2 in this same unit, and the general artifact sequence of Markasi Lusangi 2, the IA pottery in Layer 3 is possibly intrusive. That this was the case is demonstrated by the fact that most of the other IA indicators such as slag, metal and pottery in Unit 3 dominated the upper stratigraphical sequences (Layers 1 and 2) and were almost absent from Layer 3.

Layer 2 produced over half (58.2%) of the total recovered lithic artifacts while flake/blades were the most frequent representing 47.9%. Units 3 demonstrates low percentages of tools and cores compared to debitage (flakes/blades and angular fragments) suggesting that the area was used as a lithic workshop. Most of the pottery was recovered from Layer 1. A small amount of decorated pottery was recovered from this unit and is described in Figure 6.20d-e and f-k, in Chapter 6. However most potsherds were of a miscellaneous type not common among Pahi ceramic categories. The presence of tuyere fragments and slag in Unit 3 suggests that the site may have been used for forging iron. This is supported by small size and porous texture of the slag. As was the case at Lusangi 1 Unit 1 (Rock-shelter P44) red ochre remains are generally found in lower levels compared to white chalks. At Unit 3 white chalk and red ochre occur together in the two upper layers (1 and 2), however only red ochre is found in the lowest Layer (3). Again this implies that red ochre was the first raw material to be used in producing the art in Rock-shelter P 1, although sometime later both red ochre and white chalk were used to execute paintings (Table 5.31).

One charcoal sample collected from Layer 2 at 97 cm bd, has been dated to 4510 ±70 BP, calibrated to BC 3180 (BC 3370-2930) (Beta 176190) (Table 5.26). Remains associated with this date include lithics, pottery, slag, iron, white chalks, red ochre, burnt clay, bones and fragments of tuyere and land snail shell fragments (Table 5.31). This date is too early for the pottery and iron-working remains. It is highly likely that materials have been mixed by slope wash in Unit 3 or the charcoal sample was contaminated.

Unit 4

Unit 4 is located 160 m southwest of Unit 1 and 100 m northwest of Unit 3 (Figure 5.13). The area is covered by acacia scrub and does not appear to have been cultivated in recent times. The area was selected for excavation after finding massive pieces of slag on the surface. Judging from the extent of surface scatters of slag, the locality was a significant smelting site. Unfortunately, we were unable to locate the smelting furnace. Unit 4 is 1 x 2 m and was excavated to 1.2 m by 20 cm level intervals.

Litho-stratigraphy

Unit 4 consisted of 3 discrete layers as illustrated in Figure 5.25. The recovered materials are described in Table 5.32. Layers 1 and 2 produced similar types of cultural materials, however in different quantities. Both layers yielded LSA lithic artifacts, slag, bones, tuyeres and furnace wall fragments. As was the case for Baura 3 Unit 1 the association of bones with slag suggests that an animal was brought to the site as a sacrifice to ensure a successful smelt (see Barndon 1996; Schmidt 1996b). If slag weight can be taken for a comparison, Layer 1 yielded over 31 times more slag than Layer 2. Layer 1 was 25 – 40 cm thick and was characterized with dark greyish brown sandy clay loam while Layer 2 was 35 – 48 cm thick and consisted of dark brown sandy clay. Layer 3 was on average 25 cm thick and was characterized by brown sandy clay. Only LSA lithic artifacts were recovered from this deepest layer.

Unit 4 Cultural Assemblages and Dating

As observed in Table 5.32, in Unit 1 the sequence of artifacts in the stratigraphy can be divided into two components. A component with a mixture of LSA lithics and IA artifacts, mainly slag and tuyere fragments, dominate the upper sequences including Levels 1-4 (Layer 1 and 2) while a second component consisting of exclusively LSA lithic artifacts is prevalent in Levels 5 and 6 (Layer 3). Overall, slag was recovered in larger quantities than any other artifact and dominated the upper levels (Layer 1) of the

Figure 5.25. Markasi Lusangi 2, Unit 4. eastern wall profile

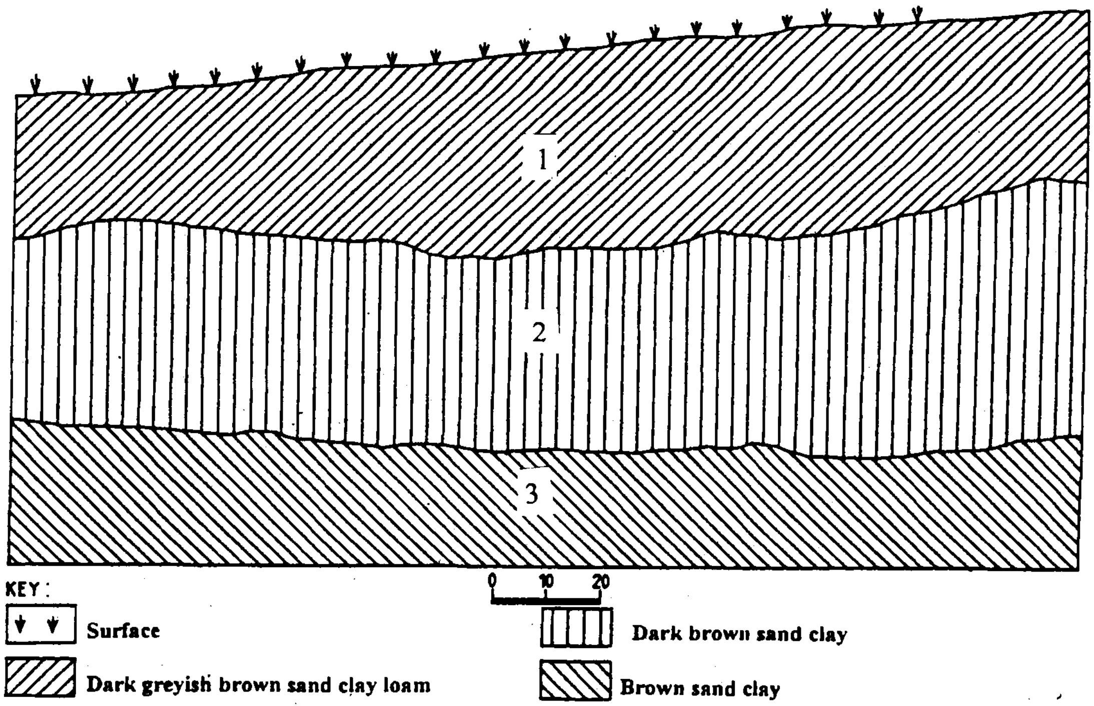


Table 5.32. Markasi Lusangi 2 Unit 4: summary of excavated finds in arbitrary levels

Lithic artifacts	Level							
	1	2	3	4	5	6	Total	%
Tools		1					**1**	0.3
Cores		3	16	10	3		**32**	9.7
Flakes/blades		13	49	86	10	8	**166**	50.5
Angular Fragments			(13) 60	(16) 60	(2) 7	(1) 3	**(32)** **130**	39.5
Non-flaked stones								
Total		**17**	**125**	**156**	**20**	**11**	**329**	**100.0**
%		5.2	38.0	47.4	6.1	3.3	**100.0**	
Non-lithic artifacts								
Slag	(5886) 642	(54,112) 7939	(1814) 1100	(83) 70			**(61,895)** **9751**	
Pieces of tuyere	18	10	17				**45**	
Furnace wall	14		6	1			**21**	
Bone	1	96	7	10			**114**	

*numbers in parentheses are weight in grams unit. The amount of slag recovered at this unit was greater and it occurs in larger fragments than that of any excavated units in the Pahi project. Some of the recovered bones were charred suggesting that they were burned at the time of smelting. Of all excavated units in the entire Pahi project this is the only one which did not produce pottery. Level 4 (Layer 2) yielded the largest amount of lithic artifacts while Level 6 (Layer 3) produced the least. Flakes/blades occurred at higher frequencies than any other lithic artifacts while only one shaped tool was recovered from the entire unit. As was the case for Unit 1 and 2, lithic production at Unit 4 increased dramatically at the initial period of metal-working/LSA transition before decreasing again in upper levels (Table 5.32).

A charcoal sample collected from Level 2 at 32 cm bd (Layer 1) has been dated to 760 ±60 BP, calibrated to AD 1270 (AD 1180-1300) (Beta 176193) (Table 5.26). This determination is significant because it dates an iron smelting site that is intermediate in age between those at Baura 1 Unit 2 and Markasi Lusangi 2 Unit 2. This evidence from the two sites suggests that pottery and iron-working were adopted roughly at the same period.

Summary of Markasi Lusangi 2

In the overall analysis it can be concluded that, similar to Lusangi 1, materials excavated from Rock-shelter P1 differed from those of adjacent open-air units. Variation is most pronounced in terms of quantity rather than type of artifacts recovered. For example, Unit 3 (Rock-shelter P1) yielded approximately 16 times the quantity of lithic artifacts recovered from Unit 1, 2 and 4 (open air units) combined (Tables 5.29, 5.30, 5.31 and 5.32). This suggests that rock-shelters were more regularly used for knapping activities than adjacent open-air sites. In addition, the presence of white chalks and red ochre at Rock-shelter P1 and their absence at open-air units supports an interpretation in their use in rock art production. Finally one notable difference between rock-shelters P44 and P1 is the absence of slag at the former site.

Markasi Lusangi 2 is also exceptionally rich in iron-working remains. All units yielded slag but in varying quantities. The largest amount of slag was recovered in Unit 4 while smaller amounts were obtained from Units 1, 2, and 3. The varying quantity and texture of the slag remains at Markasi Lusangi 2 probably reflect different activities. The areas in Unit 2 and 3 (Rock-shelter P1) were probably used for forging while the area around Unit 4 was definitely used for smelting. The artifacts of Units 1, 2 and 3 at Markasi Lusangi 2 indicate that lithic production increased dramatically at the initial period of metal-working/LSA contact before decreasing in upper levels (compare Levels 3 and 4 in Table 5.29, 4 and 5 in Table 5.30 and 3 and 4 in Table 5.32 to the other levels in the respective units). This suggests an increase in population or activities at the sites as a result of establishment of permanent settlements by the LSA hunter-gatherers. Finally, all units at Markasi Lusangi 2 consist of two components in which upper stratigraphic sequences are comprised of a mixture of LSA and IA artifacts while the lower are composed of almost exclusively LSA lithics. Chronology from Markasi Lusangi 2 Units 2 and 4 indicates the IA tradition was acquired at the site between 760 ±60 and 1030 ±40 BP. These dates are consistent with the period when LIA was widespread in most areas of east and central Africa (Phillipson 1976a:212-4, 1977a:53-209, Huffman 1989).

Lusangi 3

Lusangi 3 is located at 1304 -1312 m asl and 1.75 km southwest of Pahi town northeast of Muheya Hill (Figure 4.4). It is also about 0.7 km southeast of Lusangi 1 and 0.7 km northwest of Markasi Lusangi 2 (Figure 5.13 and 5.26). The site covers 0.05 square km. Unlike Lusangi 1 and Markasi Lusangi 2 there are no rock-shelters in the vicinity. The presence of several surface scatters of pottery led us to excavate two units at Lusangi 3.

Unit 1

Unit 1 was 2 x 1 m in dimension and was excavated in 20 cm levels to a depth of 2.2 m. The area was under cultivation in the recent past.

Litho-stratigraphy

Unit 1 consisted of 4 discrete layers and its stratigraphy is illustrated in Figure 5.27. The recovered artifacts are described in Table 5.33. Layer 1 was 24 – 26 cm thick and was comprised of light greyish brown sandy clay. Recovered materials include LSA lithic artifacts, IA pottery, slag, bone and daub. Layer 2 was 52 – 80 cm thick and consisted of dark greyish brown sandy clay. It produced LSA lithics, IA pottery, bone, daub and one bead. The glass bead was collected in the upper part of Layer 2 (Level 2, see Table 5.33) and indicates these deposits to be not more than a century old. Only LSA lithic artifacts and bones were recovered from Layers 3 and 4. Layer 3 was 18 – 44 cm

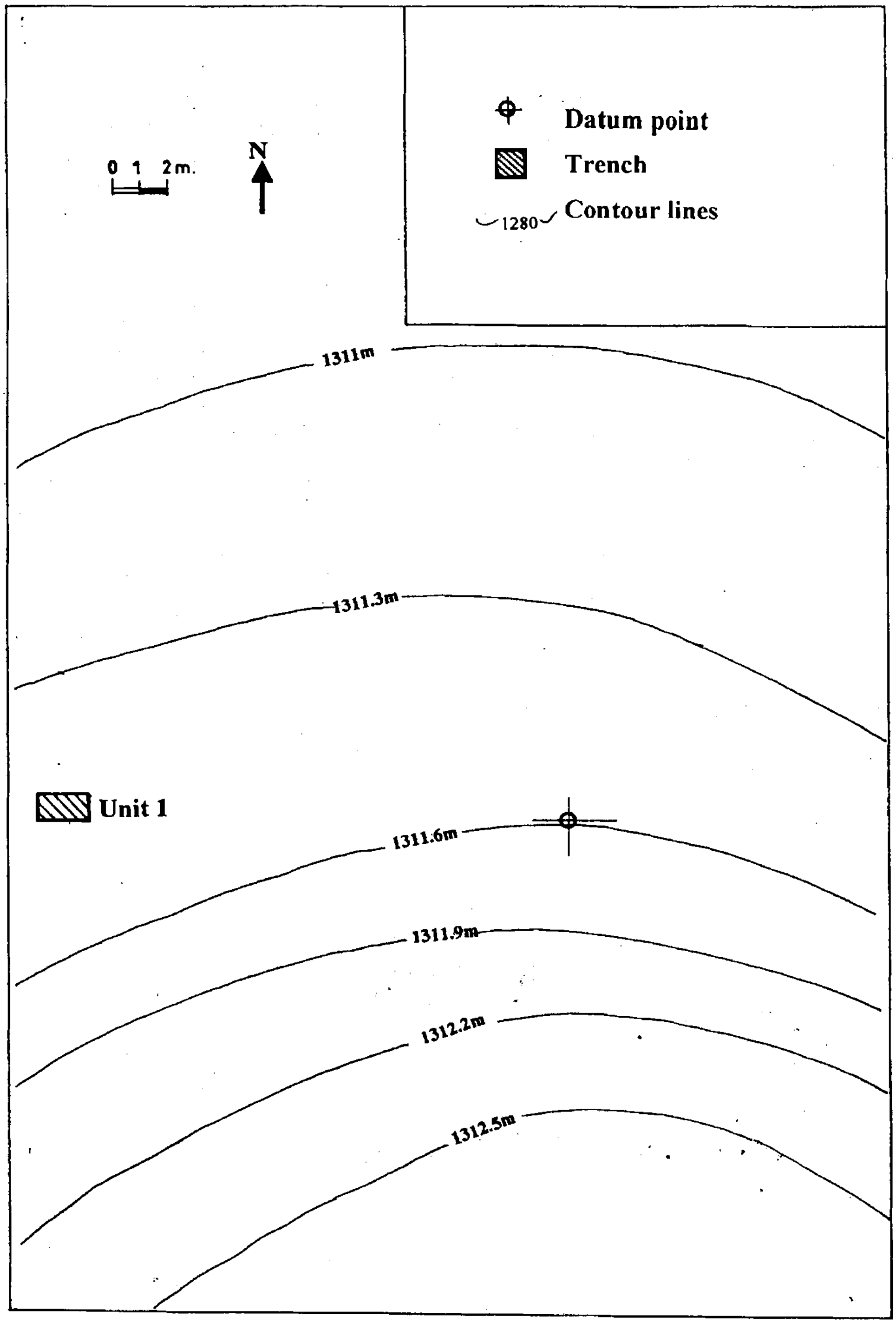
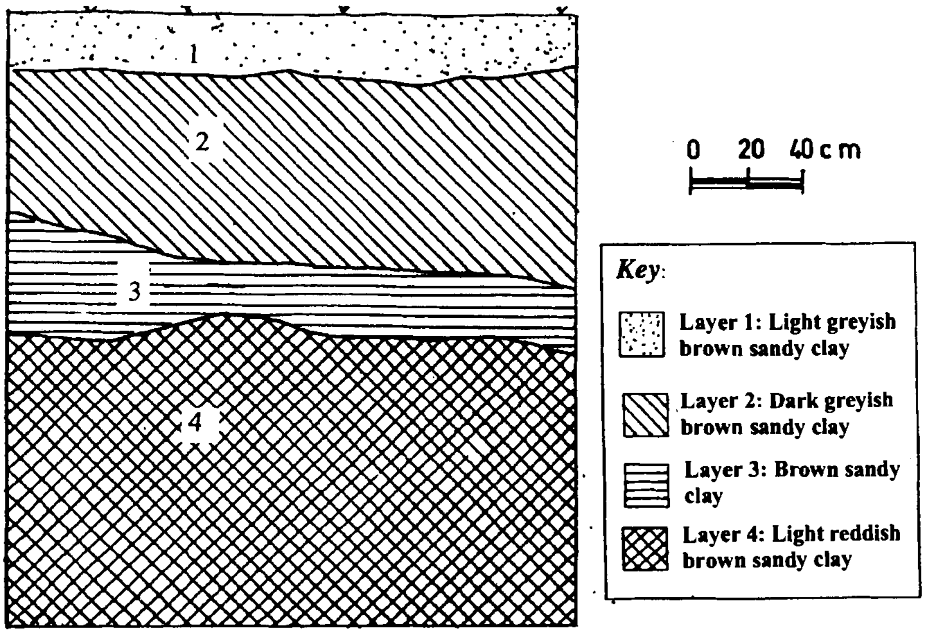


Figure 5.26. Locality 6: Lusangi 3 Unit 1

Figure 5.27. Lusangi 3 Unit 1: southern wall profile



thick and was comprised of brown sandy clay while Layer 4 was 98 – 112 cm thick and consisted of light reddish brown sandy clay.

Unit 1 Cultural Assemblages

The summary of excavated finds shown in Table 5.33 indicates that the sequences of the artifacts in the stratigraphy can be divided into two components. A component with a mixture of LSA lithics and IA pottery is prevalent in the upper strata including Levels 1, 2, 3 and 4 (Layer 1 and middle 2) underlain by a component with almost exclusively LSA artifacts in Levels 5-10 (Layer, lower 2, 3 and 4). A glass bead in Level 2 (upper Layer 2), if not intrusive, suggests that some of the upper deposits are not more than a century

Table 5.33. Lusangi 3 Unit 1: summary of excavated finds in arbitrary levels

Lithic artifacts	Level											
	1	2	3	4	5	6	7	8	9	10	Total	%
Tools				1							**1**	0.6
Cores	2			5	3	2	1		2		**15**	8.2
Flakes/blades	2	1	2	22	15	21	12	3	12	9	**99**	54.4
Angular fragments			(0.4) 2	(0.4) 4	(1.4) 13	(3.2) 23	(0.4) 4	(0.8) 7	(1.4) 12		**(8) 65**	35.7
Non-flaked stones	1				1						**2**	1.1
Total	**5**	**1**	**4**	**32**	**32**	**46**	**17**	**10**	**26**	**9**	**182**	**100.0**
%	2.7	0.5	2.2	17.6	17.6	25.3	9.3	5.5	14.3	4.9	**100.0**	
Non-lithic artifacts												
Pottery	243	21	1	1							**266**	
Slag	(3.8) 1										**(3.8) 1**	
Bone	31	7	1		1			1			**41**	
Daub	4		3	2							**9**	
Bead		1									**1**	

*numbers in parenthesis are weight in grams

old. Level 1 (Layer 1) yielded more than ten times the pottery recovered from the entire Unit (Table 5.33). Most were body sherds lacking diagnostic features. Three body sherds from Layer 1 had decorations that resemble those of category A in Chapter 6 (Figure 6.13 a-b) while one rim sherd had decorations on the neck that resembles those in Figure 6.13c. Flakes/blades were the most frequent lithic artifacts with only one shaped tool present (Table 5.33). As was the case for Unit 1, 2 and 4 at Markasi Lusangi 2, Unit 1 yielded higher frequencies of lithic artifacts at the period just immediately before and after the metal-working/LSA inter-face then declining again in the upper levels (compare Levels 4, 5 and 6 to the rest in Table 5.33). The presence of slag in Layer 1 suggests that iron-working was practiced in the vicinity. The appearance of daub in Level 2 just before the introduction of pottery may indicate the beginning of permanent settlement at the site.

Unit 2

Unit 2 is located 123 m northwest of Unit 1 in an area that was previously cultivated (Figures 5.13 and 5.28). The unit measured 2 x 1 m and was excavated in five 20 cm levels to a depth of 1 m.

Litho-stratigraphy

Unit 2 consisted of four discrete layers (Figure 5.29). The types and quantities of recovered artifacts are described in Table 5.34. Layer 1 was 12 – 20 cm thick and was comprised of light greyish brown sandy clay. Recovered artifacts include two flakes, IA

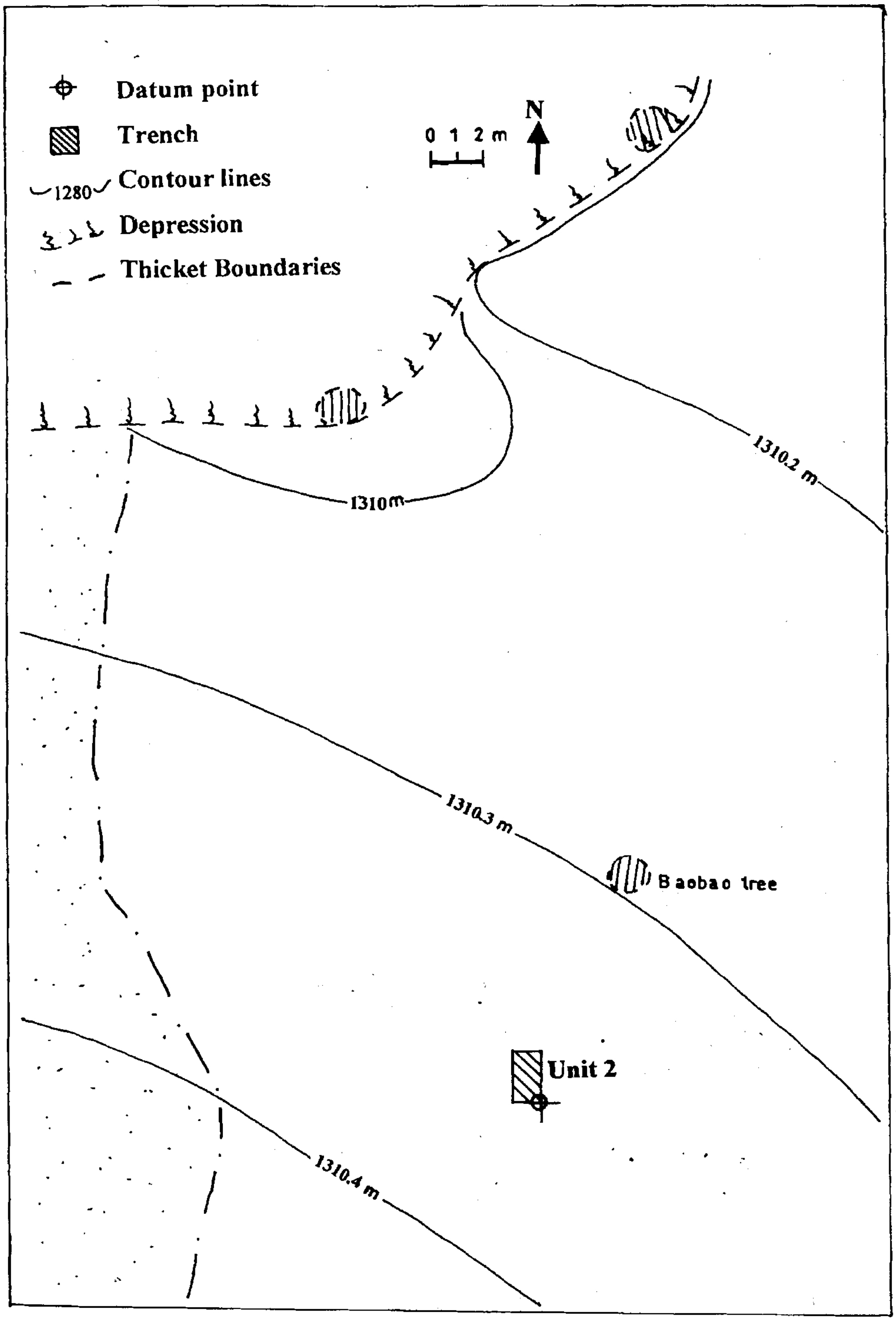


Figure 5.28. Locality 7: Lusangi 3 Unit 2

Figure 5.29. Lusangi 3 Unit 2: western wall profile

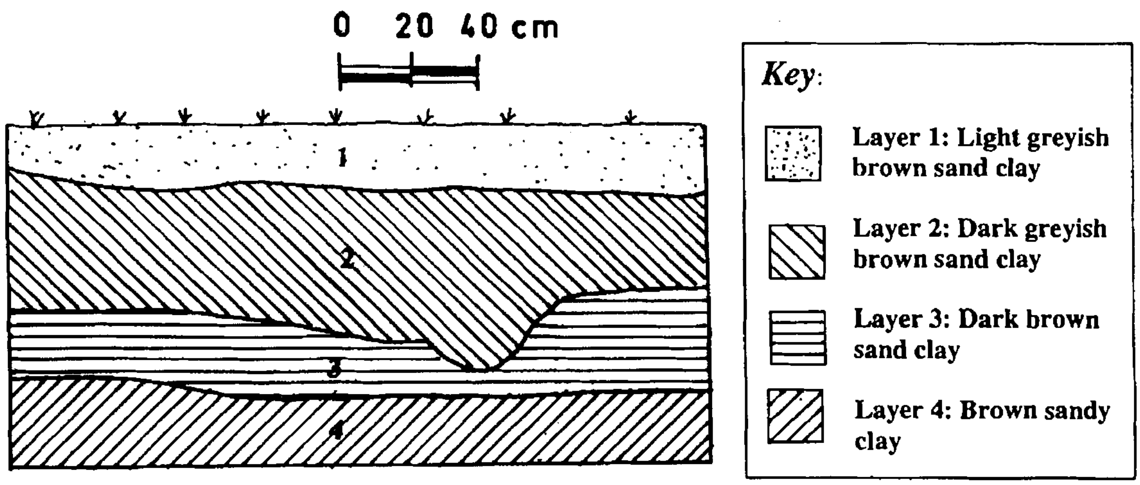


Table 5.34. Lusangi 3 Unit 2: summary of excavated finds in arbitrary levels

Lithic artifacts	Level						
	1	2	3	4	5	**Total**	%
Tools							
Cores							
Flakes	2					**2**	100.0
Non-Flaked stones							
Total	**2**					**2**	**100.0**
Non-lithic artifacts							
Pottery	110	1				**111**	
Bone	31	1				**32**	
Land snail shell	1					**1**	
Daub	36	4	14			**54**	
Glass	1					**1**	

pottery, bone, land snail shell, daubs, and a piece of glass. Layer 2 was 26 – 51 cm thick and was characterized by dark greyish brown sandy clay. Recovered materials include IA pottery, bone and daubs. Layer 3 and 4 were sterile therefore excavation was stopped.

Layer 3 was 6 – 27 cm thick and consisted of dark brown sandy clay, while Layer 4 was 18 - 25 cm thick and was characterized with brown sandy clay.

Unit 2 Cultural Assemblages

In comparison to Unit 1, the depth of the cultural deposits in Unit 2 is very shallow despite the proximity of the two Units (Table 5.34). In the overall analysis, Unit 2 yielded very small quantities of cultural remains except for the top 20 cm. Also lithic artifacts are almost nonexistent with only two flakes collected from Level 1 (Layer 1, Table 5.34). Pottery was recovered in higher amounts than any other artifact and most of it was found from Level 1 (Layer 1). Two sherds, one with decorations that resemble category A Figure 6.13a and another equivalent to category I Figure 6.15c were present. In general the deposits in Unit 2 can be categorized as representing only one component consisting of a mixture of LSA lithics and IA artifacts. A substantial amount of daub was obtained from Level 1 - 3 (Layer 1 and 2) suggesting that a mud house was erected at the site.

Summary of Lusangi 3

In general the cultural deposits at Lusangi 3 Unit 1 as in most of sites excavated in the Pahi project consist of two cultural components (Table 5.33) with one component with a mixture of LSA lithics and IA artifacts dominating the upper stratigraphic sequences and a component with exclusively LSA lithics prevailing in the lower sections of profiles. Pure LSA cultural deposits are nonexistent in Unit 2. In both units daubs appear together with the introduction of the IA tradition possibly marking the beginning of permanent settlements at the site.

Lusangi 4

Lusangi 4 is located 1.75 km southeast of Mnenya town, northeast of Muheya Hill at an elevation of 1280m asl. It is about 4.1 km west of Pahi town and 2.2 km northwest of Lusangi 1 (Figure 4.4). To the immediate north and northwest is the Mnenya River and the site itself is a former Public Works Department camp (PWD) which is now in ruins (Figure 4.4 and 5.30). Although the Mnenya River is a seasonal stream, water can be obtained from the valley during the dry season by digging shallow pits. The site was reported to us by villagers and is beyond the survey area boundaries. It was quite small, covering about 32,000 m^2 and had a high concentration of lithics and pottery, especially around the PWD camp. To the east and southeast of the camp are two boulders which may have been used in the past as a place for lithic knapping although they are unlikely to have provided adequate shelter space for camping. Lithic artifact scatters extend to these boulders and according to local informants one of the boulders had rock paintings which have since deteriorated. Looting has taken place at one of the boulders which resulted in the destruction of the sequence of cultural deposits. In general, most of the area near the abandoned PWD camp and the boulders have been subjected to erosion and there has been much disturbance.

Unit 1

Unit 1 was placed 138 m south of the PWD camp to avoid a section that had been subjected to extreme disturbance (Figure 5.30). It was 1 x 2 m and was excavated in three 20 cm levels to a depth of 0.6 m bd.

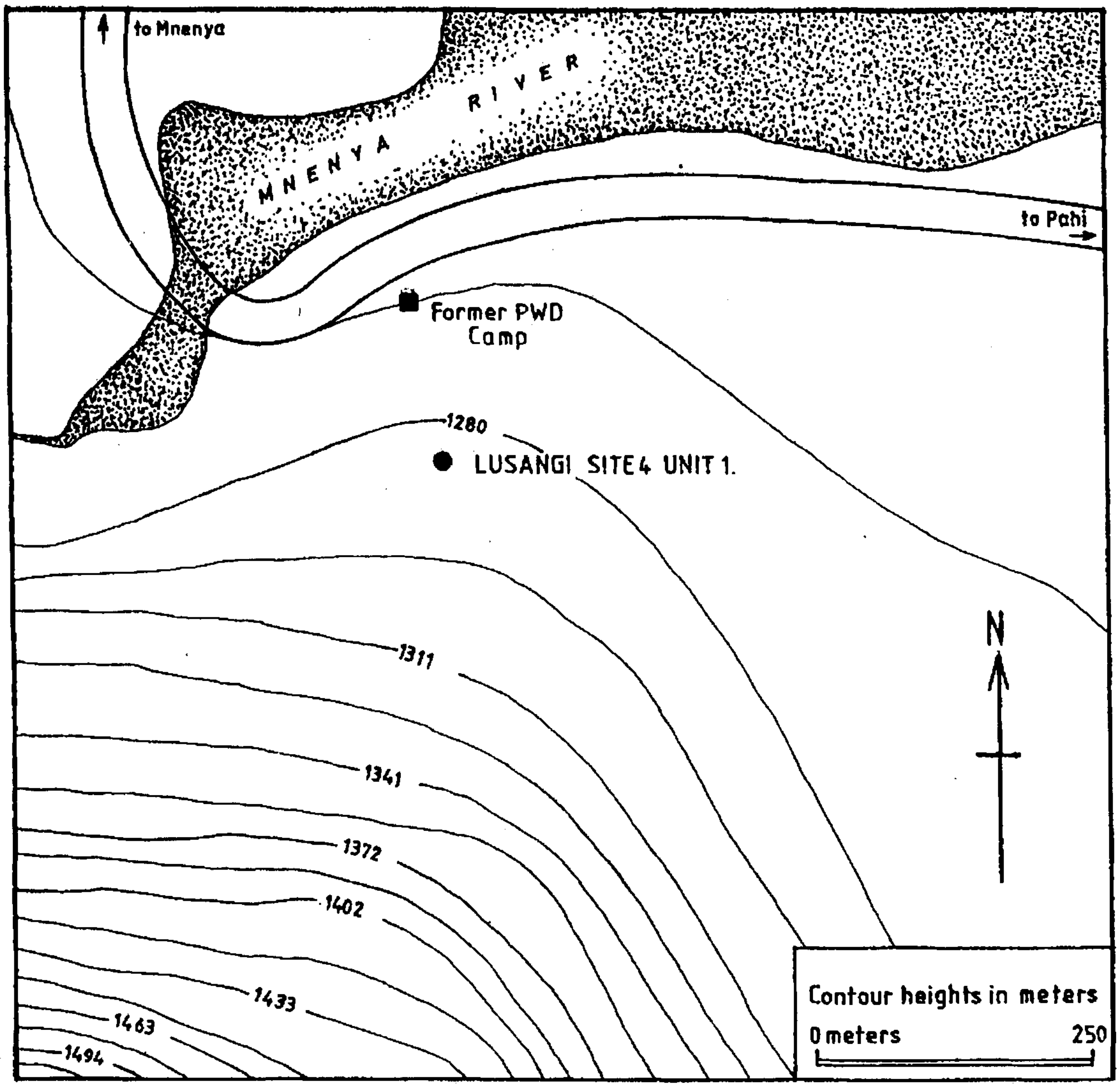


Figure 5.30. Location of Lusangi 4

Litho-stratigraphy

Unit 1 consisted of two discrete layers (Figure 5.31). The types and amount of the excavated artifacts are described in Table 9.34. Only small numbers of artifacts were recovered possibly because the area was marginal to the centre of the site. Layer 1 was 27 – 32 cm thick and consisted of dark grey brown sandy clay. Recovered materials include

LSA lithic artifacts, IA pottery and a land snail shell. Layer 2 was 24 – 31 cm thick and was composed of red brown sandy clay. It produced LSA lithic artifacts and one bone.

Unit 1 Cultural Assemblages

Unit 1 was placed at the marginal area of the site and as a result only a small number of artifacts was recovered (Table 5.35). Despite this, the stratigraphy displays a sequence that is comparable to other excavated areas. Unit 1 indicates a break of artifacts into two components. A component with a mixture of LSA lithics and IA pottery is prevalent in Level 1 and upper 2 (Layer 1) while a component dominated by lithics is found in the lower Levels - lower 2 and 3 (Layer 2). In the entire unit only 7 lithic artifacts were recovered of which 4 were flakes while 3 were cores (Table 5.35). Pottery was recovered only from Level 1 and upper 2 (Layer 1).

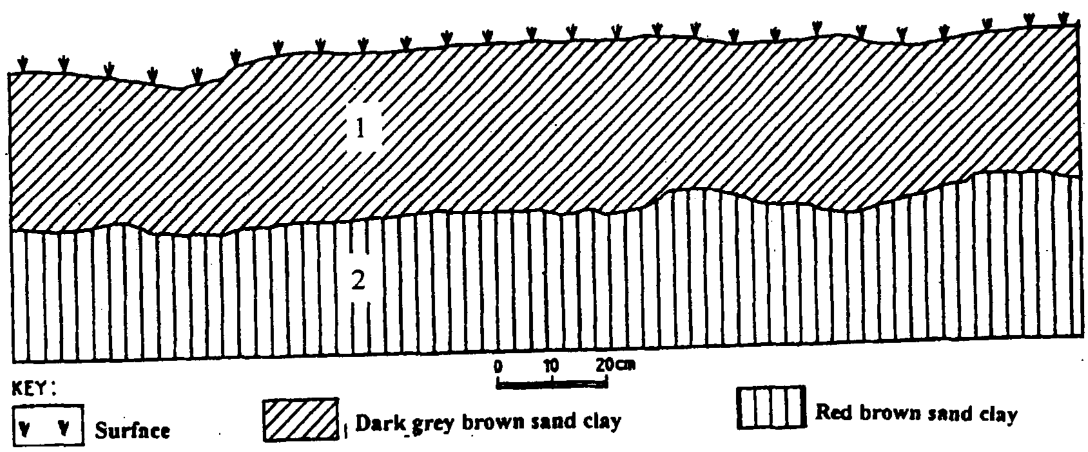


Figure 5.31. Lusangi 4 Unit 1, northern wall profile

Table 5.35. Lusangi 4 Unit 1: summary of excavated finds in arbitrary levels

Lithic artifacts	Level				
	1	2	3	**Total**	%
Tools					
Cores			3	**3**	42.9
Flakes	1	2	1	**4**	57.1
Angular fragment					
Non-flaked stones					
Total	**1**	**2**	**4**	**7**	**100.0**
%	14.3	28.6	57.1	**100.0**	
Non-lithic artifacts					
Pottery	7	1		**8**	
Bone		1		**1**	
Land snail shell		1		**1**	

Chronological Summary

A relatively small number of radiocarbon dates is available for the Pahi sites but several comments can be made regarding the cultural sequence at Baura and Lusangi. An LSA context with exclusively lithic artifacts has been dated to 2500 ±40 BP at Baura 1 Unit 1 Level 5 (Beta 176185). This determination falls well within the currently established range for the central Tanzanian LSA. For example, excavations at Kisese II Rock-shelter in Kondoa (about 24 km northwest of Lusangi) has a date of 18,190 BP for the LSA transitional industry (Deacon 1966:38; Inskeep 1962) and by 3500-1000 BP the LSA was ubiquitous in central Tanzania (Masao 1979:210). As is the case for other central Tanzanian sites, the LSA at Lusangi and Baura may have survived as late as 1000 BP. Iron-working and pottery appear by 1030 ±40 BP or slightly earlier as demonstrated by the date at Lusangi 1 Unit 1 (Beta 176186) (Table 5.26) where LSA and IA pottery are in association. The 1030 BP date as marking the beginning of a transitional period is supported by ceramics recovered in the study area that can be assigned to the LIA (see Chapter 6 and 7). By 760 ±60 BP iron-working was practiced at a substantial scale at Markasi Lusangi 2. Despite this apparent early adoption of iron-working, lithic tools continued to be produced until recent times. This is clearly demonstrated by the sequences of cultural remains in most of the excavated sites as well as a date of 140 ±40 BP obtained from Lusangi 1 Unit 2. The date of 120 ±50 BP (Beta 176192) at Baura 2 and 140 ±50 BP (Beta 176191) from Baura 3 are associated with iron smelting furnaces which indicates that iron-working was practiced until recent times.

5.4. Chapter Summary

During fieldwork 76 STPs and 16 excavation units were completed, of which 43 STPs and 6 excavation units were completed at Baura while 33 STPs and 10 units were excavated at Lusangi. Results from the excavated units generally support those obtained from the STPs survey. It can therefore be concluded that the upper sequences of archaeological deposits at both Baura and Lusangi consist of a component with a mixture of LSA and IA artifacts while lower levels are composed of exclusively LSA lithic remains. The sequence of artifacts in the Pahi profiles is best demonstrated by the excavation results discussed above and summarized in Table 5.36. As observed in Table 5.36, only in a few exceptions was a single cultural component encountered that dominated the whole profile. These include Baura 1 Unit 1, Baura 2 Unit 1, Lusangi 1 Unit 2 and Lusangi 3 Unit 2.

The technology of making pottery and iron smelting seem to have been adopted at a more or less similar period in the Pahi study area. This is best demonstrated by excavation results at Baura 1 Unit 4, Lusangi 1 Unit 3 and Markasi Lusangi 2 Unit 1, 2

Table 5.36. summary of excavated components per unit of all Pahi sites

Site Name	Unit	Affiliated Component					
		Exclusively IA		Mixture of LSA/IA		Exclusively LSA	
		Present (P) or Absent (A)	Position Within Profile	Present (P) or Absent (A)	Position Within Profile	Present (P) or Absent (A)	Position Within Profile
Baura 1	1	A	-	A	-	P	Throughout
	2	A	-	P	Upper	P	Lower
	3	A	-	P	Upper	P	Lower
	4	P	Upper	P	Lower	A	-
Baura 2	1	P	Throughout	A	-	A	-
Baura 3	1	P	Lower	P	Upper	A	-
Lusangi 1	1	A	-	P	Upper	P	Lower
	2	A	-	P	Throughout	A	-
	3	A	-	P	Upper	P	Lower
Markasi Lusangi 2	1	A	-	P	Upper	P	Lower
	2	A	-	P	Upper	P	Lower
	3	A	-	P	Upper	P	Lower
	4	A	-	P	Upper	P	Lower
Lusangi 3	1	A	-	P	Upper	P	Lower
	2	A	-	P	Throughout	A	-
Lusangi 4	1	A	-	P	Upper	P	Lower

and 3 (Tables 5.22, 5.28, 5.29, 5.30 and 5.31) where iron-working artifacts appear together with pottery. Pottery and iron-working appear at Markasi Lusangi 2 by 1030 ±40 BP. However, despite this early introduction of iron, lithic production continued until recent times.

The bases of hillslopes appear to be the preferred site location at Lusangi, while at Baura they are more commonly found in flat-lying areas. This difference may have been the result of the availability of rock-shelters at Lusangi and their absence in Baura. In areas where rock-shelter and open-air sites coexist, rock-shelters consistently demonstrate higher concentrations of lithic artifacts. For example, Rock-shelter P44 (Lusangi 1 Unit 1) produced approximately 43 times the quantity of lithic artifacts recovered from Units 2 and 3 (open air units) combined (Tables 5.25, 5.27 and 5.28). There is a more or less comparable distribution of LSA and IA sites over the landscape at both Baura and Lusangi suggesting continual exploitation of similar habitats by practitioners of both industries. For example out of 26 STP (61%) that produced lithic artifacts at Baura only 2 (4.7%) produced exclusively lithics, while the rest were associated with either pottery, slag, iron objects, daub, pieces of tuyere and furnace walls (Table 5.5). All excavated areas yielded both lithic and pottery artifacts of varying quantities. Baura 2 Unit 1, Baura 3 Unit 1, Lusangi 3 Unit 2 and Lusangi 4 Unit 1, all produced extremely low quantities of lithic artifacts. Pottery was rare at Baura 1 Unit 1, Baura 2 Unit 1 and Lusangi 4 Unit 1, while none was recovered at Baura 2 Unit 4.

CHAPTER 6: ANALYSIS

6.1. Introduction

This chapter describes the analysis of lithic, ceramic and zooarchaeological materials recovered at Baura and Lusangi sites. No detailed analysis was done for the remains of iron-working such as slag and tuyere apart from counting and weighing as indicated in the tables for the summary of the excavated finds in Chapter 5. However a discussion about their significance to the Pahi research findings is described in Chapter 7. As discussed in Chapter 5 all sites produced material remains of both LSA and IA industries. Although some work has been done on the LSA lithic typology for central (Masao 1979) and northeast Tanzania (Mehlman 1989), the IA industry remains inadequately described despite its widespread occurrence in the region. A few researchers (Liesegang 1975; Masao 1979; Odner 1971b; Sutton 1968) provide a brief description of IA pottery from central Tanzania. Apart from Sutton (1968) who assigns pottery from Usandawe (Lelesu) to the EIA and Masao (1979:36-8) whose work attributes Kandaga pottery to LIA, no well-detailed typological or chronological sequence of central Tanzanian pottery has been established. Unfortunately, an adequate sample of diagnostic pottery was not recovered from excavations at Baura and Lusangi. However an attempt was made to define the main features of pottery collected during survey and where possible, sherds were grouped together on the basis of common features displayed.

Lithic artifacts were classified based on Mehlman's (1989) typology with a few additions and descriptive modifications to suit the type of artifacts under discussion. The intention of this typology is to first describe and classify the lithic artifacts into main groups such as cores, debitage, shaped tools and non-flaked implements. Each of the above categories is further broken down into implement types based on the attributes displayed by each artifact such as major flaking patterns, retouch, placement of retouch and general morphology. Although the terminologies used are basically those used by Mehlman (1989), in some instances definitions were modified to make them suitable to the observations made in the Pahi assemblage. This is important since the assemblage studied here comes from a relatively distinct area where craftsmanship may have varied. An example of this is the definition of small convex scraper discussed below. Also "concave backed" pieces was added as a new classification after finding that no such category occurs in Mehlman's terminology. Since Masao (1979) used different terminologies and worked on sites that are closer to Pahi, attempts also are made to relate his typological categories to those used in this study. In addition, wherever possible a comparison of lithic artifacts based on type and quantative analysis is attempted between the sites under investigation to other known sites in Tanzania and East Africa. Finally, this chapter also presents a detailed description of raw materials used in making lithic artifacts and considers the strategies used to exploit different raw materials and core reduction strategies. With the exception of Unit 3 at Markasi Lusangi 2 only small amounts of animal bone were recovered from the excavated units. Most bones were fragmentary and unidentifiable, however wild species dominated the identifiable specimens.

6.2. Cataloging and Quantitative analysis

Following excavation all collected materials were taken to camp for cleaning, cataloguing and preliminary sorting. Badly weathered materials such as bones and fragile metals were not washed but left to dry and later lightly brushed to remove adhering matrix. Materials were sent to the archaeology laboratory at the University of Dar es

Salaam for study. Not all materials were subjected to detailed examination. For example, slag collected from Markasi Lusangi 2 unit 4 was of enormous quantity and it was impracticable to transport it to the lab. In this case a sample was taken from levels containing the largest quantities of slag while the remainder was counted, weighed, measured and reburied in the excavation unit. As observed earlier the weight of the recovered slag is recorded in summary tables of the excavation finds in Chapter 5.

6.3. Lithic Analysis

The analysis in this study follows Mehlman's (1989) system of lithic assemblage typology. There are two main advantages using Mehlman's typology. First, the typology is derived from sites that are in close proximity to the Pahi study area. The Mumba and Nasera Rock-shelters, where Mehlman's research was based, are located about 244 and 145 km respectively north of Kondoa town. Secondly, his typology was the result of a re-evaluation of lithic typological systems established earlier by Nelson (1973), Merrick (1975) and Clark and Kleindienst (1974) working in East and Central Africa (Mehlman 1989: 122-126). His work has produced the most comprehensive typological system for northeast and central Tanzanian lithics (see also Mabulla 1996:396).

The lithic analysis was undertaken in two stages. First, all artifacts recovered from the field were sorted into four main categories based on Mehlman's typology: shaped/retouched tools, cores, debitage and non-flaked lithic artifacts. In total, 29,726 excavated lithic artifacts were classified in this manner. This quantity is considered sufficient for the purpose of this study, and as such, lithic artifacts recovered from survey are not included in this analysis. Preliminary identification of lithic raw materials for all excavated lithics except angular fragments was also done at this stage.

Table 6.1. Lithic artifacts analyzed in detail

Site	Unit	Number of lithic artifacts recovered: (Only tools, cores and flakes/blades and non-flaked stones represented)	Number of artifacts analyzed in detail
Baura 1	1	1,764	1,764 (100.0%)
	2	1,522	490 (32.2%)
	3	1,452	462 (31.8%)
	4	267	75 (28.1%)
Baura 2	1	1	1 (100.0%)
Baura 3	1	6	6 (100.0%)
Lusangi 1	1	2,280	698 (30.6%)
	2	36	36 (100.0%)
	3	24	24 (100.0%)
Markasi Lusangi 2	1	83	83 (100.0%)
	2	161	161 (100.0%)
	3	5,874	727 (12.4%)
	4	199	199 (100.0%)
Lusangi 3	1	117	117 (100.0%)
	2	2	2 (100.0%)
Lusangi 4	1	7	7 (100.0%)
Total		**13,795**	**4,852** (35.1%)

The second stage involved performing detailed analysis of a subsample of 4852 artifacts (Table 6.1) representing 16.3% of the total number (29, 726) excavated. If angular fragments are not included, this sample includes 35.1% of the total number of tools, cores, flakes, and non-flaked artifacts (Table 6.1). It should be noted that angular fragments were not examined in detail because they are considered a subcategory of debitage and instead the focus was on flakes.

6.4. Sampling

All recovered tools and non-flaked stone artifacts were analyzed in detail, while cores and flakes were subsampled. The samples were selected randomly after dividing the artifacts into several groups with equal numbers of artifacts. The number of lithic artifacts recovered from a unit dictated the subsample size. All units with a small number of lithic artifacts (except Baura 1 unit 1) had 100% of cores and flakes/blades analyzed in detail. However, units with several hundred cores and flake/blades were subsampled due to time constraints. For example 25% of the cores and flakes/blades were analyzed in detail from Baura 1 unit 2, 3, 4 and Lusangi 1 Unit 1, while 10% were examined from Markasi Lusangi 2 Unit 3 (Table 6.2). However Unit 1 of Baura 1 was an exception to this rule despite massive quantity of cores and flakes/blades. This was the first unit to be analyzed and based on the amount of time involved in analyzing all cores and flakes/blades from this unit, it was decided that subsampling these elements was the most efficient option to be applied to the remaining units.

6.5. Detailed Attribute Analysis

Detailed attribute analysis was done with a help of a hand lens with magnification power x 2 to assist in identifying the smaller-scale attributes. Each artifact was weighed in an electronic balance (Type: Ainsworth, CP-3000, Model: XP-3000) followed by identification of raw materials. Both cumulative and individual weights of the artifacts did not display any meaningful results apart from showing that on average angular fragments weighed less than other artifacts, followed by tools, flakes/blades, cores and non-flaked lithics. The weights of the angular fragments were retained and are recorded in the tables of summary of the excavated finds in Chapter 5. The length, width and thickness of each flake and tool were measured to their nearest millimetre using electronic callipers (Type: Mitutoyo. Model: XCD-8'CS). Measurement criteria for each

Table 6.2. Lithic artifacts sampling strategy

Site	Unit	Number of artifacts recovered				Number of artifacts sampled for detailed analysis			
		Tools	Cores	Flakes	NFS	Tools	Cores	Flakes	NFS
B1	1	75	519	1169	1	75 (100%)	519 (100%)	1169 (100%)	1 (100%)
	2	142	509	871	-	142 (100%)	132 (25%)	216 (25%)	-
	3	130	458	862	2	130 (100%)	115 (25%)	215 (25%)	2 (100%)
	4	9	89	169	-	9 (100%)	23 (25%)	43 (25%)	-
B2	1	-	-	1	-	-	-	1 (100%)	-
B3	1	-	4	2	-	-	4 (100%)	2 (100%)	-
L1	1	170	523	1587	-	170 (100%)	131 (25%)	397 (25%)	-
	2	-	14	18	4	-	14 (100%)	18 (100%)	4 (100%)
	3	-	11	13	-	-	11 (100%)	13 (100%)	-
ML2	1	-	18	64	1	-	18 (100%)	64 (100%)	1 (100%)
	2	1	35	122	3	1 (100%)	35 (100%)	122 (100%)	3 (100%)
	3	156	503	5214	1	156 (100%)	50 (10%)	520 (10%)	1 (100%)
	4	1	32	166	-	1 (100%)	32 (100%)	166 (100%)	-
L3	1	1	15	99	2	1 (100%)	15 (100%)	99 (100%)	2 (100%)
	2	-	-	2	-	-	-	2 (100%)	-
L4	1	-	3	4	-	-	3 (100%)	4 (100%)	-

Abbreviations: B1 = Baura 1, B2 = Baura 2, B3 = Baura 3, L1 = Lusangi 1, L3 = Lusangi 3, L4 = Lusangi 4, ML2 = Markasi Lusangi 2, NFS = Non-flaked stone.

category of stone tool is detailed below. The list of all artifacts analyzed in detail on a unit and level basis is summarized in Appendix B while their mean measurements, standard deviations and form ratios are described in Appendix C.

Flakes and Blades: The length of a flake/blade was the maximum dimension measured perpendicular to the plane of the striking platform *i.e.*, the length of the long axis passing through the striking platform. The width was measured at the widest point at right angles to length, while thickness was the maximum dimension measured perpendicularly to ventral face of flake.

Shaped Tools: All shaped tools which retained their flake features, such as a striking platform or bulb of percussion, were measured using the same criteria described for flakes/blades. Crescent measurements were oriented with the major axis passing through the crescent's ends. Length was the maximum distance between the ends, while width was taken at widest point at right angles to length. Thickness was the maximum dimension measured perpendicular to the two main opposite faces. In triangles and points, length measurements are oriented towards the longitudinal axis passing through the tips, while width was taken at the widest point at right angles to length. Thickness was the maximum dimension measured perpendicular to the two main opposite faces. Shaped tools without striking platforms, including irregular tools, were measured with the main worked edges oriented away from the observer. The length of the tool was the maximum dimension of the edge that runs parallel to observer, while its width was the greatest dimension at right angles to length.

Cores: In general, the length of a core was its maximum dimension measured perpendicular to the plane of the main striking platform and parallel to the flake release face, while width was measured at the widest point at right angles to length. In bipolar cores length measurements were oriented with the longitudinal axis passing through both striking platforms targeting the areas of maximum projection. In cores with single platform, length measurements were oriented with the long axis passing through the striking platform along a line sub-parallel to the flake release surface, while for cores with more than one platform, such as multiple platform cores and peripherally worked cores, length measurements were taken targeting the maximum projection while width was the greatest dimension at right angles to length. No thickness measurements were taken in cores. Due to irregularities demonstrated in amorphous cores, no measurements were taken.

6.6. Lithic Artifact Typology

6.6.1. **Shaped/Retouched tools**

Shaped/retouched stone tools have regular retouch patterns determined as additional deliberate modification after the flaking process (Masao 1979:95). Such modifications appear in the form of retouch on any chunk, chip, flake or flake fragment. The retouch patterns can be unifacial or bifacial, normal or inverse, invasive or marginal and alternate or a combination of these (Masao 1979:95; Mehlman 1989:127). Unifacial retouch refers to trimming directed on only one face of an artifact while bifacial retouch refers to trimming occurring on both the ventral and dorsal sides (Clark and Kleindienst 1974:85). Normal retouch refers to trimming directed from the ventral to the dorsal surface of a flake. Inverse retouch is the opposite of normal retouch where trimming is directed from the dorsal surface of the flake onto the ventral (Clark and Kleindienst 1974:85; Mehlman 1989:127). Marginal retouch refers to trimming confined to the edge of an artifact while invasive retouch involves trimming that extends across to half or more of the tool surface. Alternate retouch occurs when trimming on the same edge comes partly from the ventral and partly from the dorsal face (Clark and Kleindienst 1974:85).

Angle of retouch is an important component of lithic artifact classification because it differs from one tool category to another. For example, scrapers may have an angle of retouch varying from 30° to 90 °, while in backed tools it normally approaches 90°. A cutting tool typically has an angle of retouch less than 30° (Mehlman 1989:127).

A distinction is made in lithic artifacts whose retouch is the sole result of use wear. Retouch patterns resulting from such activities is irregular and un-standardized. Mehlman (1989) classified such tools as utilized artifacts (*e.g.,* utilized flake/blade or utilized angular fragment). Some authors have classified utilized artifacts as unshaped tools (Masao 1979:95-9). Over 99% of the lithic materials excavated in this study are quartz which is more resistant to edge damage than other materials such as obsidian. This means that intentionally modified edges can be sorted out more accurately. However, non-intentional secondary modifications on quartz artifacts can be difficult to identify because in quartz most of the fine striations are only identifiable using hand lenses. In the samples studied here, non-intentional modifications were more noticeable on clear than on cloudy quartz. Retouched/shaped tools are described in five major groups namely, scrapers, backed pieces, points, burins and *outil écaillés.*

6.6.1.1. Scrapers

Most scrapers are made out of chunks, lithic flakes and flake pieces. The main feature of scrapers is their unifacial planoclinal edges (Clark and Kleindienst 1974:85, 102; Nelson 1973:175). A distinction is made between formal and casual scraper edges. Intensive regular retouch along the modified edge leading to sub invasive or invasive retouch indicates a formally modified edge. A scraper edge is said to be casually modified when it has sporadic retouch along the edge that is usually marginal (Mehlman 1989:128; Merrick 1975: 448). However "regular intensive marginal retouch may also qualify a piece as a formal scraper". (Mehlman 1989:128). Mehlman suggests that the ability to identify formal and casual scraper edges can vary from one type of raw material to another resulting in a biased judgment. In an example, Mehlman (1989:128) notes that owing to difficulties in making observation of edges one may classify quartz scrapers as casual. Problems associated with quartz artifacts analysis include the "difficulty of observing flake properties or retouch and uncertainties concerning artifact breakage" (Mehlman 1989:116). Casual observation of features are virtually impossible due to the optical properties of quartz. Sometimes surface irregularities can be mistaken for edge modification. According to Mehlman (1989:129) "a scraper edge demonstrates unifacial retouch forming an edge with angle averaging >35° and <90°. Usually the retouch forms an angle between 45° and 70° with the basal surface upon which the retouch blows were struck." A retouched edge that exceeds 80° is indicative of a core or backed edge. The criterion used in determining scraper class is dependent on the nature of edge modification. However the retouched area of an artifact such as whether it is distal, proximal and lateral is also significant. Edge plan forms may be classified as convex, straight, concave and irregular.

Most scrapers in Mehlman's typology have been defined on the basis of the location and shape of the working edge. An exception to this rule is the "small convex scraper" which has been defined by size criteria (Mehlman 1989:129). The following retouched/shaped tool descriptions are only from Baura 1 Units 1, 2, 3 and 4, Lusangi 1 Unit 1 (Rock-shelter P44) and Markasi Lusangi 2 Unit 3 (Rock-shelter P1) because over

99.6% of the tools recovered in this study came from these contexts. The mean dimensions in mm, standard deviations and the form ratios of scrapers from these sites are described in Appendix C1 – C6. These measurements do not indicate any definite pattern differences among the sites or between the LSA/IA and the LSA assemblages suggesting that there was no lithic technological change during transition from LSA to LSA/IA. An example of this pattern is indicated in the mean length, breadth and thickness of convex end, convex side and convex double side scrapers from LSA/IA and LSA levels at Baura 1, Lusangi 1 and Markasi Lusangi 2 (see Table 6.3). Also, the length, breadth and

Table 6.3. Mean dimension in mm, standard deviations and form ratios of convex end, convex side and convex double side scrapers from Pahi sites

Site name	Context	Scraper type	#	Length	Range	Breadth	Range	Thickness	Range	B/L ratio
B1	LSA/IA	Convex end	27	25.2±6.3	21-49	16.4±8.3	6-47	5.8±4.3	3-23	.65
	LSA	"	12	27.5±2.8	24-33	14.0±2.5	11-17	4.2±2.1	2-6	.51
L1	LSA/IA	"	5	29.4±4	26-36	16.2±5.9	11-25	7.4±4.4	4-15	.55
	LSA	"	9	34.8±7.3	23-45	25.0±5	21-33	13.7±4.5	10-25	.72
ML2	LSA/IA	"	10	22.2±1.1	21-24	16.5±2.3	12-19	6.3±1.3	5-9	.74
	LSA	"	3	23.0±2	21-25	17.0±2	15-19	8.0±2.6	5-10	.74
B1	LSA/IA	Convex side	36	25.8±3.6	22-30	13.3±6.1	7-27	4.6±1.9	2-9	.52
	LSA	"	18	23.9±2.6	21-28	12.3±3.2	9-20	6.0±1.8	3-9	.51
L1	LSA/IA	"	8	25.0±4	21-31	13.3±3.2	7-17	5.4±1.1	4-7	.53
	LSA	"	15	23.8±3.7	21-35	17.0±2.4	13-21	8.2±1.7	6-12	.74
ML2	LSA/IA	"	9	24.8±4.5	21-35	15.2±5	9-22	6.3±2.7	3-11	.61
	LSA		7	23.6±2	21-26	18.1±1.3	16-20	7.4±1.3	5-9	.77
B1	LSA/IA	Convex double side	11	23.0±4.4	21-34	12.5±4.1	8-22	6.1±2.1	4-10	.54
	LSA	"	19	25.1±1.9	22-28	19.7±9.6	10-39	6.5±2.4	4-11	.78
L1	LSA/IA	"	5	29.0±7.1	22-38	12.6±2.3	9-15	4.6±2.1	2-7	.43
	LSA	"	25	23.9±3.5	21-36	17.5±2.3	12-22	10.3±2.8	6-15	.73
ML2	LSA/IA	"	10	24.1±2.4	22-28	17.8±2	15-21	7.3±1.8	5-10	.74
	LSA	"	6	23.1±1.9	22-27	17.8±2.1	14-20	7.3±2.1	5-10	.77

Abbreviations: B1 = Baura 1, L1 = Lusangi 1, ML2 = Markasi Lusangi 2 thickness ranges of these artifacts between LSA/IA and LSA levels from the three sites are so closely related so as to suggest similar type of workmanship (Table 6.3, Appendix C1 – C6). That technology did not change is demonstrated by similar type of distribution of scraper types within the LSA/IA and LSA levels in most sites (Table 6.4). However, Baura 1 LSA/IA levels have revealed certain types of scrapers that were not obtained in most other sites possibly because of its position and function. As stated earlier Baura 1 has a permanent water supply and this could have influenced occupation intensity as well as the types of activities carried out. Scrapers that are unique to Baura 1 include circular, nosed end, sundry end and side, sundry double side, concavity, notch, sundry combination and convex side and concave combination (Table 6.4).

Small convex scrapers (Figure 6.1. a-c)

Small convex scrapers are ≤20 mm long and have one or more convex edges. While most convex scrapers are classified on the basis of the location of the modified edge (side or end), dimension is a criterion that distinguishes this category from other convex scrapers. This type of scraper was well represented at Baura 1, Lusangi 1 (Rock-shelter P 44) and Markasi Lusangi (Rock-shelter P1) (Table 6.4). They range from 4.3 - 11.5% and 9.1 - 9.5% in the LSA/IA and LSA levels respectively and represent 5.3% of the total scrapers excavated from the Pahi sites. These percentages are low compared to sites such as Nasera and Mumba rock-shelters where they range from 49.2% - 12.5% of total scrapers (Mehlman 1989:371-422). However this discrepancy is related to the fact that Mehlman (1989) uses ≤25 mm as a maximum dimension for his small convex

Table 6.4. Frequency of scrapers from the LSA/IA and LSA Levels at Baura 1, Lusangi 1 (Rock-shelter P44 and Markasi Lusangi 2 (Rock-shelter P1)

Scraper type	Site Name							
	Baura 1, Units 1, 2 3 and 4		Lusangi 1, Unit 1 (Rock -shelter P44)		Markasi Lusangi 2, Unit 3 (Rock-shelter P1)		**Total (All sites and levels)**	%
	Affiliated cultural assemblage		Affiliated cultural assemblage		Affiliated cultural assemblage			
	LSA/IA	LSA	LSA/IA	LSA	LSA/IA	LSA		
Small convex	7 (4.3)	-	3 (11.5)	9 (9.1)	3 (5.6)	2 (9.5)	**24**	5.3
Convex end	27 (16.5)	12 (13.3)	5 (19.2)	9 (9.1)	10 (18.5)	3 (14.3)	**66**	14.5
Convex double end	1 (0.6)	2 (2.2)	3 (11.5)	15 (15.1)	10 (18.5)	3 (14.3)	**34**	7.5
Convex end and side	27 (16.5)	23 (25.6)	1 (3.9)	25 (25.3)	11 (20.4)	-	**87**	19.2
Circular	1 (0.6)	-	-	-	-	-	**1**	0.2
Nosed end	1 (0.6)	-	-	-	-	-	**1**	0.2
Convex side	36 (22.0)	18 (20.0)	8 (30.8)	15 (15.1)	9 (16.7)	7 (33.3)	**93**	20.5
Convex double side	11 (6.7)	19 (21.1)	5 (19.2)	25 (25.3)	10 (18.5)	6 (28.6)	**76**	16.7
Sundry end	3 (1.8)	-	-	-	1 (1.8)	-	**4**	0.9
Sundry end and side	1 (0.6)	-	-	-	-	-	**1**	0.2
Sundry side	12 (7.3)	1 (1.1)	-	1 (1.0)	-	-	**14**	3.1
Sundry double side	3 (1.8)	-	-	-	-	-	**3**	0.7
Concave	22 (13.4)	12 (13.3)	1 (3.9)	-	-	-	**35**	7.7
Concavity	9 (5.5)	2 (2.2)	-	-	-	-	**11**	2.4
Notch	1 (0.6)	-	-	-	-	-	**1**	0.2
Sundry combination	1 (0.6)	-	-	-	-	-	**1**	0.2
Convex side and concave combination	1 (0.6)	-	-	-	-	-	**1**	0.2
Scraper fragment	-	1 (1.1)	-	-	-	-	**1**	0.2
Total	**164(100.0)**	**90(100.0)**	**26(100.0)**	**99(100.0)**	**54(100.0)**	**21(100.0)**	**454**	**100.0**

* Numbers in parenthesis are percentages

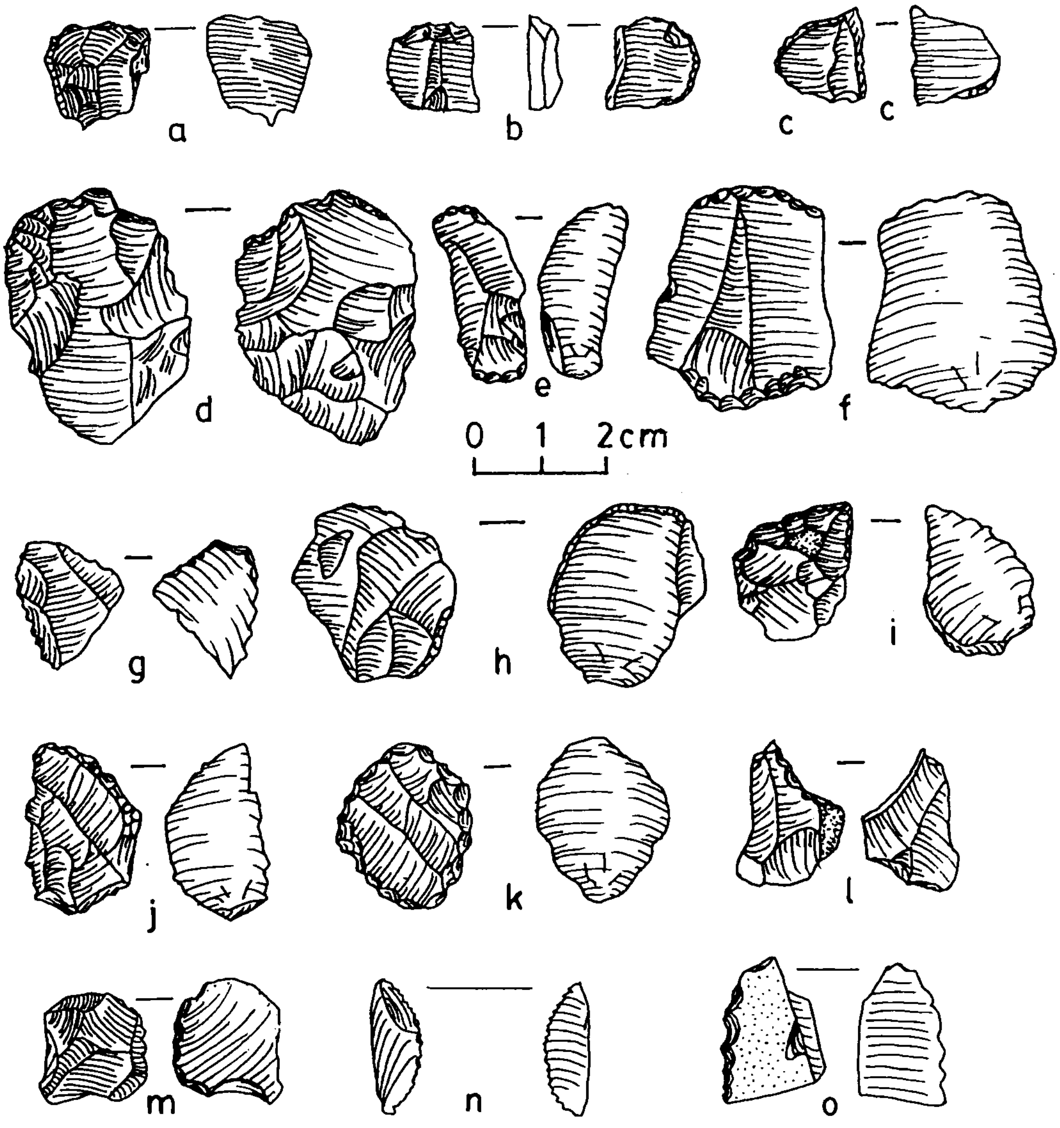


Figure 6.1. Pahi scrapers: a-c, small convex; d, convex end; e-f, convex double end; g-j, convex end and side; k- circular; l, nosed end; m-o, convex side

scrapers while in the assemblage studied here ≤20 mm was chosen. The smaller size was selected for this study because assemblages consist of tools that were made out of smaller flakes than at Nasera and Mumba rock-shelters (see flakes category below). For example, while the mean length of quartz flakes at LSA levels (level 4 and 3) at Nasera ranges from 21.5-25.5 mm (Mehlman 1989:658) the mean length in this assemblage was only 16.1 mm. It is therefore quite certain that shaped tools at Lake Eyasi and Nasera rock-shelters were made from longer flakes. Since sites may produce flakes of varying sizes which ultimately influence tool size I suggest the abandonment of the "small scrapers" category. It is an ambiguous term and does not make a significant contribution to the overall scraper classification because tools of this group can be assigned to other types of scrapers with convex edge plan.

Convex end scrapers (Figure 6.1. d)

Scrapers with one modified edge that is approximately perpendicular to the long axis of a flake or chunk and whose length is >20 mm is termed a convex end scraper. The modified edge is more or less convex and should neither be straight nor concave. Normally they are fairly thin and flat, with a dorsal face that may have very few negative flake scars. These scrapers are equivalent to "simple end scrapers", "carinate end" or "oblique end" as defined by Masao (1979:131) and Nelson (1973:186-9). Convex end scrapers were common at Baura 1, Lusangi 1 (Rock-shelter P44) and Markasi Lusangi 2 (Rock-shelter P1) where they represent 16.5 - 19.2 % and 9.1 - 14.3% in the LSA/IA and LSA levels respectively (Table 6.4). In the overall analysis they represent 14.5% of the total excavated scrapers in the entire Pahi project.

Convex double end scrapers (Figure 6.1. e-f)

The edges of convex double end scrapers are modified in a manner similar to those of convex end scrapers except that both ends are modified. As a general rule they are >20 mm long. The retouch on both ends may be inverse but in other specimens the retouch is alternate *i.e.,* inverse at one end, and normal at the other. Others have termed this type of scraper "double end scraper" (Masao 1979:131; Nelson 1973). There were only a few specimens from Baura 1 while more were found in Markasi Lusangi and Lusangi sites. At these sites they represent 0.6 – 18.5% and 2.2 – 15.1% in the LSA/IA and LSA levels respectively (Table 6.4), while in the overall analysis they represent 7.5% of the total excavated scrapers in all Pahi samples.

Convex end and side scrapers (Figure 6.1. g-j)

Convex end and side scrapers are >20 mm long and have been modified at their lateral and distal or proximal edges with one convex edge at one end (Mehlman 1989:130). This type of scraper is termed "simple end scraper" by Nelson (1973) and Masao (1979:131). Convex end and side scrapers are found at Baura, Lusangi and Markasi Lusangi sites representing 3.9 – 20.4% and 25.3 – 25.6% in the LSA/IA and LSA levels respectively (Table 6.4). In the overall analysis they represent 19.2% of total excavated scrapers at Pahi sites.

Circular scrapers (Figure 6.1. k)

Circular scrapers have a continuous convex edge along their periphery. This kind of scraper should have at least one dimension that is greater than 20 mm. In the assemblage studied here the term circular does not necessarily imply a circular morphology but refers to a continuous retouch pattern that covers almost or the entire edge of the scraper, provided that edge morphology is more or less convex. Nelson (1973) has used the term "convex and circular scraper". Only one circular scraper was collected from of Baura 1 where it represents 0.6% of the scrapers excavated from LSA/IA contexts.

Nosed end scrapers (Figure 6.1. l)

Nosed end scrapers have the edge of a convex end defined on one or both ends by a narrow constricted tip. The scraper edge can vary from a "V" to "U" shape. Masao (1979:138) refers to this kind of scraper as "nosed scraper" and were very rare in sites he investigated. Only one specimen was excavated in the entire Pahi project (Baura 1) from an LSA/IA context where it represents 0.6% (Table 6.4). While end scrapers (including convex end, convex double end, convex end and side and nosed end) constituted 6.8-36.1% of scrapers excavated at Lake Eyasi and Nasera Rock-shelter (Mehlman 1989:371-422), they comprise 17.13% at Kondoa and Singida (Masao 1979:127). At the Pahi sites they represent 34.2 – 57.4% and 28.6 – 49.5% in the LSA/IA and LSA levels respectively. These figures indicate great variability in distribution of the end scrapers probably reflecting variation in type and intensity of particular activities carried out in different localities.

Convex side scrapers (Figure 6.1. m-o)

Scrapers bearing one convex edge (parallel to the long axis) and >20 mm long are termed convex side scrapers. This type of implement has been classed as a "single side scraper" by Nelson (1973) and Masao (1979:134). Convex side scrapers are very common at Baura 1, Lusangi 1 (Rock-shelter P44) and Markasi Lusangi 2 (Rock-shelter P1) and represent 16.7 – 30.8% and 15.1 – 33.3% in LSA/IA and LSA levels respectively (Table 6.4). In the overall analysis they represent 20.5% of the total excavated scrapers in Pahi sites, indicating that they are the most frequent type of scraper encountered in the sites studied here (Table 6.4).

Convex double side scraper (Figure 6.2. a-b)

Convex double side scrapers are retouched on both lateral edges and are >20 mm long. At least one side must have a convex edge plan. The flaking pattern is usually inverse but alternate was also observed in some pieces. Masao (1979:134) and Nelson (1973) have classified these tools as "double side scrapers". These types of scrapers are common at Baura 1, Lusangi 1 (Rock-shelter P44) and Markasi Lusangi 2 (Rock-shelter P1) where they represent 6.7 – 19.2% and 21.1 - 28.6% in the LSA/IA and LSA levels respectively (Table 6.4). In the overall analysis they represent 16.7% of total excavated scrapers in the study area.

Percentages of convex side scrapers (including convex side scraper, convex double side scraper and nosed side scraper) from LSA levels at lake Eyasi and Nasera Rock-shelters range from 11.7%-1.1% (Mehlman (1989:370-422). At Baura 1, Lusangi 1 (Rock-shelter P44) and Markasi Lusangi 2 (Rock-shelter P1) convex side scrapers range from 28.7 – 50% and 40.4 – 61.9 % in LSA/IA and LSA levels respectively while sites from central Tanzania have yielded 40.29% (including single side scrapers and double side scrapers) (Masao 1979:127, 132). As was the case in convex end scrapers, there is a great variation in the distribution of convex side scrapers at different Pahi sites.

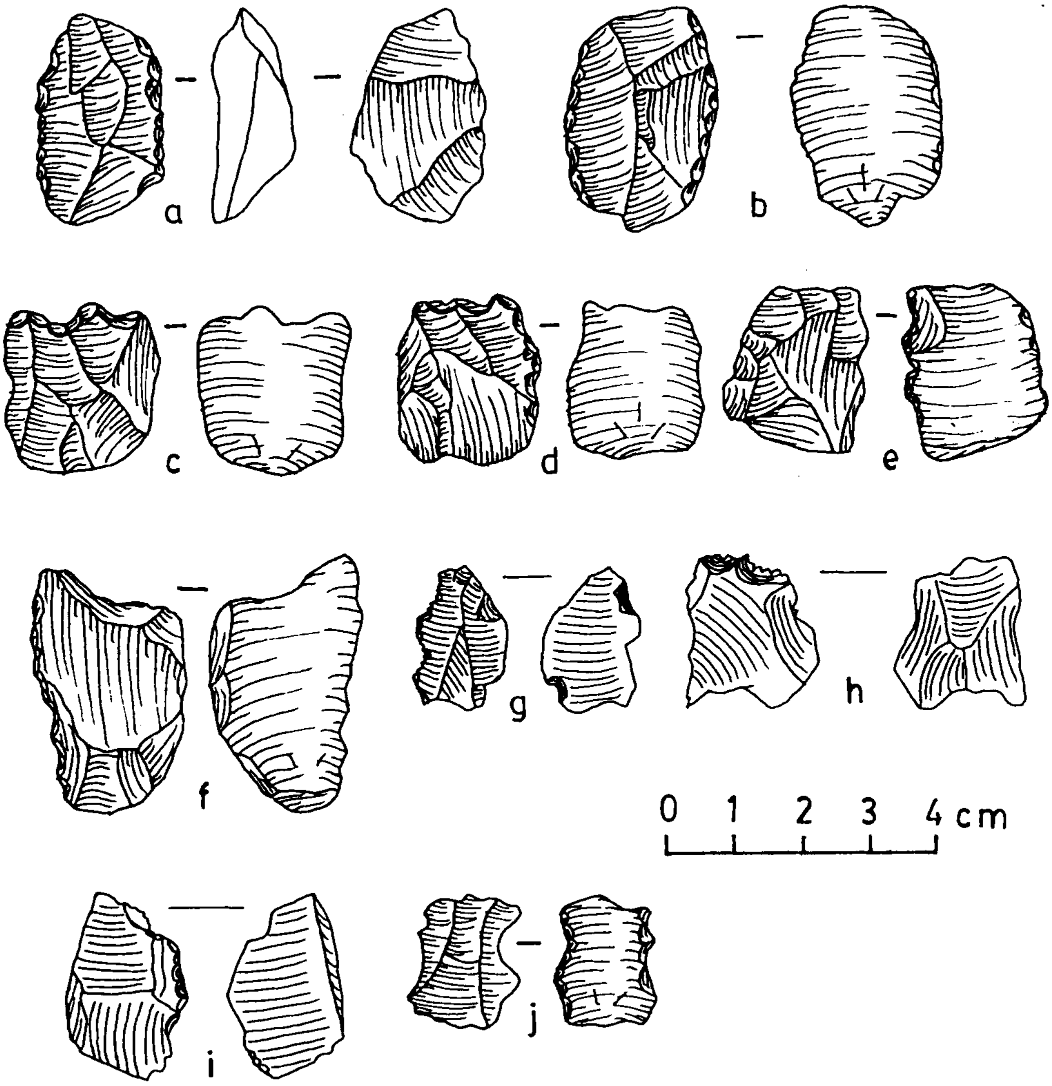


Figure 6.2. Pahi scrapers: a-b, convex double side; c & h, sundry end; d, sundry end and side; e-g & i, sundry side; j, sundry double side

Sundry end scrapers (Figure 6.2. c & k)

Scrapers that have one straight or irregular modified edge approximately perpendicular to their long axis are classified as sundry end scrapers. The edge can be markedly denticulate and often concavo-convex ("S" shaped) (Mehlman 1989:130). There is no equivalent that can be clearly drawn from Masao's (1979) or Nelson's (1973) typology. All four scrapers found in Pahi assemblages were from LSA/IA contexts in Baura 1 and Markasi Lusangi 2 (Rock-shelter P1) where they represent 1.8% (Table 6.4). In the overall analysis they represent 0.9% of the total scrapers excavated at Pahi sites. The average breadth/length ratios of these scrapers indicate that they were made out of narrower flakes than the average flakes. This is evident when one compares the breadth/length ratios of sundry end scrapers in Appendix C1 and C5 and those of flakes in appendix C20 – C25.

Sundry end and side scrapers (Figure 6.2. d)

Scrapers made from chunks or flakes with straight or irregular retouch at one edge perpendicular to the long axis, and a convex, straight or irregular edge along one or both lateral sides are termed sundry end and side scrapers. No equivalent is illustrated in either Masao's (1979) or Nelson's (1973) typology. The only sundry end and side scraper was recovered from an LSA/IA context at Baura where it represents 0.6% (Table 6.4). In contrast to the sundry end scraper described above, the breadth /length ratio indicates that this specimen was made from a broad flake (Appendix C1).

Percentages of sundry end scrapers, including sundry end scrapers, sundry double end scrapers and sundry end and side scrapers from LSA levels at Lake Eyasi and Nasera Rock-shelters range from 9.2% - 4.5% (Mehlman 1989:371- 422). In the sites studied here the same category of scrapers all of which were from the LSA/IA contexts range from 1.8 – 2.4% and represent 1.1% of total excavated scrapers (Table 6.4).

Sundry side scrapers (Figure 6.2. e-g & i)

Scrapers made from chunks or flakes with a straight or irregular modified edge on one lateral opposing side are termed sundry side scrapers. There is no equivalent that can be clearly drawn from Masao's (1979) or Nelson's (1973) typology but the closest category seems to be "single side scraper". Sundry side scrapers occur at a frequency of 7.3% in LSA/IA contexts at Baura 1 and ranges from 1.0 – 1.1 % in LSA deposits at both Baura and Lusangi 1 (Rock-shelter P44), while none were recovered from Markasi Lusangi 2 (Rock-shelter P1) (Table 6.4). In the overall analysis this type of scraper represented 3.1% of total excavated scrapers.

Sundry double side scrapers (Figure 6.2. j)

Sundry double side scrapers are chunks or flakes with irregular or straight modified edges on both long lateral opposing sides. Two of the studied specimens had inverse retouch, while one had alternate retouch. This type of scraper probably falls in the category of "double side scraper" in Masao's (1979:134) and Nelson's (1973) typology, as well as Masao (1979:139) "irregular scrapers" or Nelson's (1973) "informal scrapers". In their definitions, scrapers of this kind are made from chunks which possess highly variable outlines and cross-sections and their worked edges are not situated in any consistent relationship to the flake outline or talon. Sundry double side scrapers were recovered only from LSA/IA levels at Baura 1 where they represent 1.8% (Table 6.4).

Percentages of all varieties of sundry side scrapers from LSA levels at Lake Eyasi and Nasera rock-shelters range from 3.4 - 15.1% (Mehlman 1989: 371- 422), while the Pahi assemblages represent 9.1% in the LSA/IA levels and range 1.0 – 1.1% in LSA contexts (Table 6.4).

Concave scrapers (Figure 6.3. a - i & k)

Concave scrapers are chunks or flakes with a concave modified edge that normally covers most of the length or width of the implement. The retouched edge is normally shallower *i.e.*, "the length across the arc from the end to end is greater than twice the depth of the arc." (Mehlman 1989:131). Nelson (1973) assigns a similar term to this type of scraper but Masao (1979:134) classifies it as "concave side scraper". Concave scrapers occur at a frequency of 3.9 - 13.4 % in LSA/IA contexts while in the LSA they represent 13.3% (Table 6.4). In the overall analysis they represent 7.7% of total excavated scrapers in the Pahi study area. Percentages of concave scrapers from other sites of central Tanzania approximate 4.98% of total scrapers (Masao 1979:127-132).

Concavity scrapers (Figure 6.3. j & l)

Concavity scrapers are flakes or chunks with concave edge modifications located anywhere along the periphery. They can be differentiated from concave scrapers by the presence of a modified edge that extends for less than half the length or width of a piece and also that the length across the arc from end to end is greater than the depth of the arc, but not more than twice the arc's depth (Mehlman 1989:131). There is no equivalent from Masao's (1979) or Nelson's typology (1973). No concavity scrapers were recovered from Lusangi 1 (Rock-shelter P44) and Markasi Lusangi (Rock-shelter P1) but at Baura 1 they represent 5.5% in LSA/IA context and 2.2% in LSA deposits (Table 6.4). In the overall analysis they represent 2.4% of total excavated scrapers.

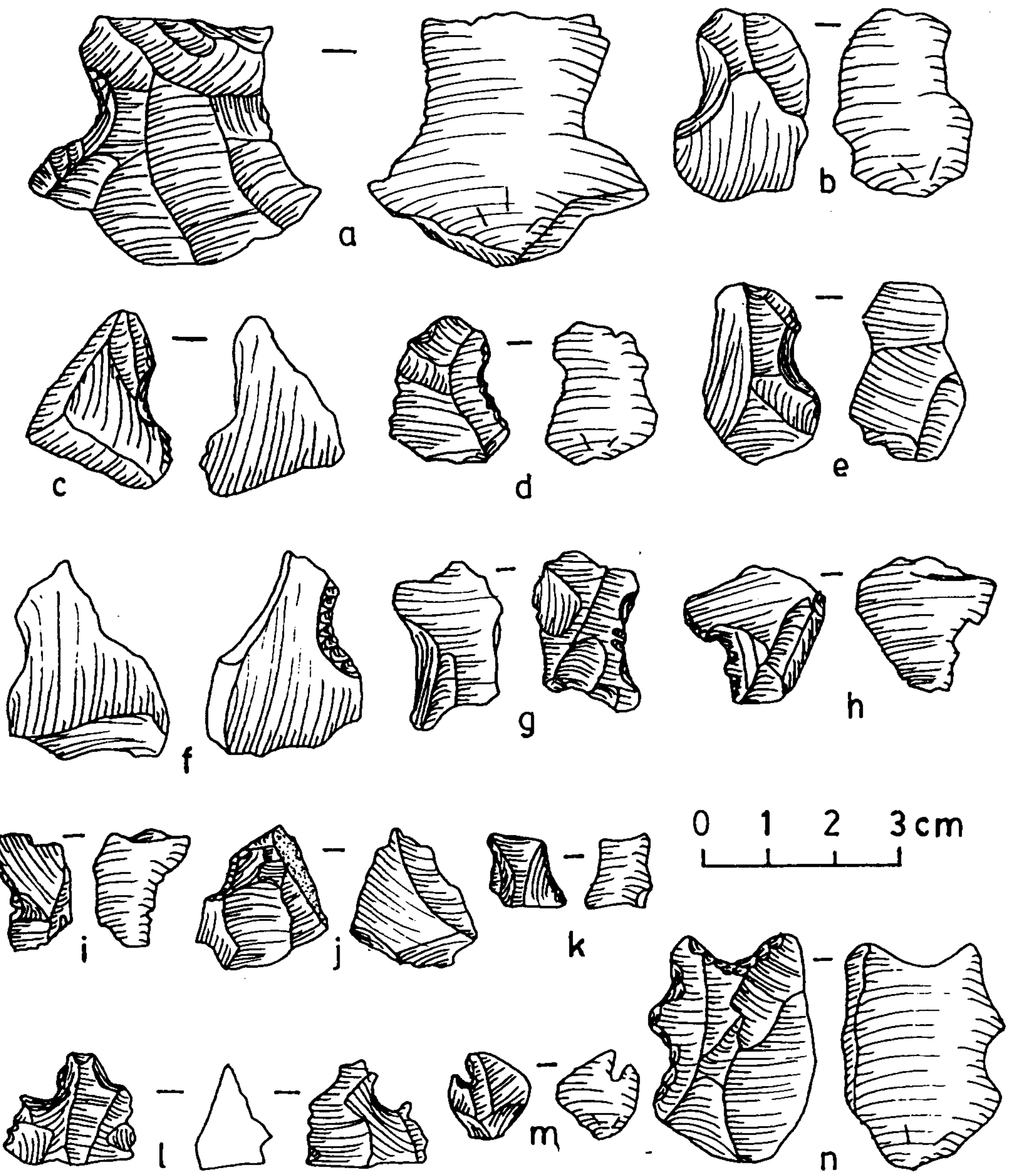


Figure 6.3. Pahi scrapers: a - i & k, concave scraper; j & l concavity; m, notch; n, sundry combination

Notch scrapers (Figure 6.3. m)

Notch scrapers are flakes or chunks with a concave modification located anywhere along the periphery. Notches are differentiated from concave and concavity scrapers based on the ratio between depth and length of the arc. In notches, the retouch modifications are so closely curved that the length across the arc from end to end is less than the depth of the arc. Only one notch scraper was recovered from the Pahi assemblages (Baura 1 LSA/IA context) representing 0.2% of total excavated scrapers (Table 6.4). The specimen had dimensions of 13.0 x 12.0 x 3.0 mm and a breadth/length ratio of 1:1.08 (0.92) (Appendix C1). Masao (1979:134) refers to this kind of implement as "notched side scraper" and also reports this artifact to be rare, representing only 2.1% of total scrapers from sites he investigated. Combined percentages of concave, concavity and notch scrapers at Lake Eyasi and Nasera rock-shelters LSA levels range from 5.3 - 18.3% (Mehlman 1989:371-422), while a range of 3.9 – 19.5% was recorded in Pahi LSA/IA contexts and 15.5% in LSA levels (Table 6.4).

Sundry combination scrapers (Figure 6.3. n)

Sundry combination scrapers are flakes or chunks which display combined features in their edge modifications, for example concave (including notch, concavity or convex) on one side and an irregular or straight retouched edge on the other. They should not be confused with sundry end and side scrapers which also have a convex modification on one side. No equivalent tools are evident in Nelson's (1973) and Masao's (1979) typology. Only one specimen was recovered from the Pahi assemblages from an LSA/IA context representing 0.2% of total excavated scrapers with dimensions of 32.0 x 25.0 x 7.0 mm and a breadth/length ratio of 1:1.28 (0.78) (Table 6.4, Appendix C1).

Convex side and concave combination scrapers (Figure 6.4. g)

Scrapers with convex modified edge on one side and a concave (including concavity or notch) edge on the other are termed convex side and concave combination scrapers (Mehlman 1989:131). No equivalent is described in Masao's (1979) or Nelson's (1973) typology. Only one specimen was recovered in the Pahi assemblage from an LSA/IA context representing only 0.2% of total scrapers (Table 6.4). The specimen was made out of a flake that is wider than long and it measures 33.0 x 44.0 x 14.0 mm, while its breadth/length ratio is 1:0.75 (1.33) (Appendix C1).

Scraper fragment

Scraper fragments have been eroded by trampling, natural forces or accidental fracture during manufacturing. As a result of this secondary modification they have lost their complete original morphological appearance because part of their modified sections have been lost. Only one scraper fragment was recovered in the Pahi assemblages from an LSA/IA context representing 0.2% of total recovered scrapers.

6.6.1.2. Backed Pieces

Backed pieces are normally made from flakes or flake pieces. Often one side of the flake (usually one lateral edge) remains in its original and unretouched condition and lacks use-wear. Backing may include unidirectional or bi-directional retouch *i.e.*, directed from both faces. The backed edge is usually characterized by blunt and steep retouch, with an average retouch angle of >80°, usually approaching 90° (Mehlman 1989:132).

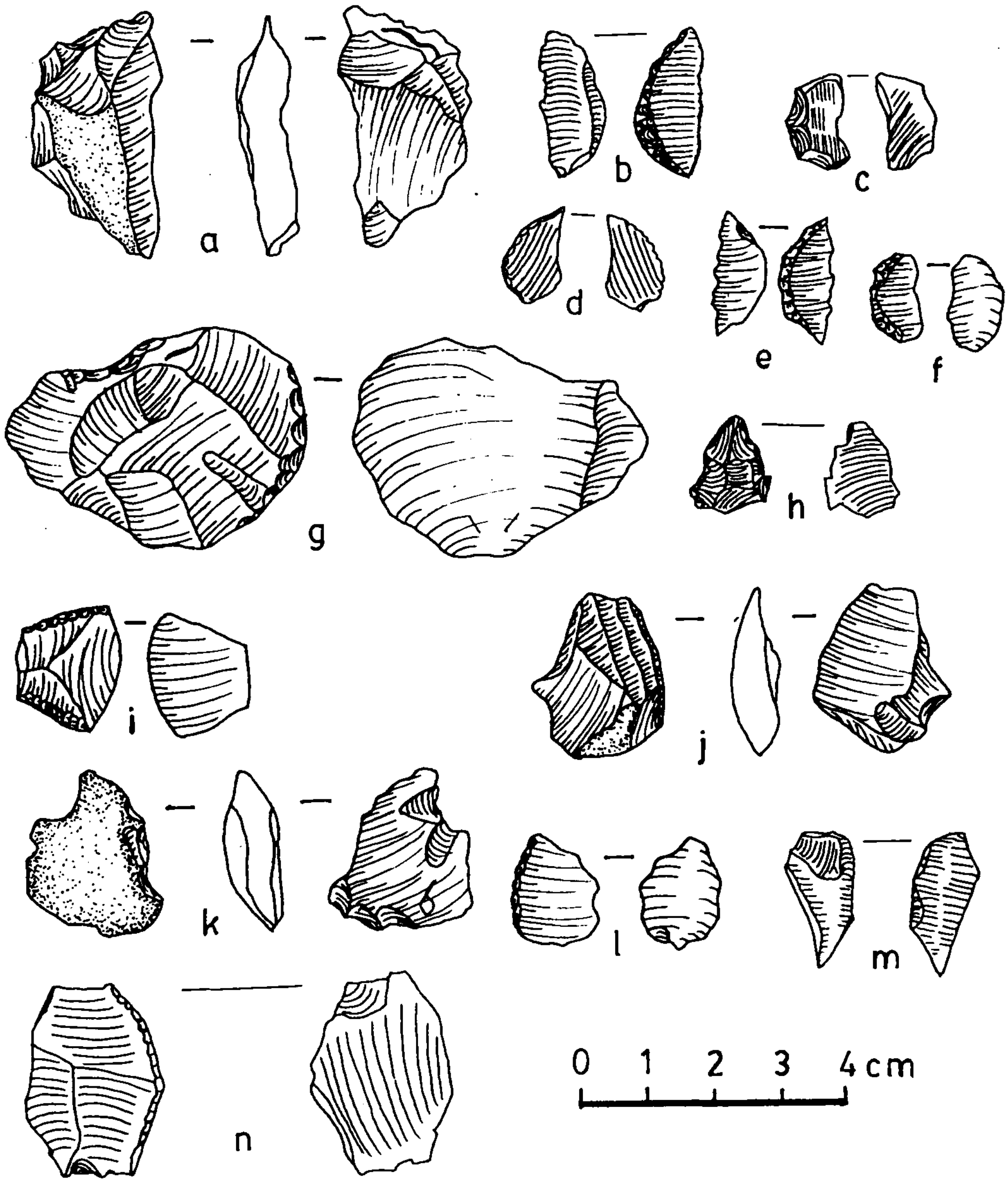


Figure 6.4. Pahi scraper and backed pieces: a-f, crescent; g, convex side and concave combination scraper; h, triangle; i, trapeze; j-n, curve-backed piece

Some backed edges still retain cortex or original truncated surfaces if the backing was not extensive enough to cover the whole surface. In some artifacts, whenever the platform surface is located on the back of the piece, they are modified so that it does not affect the curvature of the backed surface (Phillipson 1976a:26). Therefore variations do exist with some specimens retaining their platforms while others have them completely modified or undermined. Normally backed pieces are classified on the basis of overall shape and the angle and alignment of retouch on the backed side.

In sub-Saharan Africa small backed pieces are sometimes referred to as microliths to differentiate them from larger macroliths (Leakey 1931:95-96, Robbins 1967). The dimensional criteria for these classifications have varied causing some confusion (Masao 1979:99-101). For example, 30 mm was used by Leakey (1945) and Gabel (1965) as a dividing line between larger and smaller crescents, while Robbins (1967) used 30 mm to distinguish between backed blades and crescents. Some such as Odner (1971b:185) and Nelson (1973) have challenged these criteria. According to Nelson (1973:143) "...segregation of backed implements on the basis of size would constitute an unwarranted subdivision of a continuously occurring phenomenon whose documentation is better suited to the use of ranges, means and standard deviations..." This opinion has been supported by Odner (1971b:185) in that the criteria used to separate macrolithis and microliths did not take into account the gradual transition from macroliths to microliths.

Other workers such as Odner (1971b:187-9), Phillipson (1976a:26-28) and Masao (1979:100-1) divide backed pieces into two or three subcategories, namely "backed geometrics" "backed flakes" and "backed blades". However, Masao (1979) suggests the term "backed flakes" should be used instead of "backed blades". Backed flakes and blades are differentiated from other backed implements based on the presence of unmodified striking platforms (Phillipson 1976a:27). To avoid such confusion Mehlman (1989) uses the term "backed pieces" to include all specimens which demonstrate backed edge modification rather than categorize them based on the types of flakes from which they are derived.

The mean dimensions in mm, standard deviations and form ratios of backed pieces from LSA/IA and LSA levels are described in Appendix C7 – C12. Most types of backed pieces occur in both LSA/IA and LSA contexts. As was the case with scrapers, the mean dimensions and form ratios of backed pieces do not show definite pattern differences among sites or between LSA/IA and LSA assemblages suggesting no technological change occurred. For example breadth/length ratios of crescents from the LSA/IA levels range from 0.54 - 0.63 mm (Appendix C7, C9 and C11) while those from LSA contexts are 0.50 – 0.60 mm (Appendix C8, C10 and C12). Although there is a slight divergence in breadth/length ratio between LSA/IA and LSA crescents, these ratios also show one important attribute shared by most crescents in that all were made from relatively narrower flakes, hence reflecting a form of standardization. For example while crescent breadth/length ratios range from 0.54 - 0.63 mm in LSA/IA levels (Appendix C7, C9 and C11) and 0.50 – 0.60 mm in LSA (Appendix C8, C10 and C12), whole flakes range from 0.67 mm – 0.83 mm in LSA/IA levels (Appendix C20, C22 and C24) and 0.73 mm – 0.83 mm in LSA levels (Appendix C21, C23 and C25). Three types of backed pieces including a triangle, trapeze and angle backed were confined to Baura indicating higher diversity of backed tools at the site (Table 6.5).

Table 6.5. Frequency of backed pieces from the LSA/IA and LSA Levels at Baura 1, Lusangi 1 (Rock-shelter P44) and Markasi Lusangi 2 (Rock-shelter P1)

Type of backed piece	Site Name							
	Baura 1, Units 1, 2, 3, and 4		Lusangi 1, Unit 1 (Rock -shelter P 44)		Markasi Lusangi 2, Unit 3 (Rock-shelter P1)		**Total (All sites and levels)**	%
	Affiliated cultural assemblage		Affiliated cultural assemblage		Affiliated cultural assemblage			
	LSA/IA	LSA	LSA/IA	LSA	LSA/IA	LSA		
Crescent	12 (29.3)	10 (45.5)	-	21 (95.5)	46 (67.6)	3 (50.0)	**92**	57.1
Triangle	-	1 (4.5)	-	-	-	-	**1**	0.6
Trapeze	1 (2.4)	-	-	-	-	-	**1**	0.6
Curve	2 (4.9)	2 (9.1)	-	-	14 (20.6)	1 (16.6)	**19**	11.8
Straight	2 (4.9)	3 (13.6)	1 (50.0)	-	2 (2.9)	-	**8**	5.0
Oblique truncation	3 (7.3)	-	-	-	1 (1.5)	1 (16.6)	**5**	3.1
Angle	-	1 (4.5)	-	-	-	-	**1**	0.6
Divers	-	2 (9.1)	-	-	1 (1.5)	-	**3**	1.9
Awl/drill/percoir	13 (31.7)	1 (4.5)	1 (50.0)	1 (4.5)	3 (4.4)	1 (16.6)	**20**	12.4
Concave	8 (19.5)	2 (9.1)	-	-	1 (1.5)	-	**11**	6.8
Total	**41(100.0)**	**22(100.0)**	**2(100.0)**	**22(100.0)**	**68(100.0)**	**6(100.0)**	**161**	**100.0**

* Numbers in parenthesis are percentages

Crescents (Figure 6.4. a-f)

Crescents have a convex blunted back or convex backed edge. Most also have one straight edge that is normally unretouched. Some authorities have referred to them as "lunates" (Clark and Kleindienst 1974:99; Phillipson 1976a:27). According to Mehlman (1989:132) the backed edge "need not be continuous from tip to tip but the tips are backed to complete the arc and the flake/blade talon is therefore absent". Retouch is almost perpendicular to the dorso-ventral surface of a flake. In most pieces retouch is heaviest on one or both ends of the convex back while the middle part is often lightly retouched (Masao 1979:103). Other authorities such as Phillipson (1976a:27) further subdivide crescents (or "backed geometrics") into three categories namely: pointed, deep and asymmetrical lunates. Most crescents from the Pahi assemblages have very fine backed edges.

Crescents are the most common type of backed pieces in the assemblages examined here, ranging from 29.3 – 67.6% in the LSA/IA contexts and 45.5 – 95.5 % in the LSA (Table 6.5). They represent 57.1% of the total excavated backed pieces in the entire Pahi project. This type of artifact was widely distributed at Baura 1, Lusangi 1 (Rock-shelter P44) and Markasi Lusangi 2 (Rock-shelter P1) with crescents having the highest frequency in all sites (Table 6.5). At other sites in central Tanzania crescents are also very common but are less frequent than "backed flakes" (Masao (1979:101, Table 23). As noted above, the mean breadth/length ratios of the crescents indicates that they were made from relatively narrower flakes. This may indicate a restricted flake choice for making crescents. Mabulla (1996:429) suggests that backed tools were made from uniformly shaped flakes and bladelets contrary to scrapers which were manufactured from unstandardized blanks such as cobbles and chunks.

Triangles (Figure 6.4. h)

Triangles are backed tools which have a triangular shape with at least two partially backed sides (Mehlman 1989:133). Normally the angle formed by two backed intersecting lines is sharp, approximately 90° (Phillipson 1976a:27). This can be differentiated from the obtuse angle found in angle- backed pieces (see below). The third side is normally sharp. Most pieces have straight-backed edges but some demonstrate a slight concavity or convexity. Backing may be carried out in various ways including bi-directional retouch, steep retouch or a combination of these (Nelson 1973:159). Some triangles are asymmetrical while others are isosceles in shape. It can be difficult to distinguish the underling form for triangles but most seem to be made from flakes, possibly angular fragments (Masao 1979:107). Triangles are extremely rare in the Pahi assemblages representing only 0.6% of total backed pieces (Table 6.5). Only 1 triangle was recovered with dimensions of 14 x 11 x 3 mm and a width/length ratio of 1:1.27 (0.79) (Appendix C8).

Trapeze (Figure 6.4. i)

Backed pieces with backed retouch on the two least parallel opposing edges are referred to as trapezes (Mehlman (1989:133). Some have at least one short backed edge and two edges formed by nearly vertical retouch resulting in a roughly trapezoidal shape. Most trapezes are characterized by distal and proximal oblique truncations while the shorter of the two approximately parallel edges may be backed but the longer one is not (Mehlman 1989:133). Only one trapeze was recovered in Pahi assemblages representing 0.6% of the total backed pieces. The dimensions are 17.0 x 15.0 x 8.0 mm and it has a width/length ratio of 1:1.13 (0.88) (Appendix C7).

At LSA levels of Lake Eyasi and Nasera rock-shelters crescents, triangles and trapezes accounted for 7.0-39.2 % of backed pieces (Mehlman 1989:371-422). In the Pahi assemblages the same artifacts occur at a frequency of 31.7 – 67.6% in LSA/IA levels and 50 – 95.5% in LSA contexts (Table 6.5).

Curve-backed pieces (Figure 6.4. j-n)

Curve-backed pieces have a convex backed edge that intersects with the opposite lateral unmodified edge at only one end (Mehlman 1989:133). Retouch may cover the entire edge in some specimens while in others it is localized, usually near the tips. The backing is similar to that of crescents but as a rule the unretouched end terminates in a flake/blade talon or snap. Often the curvature of the backed side is not as deep as that of a crescent. Based on this aspect the curve-backed truncation may be proximal or distal. It is on that basis (*i.e.*, presence of talon) that other authorities have suggested that this type of artifact belongs to one of the diverse groups of so-called "backed flake" or "backed blade" (Masao 1979:99-101; Phillipson 1767a:27). Since curve-backed pieces bear a flake/blade aspect it is possible to distinguish curve-backed distal from curve-backed proximal fragments (Mehlman 1989:133). In the Pahi assemblages curve-backed pieces range from 4.9 – 20.6% in LSA/IA levels and 9.1 – 16.6% in LSA contexts (Table 6.5). Overall this type of artifact constitutes 11.8% of total excavated backed pieces. At LSA levels of lake Eyasi and Nasera rock-shelters the frequency of curved-backed pieces ranged from 2.3 -15.4% (Mehlman 1989:371-422).

Straight-backed pieces (Figure 6.5. a-b)

Backed pieces with a straight-backed edge that extends through the length of a flake and forms an acute angle <25° at the point of intersection with the opposite lateral edge are termed straight-backed pieces (Mehlman 1989:133). The opposite edge normally remains sharp and sometimes shows a slight concavity. Straight- backed pieces may have a flake talon or a snap at one end, and it is often possible to recognize a flake or blade affiliation. In cases where a striking platform persists, the backed edge may form an angle of intersection that approximates a right angle. This type of artifact is equivalent to what Masao (1979:116-17) and Phillipson (1976a:27-28) refer to as "straight backed flakes/blades". Very few straight-backed pieces were found at Baura 1, Lusangi 1 (Rock-shelter P44) and Markasi Lusangi 2 (Rock-shelter P1). Overall, this type represented 5.0% of the total excavated backed pieces and ranges from 2.9 – 50.0% in LSA/IA contexts and 13.6% in LSA levels (Table 6.5). At LSA levels of Lake Eyasi and Nasera straight-backed pieces occurred at frequencies ranging from 4.7 - 10.3% (Mehlman 1989:371-422).

Oblique truncation (Figure 6.5. c-d)

Oblique truncations are backed-pieces with a straight edge that has been truncated obliquely at one edge. The backed edge may form an acute angle greater than 25° at the point of intersection with one of the end tips of a flake/blade (Mehlman 1989:134). The unretouched end may possess a flake/blade talon or end in a snap. Because some pieces possess a flake/blade talon it is possible to recognize distal or proximal truncation. Other

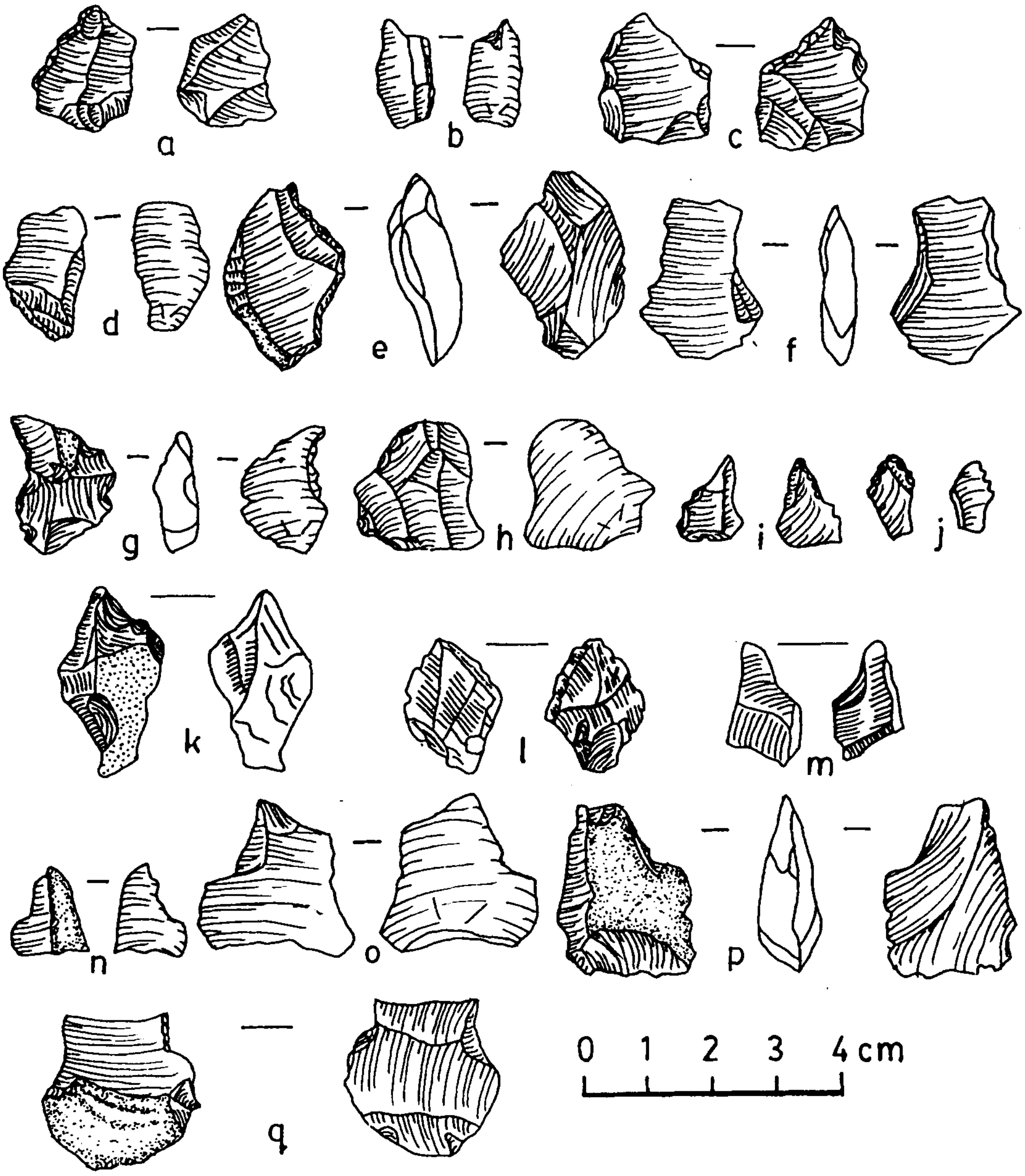


Figure 6.5. Pahi backed pieces, points and burins: a-b, straight-backed piece; c-d, oblique truncation; e, angle-backed piece; f-g concave backed piece; h, divers backed piece; i-j, backed *percoir*; k-m, unifacial points; n- q, angle burin

authorities such as Masao (1979:116-18) have categorized this type of artifact as "obliquely backed flake/blade". Oblique truncations were rare in the Pahi sites representing only 3.1% of the total excavated backed pieces. They range from 1.5 – 7.3% in LSA/IA levels and represent 16.6% in LSA deposits.

Angle-backed pieces (Figure 6.5. e)

Angle-backed pieces have two lines of backing along one side of a piece to form an obtuse angle (Mehlman 1989:134). One of the backed lines may intersect an opposite end of the flake while another terminates in a snap, flake talon or flake distal edge. Some angle-backed pieces may demonstrate partially backed edge lines which do not terminate at the distal or proximal end of a flake. In some cases they are similar to triangles but the dimension of angle at which the backed edges intersect is clearly distinctive (compare Figure 6.4 h and 6.5 e). On the other hand angle-backed pieces may still possess a flake talon, a feature which is rarely seen in triangles. Angle-backed pieces were very rare in the Pahi assemblages representing only 0.6% of the total excavated backed pieces (Table 6.5). The only excavated specimen was from Baura 1 LSA context.

At LSA levels of Lake Eyasi and Nasera rock-shelters orthogonal truncated, oblique truncated and angle-backed pieces occur at frequencies ranging from 5.0 - 15.5% (Mehlman 1989:371:422), while in Pahi assemblages they account for only 1.5 – 7.3% in LSA/IA contexts and 4.5 – 16.6% in LSA deposits (Table 6.5). No orthogonal truncated pieces were recovered from Pahi sites.

Concave backed pieces (Figure 6.5. f-g)

Backed pieces which demonstrate concave backing are termed concave backed pieces. The backing may extend the whole length on one of the lateral sides of a flake while the opposite side remains sharp or unretouched. The backing on most concave pieces recovered in Pahi assemblages ended at one of the flake tips. In some pieces the flake talon remained unretouched and therefore they retained a flake affiliation. None of the specimens demonstrated tightly flexed backing as observed in notch or concavity scrapers. The morphology of backed edges in the Pahi assemblages resembles those of concave scrapers, the only difference being that the edge is steeply retouched to an angle ranging from 80° - 90°. These types of implements have been termed "concave-backed flakes" by Phillipson (1976a:21-28, 87, 141) who reports that they are rare at Makwe and Kalemba rock-shelters. No equivalent is reported by Mehlman (1989) or Masao (1979). In the Pahi assemblages concave-backed pieces occur at a range of 1.5 – 19.5% in LSA/IA contexts and represent 9.1% in LSA (Table 6.5). Overall, concave-backed pieces represented 6.8% of total excavated backed pieces in the entire Pahi project.

Divers backed pieces (Figure 6.5. h)

Divers backed pieces are those that do not fit reasonably into any of the categories outlined above (Mehlman 1989:134). Only three specimens of this type were recovered from Pahi, two of which displayed an irregular backed retouch and a third specimen was a circular backed piece. The latter specimen had continuously backed edges making it appear as a circular backed tablet which has not been documented elsewhere. In Nelson's (1973) typology divers backed pieces are categorized as "miscellaneous backed" artifacts. Artifacts of this kind were rare in the Pahi assemblages representing only 1.9% of the total recovered backed pieces. In the LSA/IA contexts they represent 1.5% while in the LSA they account for 9.1% (Table 6.5).

Backed awls/drills/*percoirs* (Figure 6.5. i-j)

Backed pieces with a narrow, sharp point usually formed by two converging blunted edges are referred to as backed awls, drills or *percoir*. Pahi specimens demonstrated wide variations in retouch patterns on their converging blunted edges. Some pieces had only one backed side while the other side was casually or formally retouched, while others had both sides backed. Some authorities refer to these types of tools as "awls" or "backed points" (Nelson 1973; Phillipson 1976a:28). No equivalent is reported by Masao (1979). The outline of some pieces may resemble an angle burin although it is not formed by the removal of a true burin spall (Phillipson 1976a:28). The distribution of backed *percoirs* varied considerably at the Pahi sites and range from 4.4 – 50.0% in LSA/IA contexts and 4.5 – 16.6% for the LSA (Table 6.5). Overall backed *percoirs* account for 12.4% of total excavated backed pieces.

LSA levels at Lake Eyasi and Nasera rock-shelters produced divers backed, backed awl/drill/*percoir* and backed fragments ranging from 34.5% - 81.5% (Mehlman 1989:371-422). The values are much higher than those observed at Pahi sites where they represent a range of 5.9 – 50.0% in the LSA/IA levels and 4.5 – 16.6% in the LSA.

6.6.1.3. Points/*Percoirs*

Points have two shallow retouched edges that converge into a sharp point with an angle usually less than 45°. According to Mehlman (1989:135) "angles of retouch are generally shallow or low angle, <30°, forming a cutting edge, or a combination of cutting and low angle scraper retouch." Points may appear triangular or lanceolate in plan and most have two convergent retouched edges longer than the base. Edges may be unifacially, bifacially or partly bifacially retouched. The extent of retouch may vary considerably from one specimen to another. Some points made from flakes may have their striking platform unaltered while in others the trimming process may remove it. Points intergrade with backed *percoirs* in general plan form, the main difference being the angle of retouch on the convergent edges is <80° on points and almost 90° in backed percoirs.

Unifacial Points (Figure 6.5. k-m)

Unifacial points normally have one retouched edge, however some may exhibit basal thinning to facilitate hafting. Some Pahi specimens had a spall removed from one converging side to form an edge that resembles an angle burin while the other side is formally retouched. As is the case for scrapers, unifacial points are plano-clinal in cross-section (Mehlman (1989:136). Only seven specimens were collected from Pahi assemblages, six from Baura 1 (three from LSA/IA and three from LSA contexts) and one from Markasi Lusangi 2 (LSA/IA levels of Rock-shelter P1). Neither alternative edge points/*percoirs* or bifacial points were recovered from Pahi sites and they were also very rare at LSA levels in Lake Eyasi and Nasera rock-shelter. All points collected from LSA levels at Lake Eyasi were also unifacial points (Mehlman 1989:371-422). The mean dimensions of Pahi unifacial points are 23.6 (±5.9) x 16.4 (±6.1) x 6.0 (±1.9) mm with a mean width/length ratio of 1:1.43 (0.61). Their length ranged from 17.0-31.0 mm, breadth 10.0 – 28.0 mm and thickness 5.0 – 10.0 mm.

6.6.1.4. Burins

Burins are made from flakes or chunks where a spall has been removed. Spalls are normally removed from the distal or proximal end, running more or less parallel to the flake axis (Phillipson 1976a:29). One to several spalls may be removed from one end of a flake or chunk resulting in multiple scars. The removal of a spall leaves the affected end with a chisel-like appearance. Some burins may also demonstrate two opposed burin edges (Nelson and Posnansky 1970:133). A complication may exist in identifying "true burins" when dealing with materials such as vein quartz which does not display normal patterns of conchoidal fracture (Nelson and Posnansky 1970:132). It is therefore important to look for the negative bulb of percussion left by removal of burin spalls as pieces with accidental fracture will not display this feature. Another important feature of "true burins" is that they demonstrate use wear since they are manufactured for direct use. Burins can be classified on the basis of number of spalls removed from a specified edge, the number of edges (including edge alteration *i.e.*, opposite, adjacent) from which spalls have been removed, angle of spall removal, and type of modification resulting from knapping (*i.e.*, notch, truncation). The varying morphological patterns manifested in burins indicate that they served in a variety of functions (Robertshaw 1990:85).

A consensus has not yet been reached on the classification of burins into subtypes in East Africa. As a result workers have developed several diverse classification systems. For example Nelson and Posnansky (1970:137-142) have outlined nine subclasses while Mehlman (1989:136-137) has defined three. The three subtypes of burins recognized by Mehlman (1989) are adopted in this work. They include dihedral, angle and mixed/other burin. Unfortunately only angle burins were recovered from the Pahi assemblages.

Angle burins (Figure 6.5. n-q)

Flakes or chunks from which one or multiple spalls have been removed from one edge (normally at the proximal or distal end and running parallel to the flakes is long axis) are termed angle burins. The edge from which the spalls are removed may or may not be retouched. An angle that is approximately 90° is often formed by the burin blow with the edge from which the spall was removed (Mehlman 1989:137). Pahi burins were made from comparatively thick and broad flake pieces (see width/length ratio discussed below). Only four angle burins were obtained at Baura 1 (two from LSA/IA and two from LSA deposits) and one from Lusangi 1 (LSA levels of Rock-shelter P44), while none were collected from Markasi Lusangi 2 (Rock-shelter P1). All specimens demonstrate one end spall blow and had mean dimensions of 19.6 (±5.3) x 16.8 (±6.2) x 5.4 (±1.8) mm, with a width/length ratio of 1:1.17 (0.86). Their lengths ranged from 12.0 – 26.0 mm, width 11.0 – 24.0 mm and thickness 3.0 – 7.0 mm. Masao (1979:152) and Mehlman (1989:137, 371-422) report low frequencies of burins in the sites that they investigated. The history of burin manufacture in sub-Saharan Africa is not well understood. However it has been suggested that industries with higher frequencies of burins occur in northeast Africa with decreasing numbers as one moves south (Nelson 1973:236; Nelson and Posnansky 1970:135-36).

6.6.1.5. *Outils écaillés* (Figure 6.6. a-b)

The amount and component associated with the *outils écaillés* from the Pahi sites is described in Table 6.6. Several terms have been used by various authorities to describe *outils écaillés*. Leakey (1931:97-100, 174) used the term “fabricator”, “sinew frayers” and

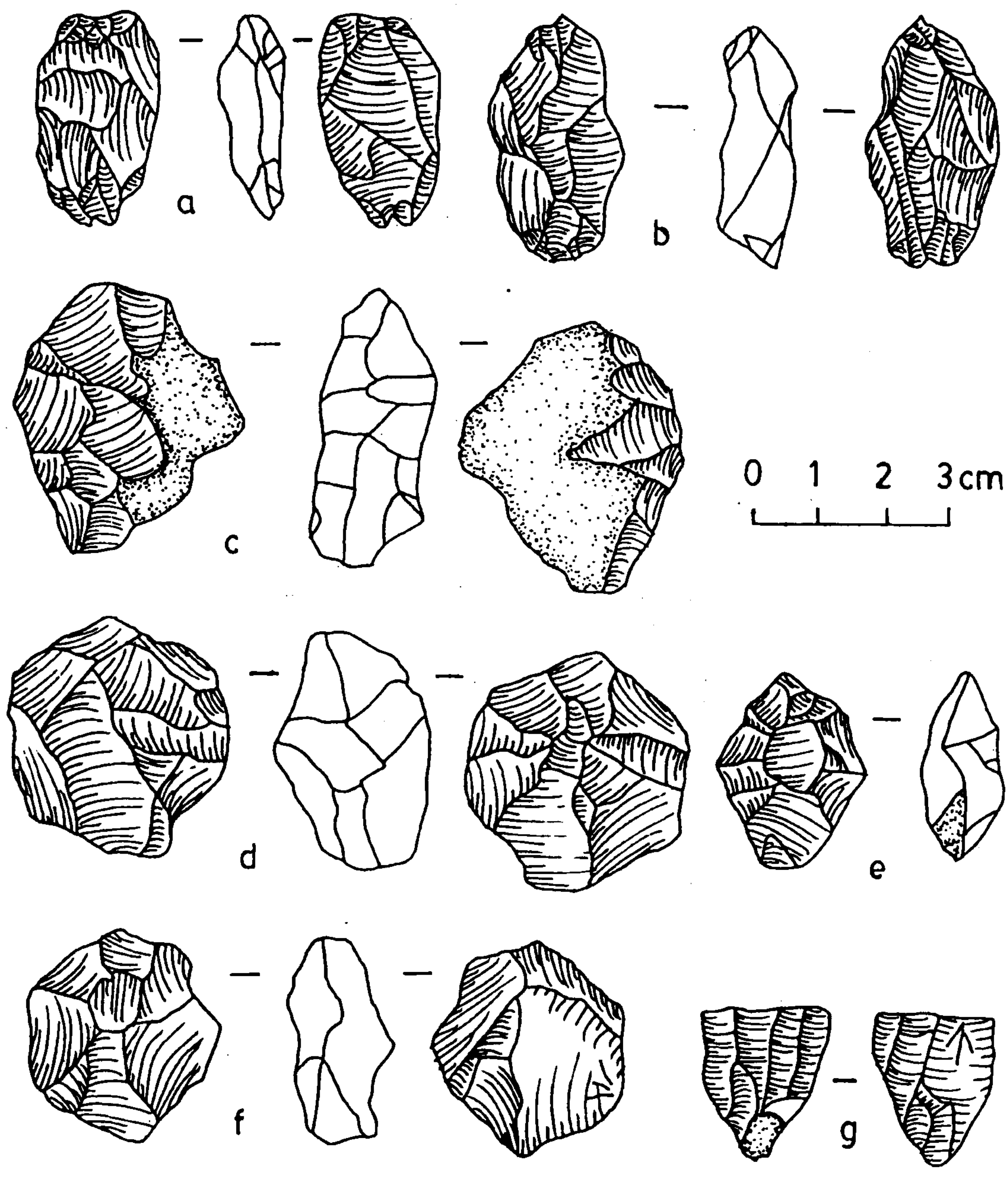


Figure 6.6. Pahi *outil écaillés* and cores: a- b, *outil écaillés*; c, part-peripheral core; d, radial/biconical core; e, disc core; f, Levallois core; g, pyramidal core

Table 6.6. Frequency of *outil écaillés* from Baura 1, Lusangi 1 and Markasi Lusangi 2

Site and component affiliation	Number
Baura 1 LSA/IA Levels	12
Baura 1 LSA Levels	17
Lusangi 1 LSA/IA Levels	4
Lusangi 1 LSA Levels	16
Markasi Lusangi 2 LSA/IA Levels	2
Markasi Lusangi 2 LSA Levels	4
Total	**55**

lame écaillée. Deacon (1972:14) defined them as *piéce ésquillés*, while Clark and Kleindienst (1974:92) refer to them as *outils esquillés*. Researchers currently prefer to use the term *outils écaillés* (Masao 1979:140-48; Mehlman 1989:138). These are lithic artifacts characterized by the presence of tiny step flake scars together with evidence of crushing or shattering along the edges. Most specimens have bifacial retouch and crushing at opposing ends. The presence of crushed opposing ends in *outils écaillés* makes it difficult to differentiate them from bipolar cores (Nelson and Posnansky 1970:139). This difficulty has led to varying opinions on whether *outils écaillés* should be treated as cores or tools. Analysis of "fabricators" or "scalar cores" (*outils écaillés*) in Australia has led to the suggestion that they are cores (of the bipolar technique) used to produce flakes that were used on "taap knives " or "death spears" (Hayden 1973:125; White 1968). However Clark and Kleindienst (1974:92-93) suggest that the existence of more regular faceted edges distinguish *outils écaillés* from bipolar cores. They also have placed *outils écaillés* in the class of utilized rather than shaped tools. However, Clark and Kleindienst's (1974:93) description of *outils écaillés* is not conclusive because they also support White (1968) and Hayden (1973) who conclude that *outils écaillés* may be cores.

What is not disputed is the idea that *outils écaillés* are a product of the bipolar technique (Hayden 1973; Clark and Kleindienst 1974:128).

Several workers have suggested that *outils écaillés* were tools (Nelson 1973 and Gramly 1975). Gramly (1975) noted that *outil écaillés* (or *pièces esquilleés*) demonstrate the removal of very thin small flakes along edges. The removal of such flakes suggests a retouch process aimed at tool production since these small thin flakes would not have been useful for other purposes. Nelson (1973-208-226) concludes that 10-20% of all *outils écaillés* were manufactured from small flakes which could not have qualified as cores. He further observed that 10 to 25% of *outils écaillés* are reduced to bipointed forms beyond the theoretical point of usefulness as cores. He concludes that tools manufactured from flakes derived from *outils écaillés* were rare. By studying relative size of waste products Nelson noted that most of the waste was derived from cores that were substantially larger than the largest *outils écaillés* or their associated flakes. This implies that waste materials could not have been by-products of *outils écaillés*. Masao (1979:140-48) observed that length and width of *outils écaillés* were closer to those measured from other tools than to bipolar cores. These results indicate that *outils écaillés* were manufactured from chunks (raw materials) of approximate dimension to that of tools. However the similarity that exists between *outils écaillés* and bipolar cores is based on the fact that both are the products of bipolar technique and that both demonstrate some form of crushing or shattering along the edges (Clark and Kleindienst 1974).

There is no consensus on the possible function of *outils écaillés*. MacDonald (1968:88) suggests they were used as a wedge or slotting tool both of which are associated with the groove and splinter technique of working bone, ivory and hard wood. On the other hand Semenov (1964:148-49) suggests *outils écaillés* to have functioned as tools for chiselling, notching or cutting ivory and as gauges for working bone and probably wood. However, experiments completed using *outil écaillés* as wood and bone wedges proved futile (Flenniken 1981:50-56).

Outils écaillés were widely distributed in Pahi sites. At Baura 1 they occurred at a frequency of 5.6 - 14.7% of the total recovered shaped tools, while at Lusangi 1 (Rock-shelter P44) and Markasi Lusangi 2 (Rock-shelter P1) they represent 11.8% and 3.9% respectively (Appendix B1, B5, B17, and B29). At sites of Kandaga A9, Majilili, Kwa Mwango and Kirumi Isumbirira *outils écaillés* occur at a frequency of 6.94%, 9.58%, 16.48% and 18.92% of total recovered shaped tools respectively (Masao (1979: 43, 60, 72, 84). At LSA levels of Lake Eyasi and Nasera rock-shelters a frequency of 0.72 – 3.0% has been recorded (Mehlman 1989:371-422). These data indicate considerable variations in the proportions of *outils écaillés* from site to site, an aspect that may be related to variation in site activities. The mean dimensions in mm, standard deviations and form ratios of the *outils écaillés* are described in Appendix C13. The mean breadth/length ratios of most *outils écaillés* falls between 0.77 – 0.89 indicating they were highly standardized in both LSA/IA and LSA assemblages.

Summary: Shaped Tools

Table 6.7. is a summary of shaped tools from Baura 1, Lusangi 1 Unit 1 and Markasi Lusangi 2 Unit 3. This table indicates the comparison of shaped tools in two ways. First, tools from LSA and LSA/IA components are compared. Secondly, it illustrates occurrences of shaped tools from all sites. Results indicate that at most sites

Table 6.7. Frequency summary of shaped tools

Scraper type	Site Name							
	Baura 1 (All Units)		Lusangi 1, Unit 1 (Rock-shelter P44)		Markasi Lusangi 2, Unit 3 (Rock-shelter P1)		**Total (All sites and levels)**	%
	Affiliated cultural assemblage		Affiliated cultural assemblage		Affiliated cultural assemblage			
	LSA/IA	LSA	LSA/IA	LSA	LSA/IA	LSA		
Scrapers	164 (73.9)	90 (67.2)	26 (81.2)	99 (71.7)	54 (43.2)	21 (67.7)	**454**	66.6
Backed pieces	41 (18.5)	22 (16.4)	2 (6.3)	22 (15.9)	68 (54.4)	6 (19.4)	**161**	23.6
Points	3 (1.3)	3 (2.2)	-	-	1 (0.8)	-	**7**	1.0
Burins	2 (0.9)	2 (1.5)	-	1 (0.7)	-	-	**5**	0.7
Outil écaillés	12 (5.4)	17 (12.7)	4 (12.5)	16 (11.6)	2 (1.6)	4 (12.9)	**55**	8.1
Total	**222(100.0)**	**134(100.0)**	**32(100.0)**	**138(100.0)**	**125(100.0)**	**31(100.0)**	**682**	**100.0**

* Numbers in parenthesis are percentages

scrapers are the most common tool in both LSA/IA and LSA levels, followed by backed pieces, *outils écaillés*, points and burins. An exception to this pattern occurs at Markasi Lusangi 2 (Rock-shelter P1) where backed tools dominate scrapers. When the total occurrence of shaped tools for all sites is examined (Table 6.7) the results are similar to those based on component divisions. Once again scrapers (66.6%) were the most frequently recovered shaped tools, followed by backed pieces (23.6%), *outils écaillés* (8.1%), points (1%) and burins (0.7%). The frequency of shaped tools by site indicates that Baura 1 Units 1, 2, 3 and 4 (52.2%) produced the largest number of shaped tools, followed by Lusangi 1 Unit 1 (24.9%), while Markasi Lusangi 2 Unit 3 (22.9%) produced the least. The results detailed in Table 6.7 are comparable to those of other sites from central and northeast Tanzania (Table 6.8). At LSA levels of Lake Eyasi and Nasera Rock-shelters (Mehlman 1989:369 –422) scrapers and backed pieces dominate over other shaped tools. Moreover, a general inter-site comparison of several sites in central Tanzania indicated that backed pieces (microliths), *outils écaillés*, scrapers, retouched waste and utilized flakes outnumber other shaped tools (Masao 1979:197).

In the scraper category, convex side (20.5%) dominates Pahi assemblages, while circular, nosed end, sundry end and side, notch, sundry combination and convex side and concave combination are the least frequent, each representing about 0.2% of the total scrapers (Table 6.4 & Figure 6.7). In terms of backed pieces, crescents (57.1%) are the most numerous, while triangles, trapeze and angle-backed pieces are the least common, each representing 0.6% (Table 6.5 & Figure 6.8). Unifacial points are the only points recovered from the sites while alternate edge points and bifacial points were absent. Most

Table 6.8. Frequency of shaped tools from LSA and LSA/IA occurrences in central and northeast Tanzania after Masao (1979) and Mehlman (1989)

Site name	% Scrapers	% Backed pieces	% Points	% Burins	% *Outils écaillés*
Nasera Level 3 (with Kansyore/Nderit Pottery) (Olmoti Industry)	37.4	29.3	0.0	5.4	0.7
Nasera Level 3b (Sisale Industry)	27.4	56.7	0.5	0.9	1.4
Nasera Levels 4 & 5 (Lemuta Industry)	39.2	30.5	0.3	4.6	2.3
Mumba Upper Lever III (Oldean Industry)	21.1	75.8	0.0	0.2	0.0
Mumba Middle Level III (Aceramic LSA or Intermediate LSA)	61.0	39.0	0.0	0.0	0.0
Kandaga A9	24.35	19.05	NT	0.53	6.94
Majilili 2B	29.94	11.39	NT	1.59	9.58
Kwa Mwango	14.73	20.51	NT	0.36	16.48
Kirumi Isumbirira Trench I	12.27	22.09	NT	1.10	17.06
Kirumi Isumbirira Trench II	15.93	17.83	NT	0.00	26.43
Baura 1 Units 1, 2, 3 & 4 (LSA/IA Levels)	73.9	18.5	1.3	0.9	5.4
Baura 1 Units 1, 2, 3 & 4 (LSA Levels)	67.2	16.4	2.2	1.5	12.7
Lusangi 1 Unit 1 (LSA/IA Levels at Rock-shelter P44)	81.2	6.3	0.0	0.0	12.5
Lusangi 1 Unit 1 (LSA Levels at Rock-shelter P44)	71.7	15.9	0.0	0.7	11.6
Markasi Lusangi 2 Unit 3 (LSA/IA Levels at Rock-shelter P1)	43.2	54.4	0.8	0.0	1.6
Markasi Lusangi 2 Unit 3 (LSA Levels at Rock-shelter P1)	67.7	19.4	0.0	0.0	12.9

% = worked out of total recovered tools.
NT = Not Typed.
* Note that Masao (1979) included unshaped tools (trimmed waste and utilized flakes) in his tool frequency calculations and this has effectively lowered his percentage calculations for scrapers, backed pieces, burins and *outils écaillés*.

tool types also occur in both LSA/IA and LSA cultural contexts suggesting a continuous production of basic lithic tools despite the introduction of iron technology. Furthermore, in most circumstances the mean dimension and form ratios of individual shaped tools types including those of scrapers, backed pieces and *outils écaillés* do not show any significant divergences among sites or between LSA/IA and LSA assemblages leading to a suggestion that there was no significant change in technology between the two cultural contexts (Table 6.3, Appendix C1 – C13).

Figure 6.7. Scraper frequency from Pahi sites

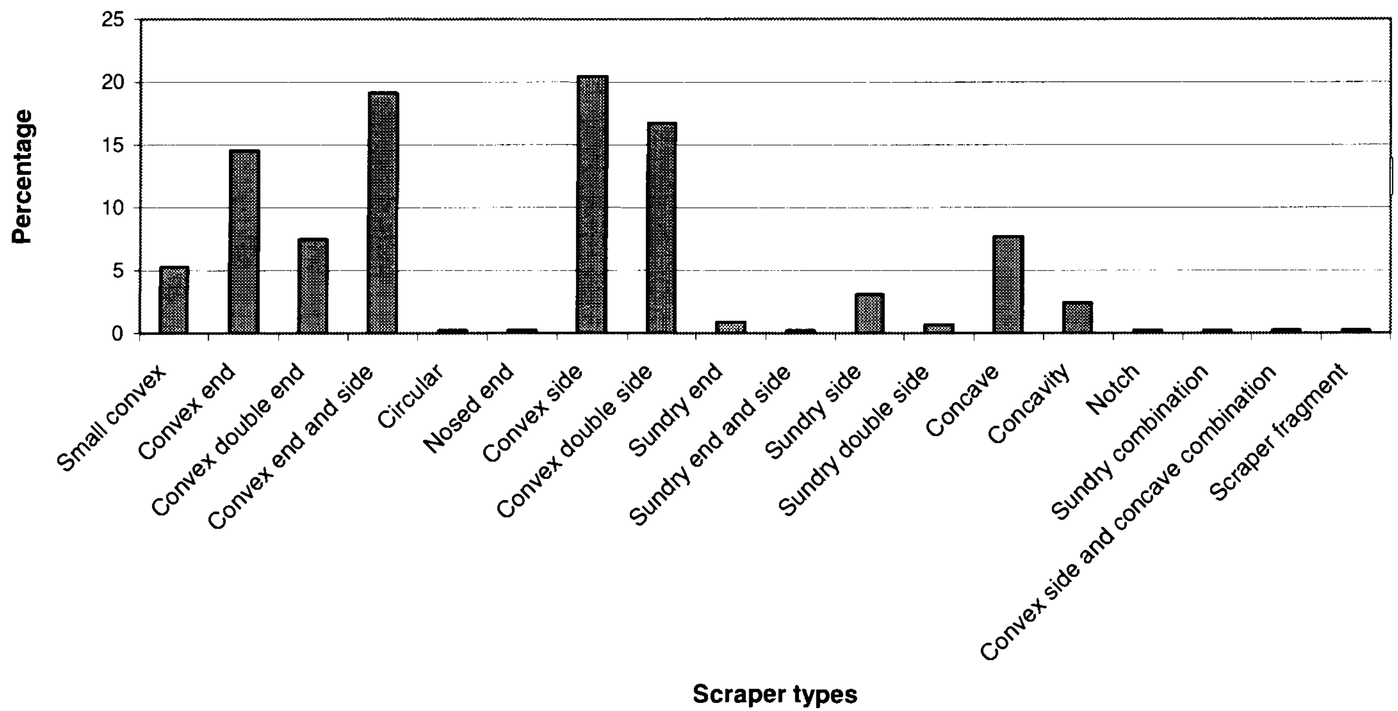
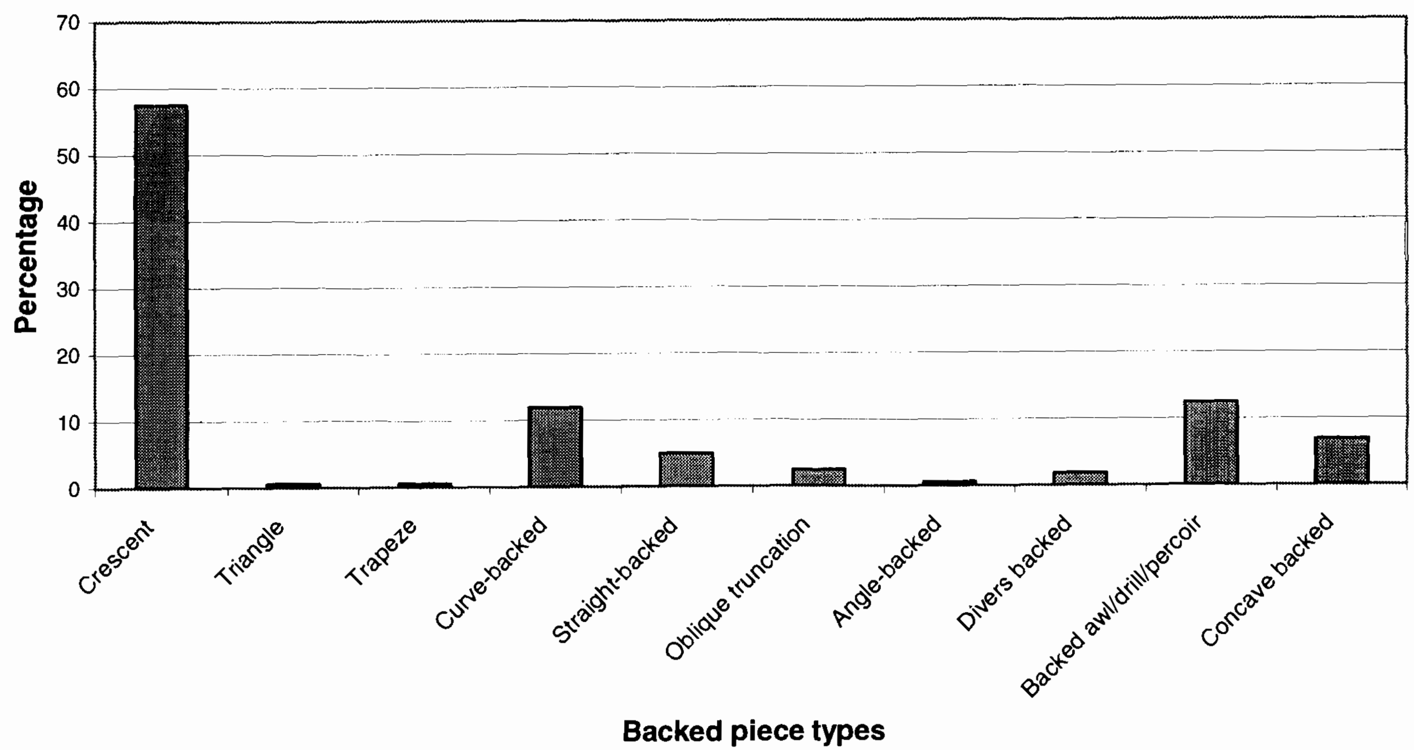


Figure 6.8. Frequency of backed pieces from Pahi sites



6.6.2. Cores

Cores are the second major category of lithic artifact after shaped/retouched tools. Cores are the basic sources from which flakes and blades are derived to make shaped tools. These artifacts have one or several steep or shallow negative flake scars. In the Pahi assemblages three stages of core development are identified based on number of flakes removed: early abandonment, premature, or exhaustion stage. These stages are discussed in detail later in this chapter.

Clark and Kleindienst (1974:90-91) divide cores into specialized and unspecialized types. Unspecialized cores are made from chunks or angular fragments and less commonly from cobbles. Most cores in this category do not have prepared flaking surfaces or striking platforms, instead these features remain plain or simply faceted. Specialized cores have distinctly prepared striking platforms. These prepared core techniques have one advantage in that they allow for the production of flakes or blades of predetermined form. In addition their production is more efficient in the sense that less effort and raw materials are needed. The platforms of these cores are multifaceted although some may also be simple or plain (Clark and Kleindienst (1974:90)

Cores may also demonstrate minor retouch and in such cases are referred to as "core scrapers". Most core scrapers have blunt or steep retouch. According to Mehlman (1989:140-41) and Clark and Kleindienst (1974:126) it is difficult to differentiate core scrapers from other cores because trimming is highly variable and retouch patterns can be similar to those produced during normal platform preparation before flakes or blades are struck. However when the retouched edge has a pronounced concave, convex or notch shape, this is clearly indicative of a core scraper.

In the Pahi assemblages cores are classified on the basis of number of platforms, relative positions of the platforms, flaking distribution pattern (*e.g.*, peripheral worked cores), general morphology and associated negative scars (presence or absence of retouch at edges). Core scrapers are quite rare in Pahi assemblages (0.6%) (Table 6.9), but are more common in other areas of central Tanzania and at LSA levels at Lake Eyasi and Nasera rock-shelters (Mehlman 1989).

The mean dimensions, standard deviations and form ratios of cores are described in Appendix C14 – C19. As is the case for shaped tools, the mean dimensions of the various individual types of cores do not show any significant divergence between sites or assemblages from the LSA and LSA/IA contexts (Appendix C14 - C19). Furthermore, most of the basic core types such as divers single platform, opposed double platform, adjacent double platform, multiple platform and bipolar cores occur in abundance in both LSA/IA and LSA contexts (Table 6.9). For example bipolar cores, which are the most frequent core type in Pahi, occur at a frequency of 50.4 – 62.6% in LSA/IA and 44.9 – 62.5% in LSA contexts (Table 6.9). These data support earlier conclusions for an absence of major technological change between LSA and LSA/IA cultural assemblages.

6.6.2.1. Peripherally worked cores

There are four types of peripherally worked cores: part-peripheral, radial/biconical, disc and Levallois cores (Mehlman 1989:141-142). They may be worked on one or both faces from a single edge which covers at least one third of the core and

Table 6.9. Frequency of cores from the LSA/IA and LSA Levels at Baura 1, Lusangi 1 (Rock-shelter P44) and Markasi Lusangi 2 (Rock-shelter P1)

Core type	Site Name							
	Baura 1 and 3 (All Units)		Lusangi 1, 3 and 4 (All Units)		Markasi Lusangi 2 (All Units)		**Total (All sites and levels)**	%
	Affiliated cultural assemblage		Affiliated cultural assemblage		Affiliated cultural assemblage			
	LSA/IA	LSA	LSA/IA	LSA	LSA/IA	LSA		
Part-peripheral	-	-	-	1 (0.9)	-	-	**1**	0.1
Radial/biconical	-	-	1 (1.5)	-	-	1 (2.1)	**2**	0.2
Disc	-	1 (0.2)	-	-	-	-	**1**	0.1
Levallois	-	1 (0.2)	-	-	-	-	**1**	0.1
Pyramidal single platform	1 (0.4)	-	1 (1.5)	-	-	-	**2**	0.2
Divers single platform	55 (22.5)	102 (18.6)	4 (6.0)	15 (14.0)	12 (13.8)	2 (4.2)	**190**	17.2
Single platform core scraper	1 (0.4)	-	-	-	-	-	**1**	0.1
Opposed double platform	21 (8.6)	43 (7.8)	11 (16.4)	26 (24.3)	23 (26.4)	9 (18.7)	**133**	12.1
Opposed double platform core scraper	1 (0.4)	-	-	-	-	-	**1**	0.1
Adjacent double platform	19 (7.8)	48 (8.7)	4 (6.0)	6 (5.6)	2 (2.3)	5 (10.4)	**84**	7.6
Adjacent double platform core scraper	-	3 (0.5)	-	-	1 (1.1)	-	**4**	0.4
Multiple platform	14 (5.7)	26 (4.7)	2 (3.0)	11 (10.3)	3 (3.4)	1 (2.1)	**57**	5.2
Platform/peripheral	1 (0.4)	7 (1.3)	-	-	-	-	**8**	0.7
Bipolar	123 (50.4)	268 (48.8)	42 (62.6)	48 (44.9)	46 (52.9)	30 (62.5)	**557**	50.5
Bipolar core fragment	-	7 (1.3)	-	-	-	-	**7**	0.6
Amorphous	8 (3.4)	43 (7.8)	2 (3.0)	-	-	-	**53**	4.8
Total	**244(100.0)**	**549(100.0)**	**67(100.0)**	**107(100.0)**	**87(100.0)**	**48(100.0)**	**1102**	**100.0**

* Numbers in parenthesis are percentages

encircle the entire circumference. Cores of this type are classified based on the extent to which the periphery has been flaked, type of flakes removed and the cross section of the core perpendicular to the plane in which the worked periphery lies (Mehlman 1989:141).

Part-peripheral cores (Figure 6.6. c)

Part-peripheral cores have been peripherally worked but the flaked area does not encircle the entire core. They are similar to what Clark and Kleindienst (1974:91) referred to as "proto-biconical cores" or to Nelson's (1973) "semi-radial cores". The flaking may be done "from one face or alternately from opposite faces to produce a sinuous edge round not more than half the periphery" (Clark and Kleindienst 1974:91). This type of flaking makes the shape similar to that of a core chopper. Because of this similarity it is important to examine the size of flake scars and their regularity, evidence of crushing or battering, and other edge damage from use (Mehlman 1989:141). Only 1 part-peripheral core was present in Pahi assemblages from an LSA context, measuring 44 x 34 mm with a breadth/length ratio of 1:1.29 (0.77) (Table 6.9, Appendix C17)

Radial/biconical cores (Figure 6.6. d)

Radial/biconical cores are peripherally worked cores where flakes have been removed around the entire circumference. The cores may be unilaterally or bilaterally worked. These have been termed biconical by Clark and Kleindienst (1974:91) or conical by Nelson (1973). The morphology is circular in plan form, with a thick biconvex section. Some specimens have a triangular cross-section and others have one face that is flatter than the others. Flakes struck from these types of cores may demonstrate convergent dorsal scars (Phillipson 1976a:26). As in the case of part-peripheral cores, radial cores were rare in the Pahi assemblages representing only 0.2% of total analyzed cores (Table 6.9). One radial core was collected an LSA/IA context at Lusangi 1 Unit 1, while another was from an LSA level at Markasi Lusangi 2 Unit 1.

Disc cores (Figure 6.6. e)

Thin cores which demonstrate flake removal from one or both faces leading to production of a flat core face are termed disc cores. Cores of this type are lenticular in cross-section. They are equivalent to Nelson's (1973) "small discoidal core" or Clark and Kleindienst's (1974:92) "discoid cores". The single specimen from Pahi assemblages came from an LSA context at Baura 1 (Table 6.9). It had a dimension of 29.0 x 20.0 mm and a width/length ratio of 1:1.45 (0.69) (Appendix C15). Substantial numbers of such cores are reported from LSA levels at Nasera and Mumba Rock-shelters (Mehlman 1989).

Levallois cores (Figure 6.6. f)

Levallois cores are peripherally worked but with specially prepared platforms for the purpose of producing large flakes or blades of predetermined forms. Platforms are normally multifaceted but simple faceted or plain platforms are also common (Clark and Kleindienst 1974:91). After the removal of a flake or blade, the flaking surface undergoes additional preparation before another flake is removed. The angle between prepared surfaces and the striking platform usually approximates 90° (Clark and Kleindienst 1974:91). Radial and disc cores may qualify as Levallois cores if they display prominent flake scars on one or both surfaces (Mehlman 1989:142). According to Clark and Kleindienst (1974:91) Levallois cores may have a varying number of plan forms including: oval to circular, in which case the prepared face generally shows radial preparation; sub-triangular with either radial or convergent preparation; and sub-rectangular with parallel or convergent flaking from one or both ends. Levallois and disc cores were almost completely absent in the Pahi assemblages (Table 6.9). They are also reported to be rare at other sites in central Tanzania (Masao 1979:161), the LSA levels of Lake Eyasi and Nasera rock-shelters (Mehlman 1989:371-422) and at Magosi II in Uganda (Nelson 1973:248). The single Pahi specimen was collected from an LSA context at Baura 1 (Table 6.9) and had a length of 31 mm, a width of 28 mm and breadth/length ratio of 1:1.10 (0.90).

At LSA levels at Lake Eyasi and Nasera rock-shelters part-peripheral cores, radial/biconical cores, disc cores and Levallois cores have a frequency of 4.3 - 11.4% of total cores (Mehlman 1989:371-422). In the Pahi assemblages the same artifacts occur at a frequency of 1.5% in LSA/IA levels and range from 0.4 – 2.1% in the LSA. In the overall analysis they represent a frequency of 0.5% of total analyzed cores (Table 6.9).

6.6.2.2. Patterned Platform Cores

Patterned platform cores can be divided into eight categories: pyramidal single platform, divers single platform, single platform core scraper, opposed double platform, opposed double platform core scraper, adjacent double platform, adjacent double platform core scraper and multiple platform. Most have striking platforms forming a steep angle of approximately 90° with the faces bearing the major negative flake scars (Mehlman 1989:142). These cores are classified on the basis of the number of platforms, relative positions of the platforms to each other, and general morphology of the core (*e.g.*, pyramidal single platform core). The presence or absence of retouched edges (small flake trimming on the edge) also can determine whether or not a core is a scraper. Most cores in this category demonstrate sub-rectangular, sub-cuboid and tubular shapes (Mehlman 1989:142).

Pyramidal single platform cores (Figure 6.6. g)

Pyramidal single platform cores are conical in shape with the base forming the platform. Cores of the type have flakes/blades struck from the entire circumference of the platform (Mehlman 1989:143). Nelson (1973) has referred to this type of core as "one platform blade core" while Clark and Kleindienst (1974:90) classify it as "pyramidal core" as a sub-class of the "prismatic cores". Pyramidal single platform cores were very rare in the assemblages studied here representing only 0.2% of total analyzed cores (Table 6.9). The two specimens were recovered from LSA/IA contexts where they represent 0.4 – 1.5%. These cores are also rare in LSA levels at Lake Eyasi and Nasera rock-shelters (Mehlman 1989:143).

Divers single platform cores (Figure 6.9. g-h)

Cores with a single striking platform that is usually unfaceted are termed divers single platform core. Usually flakes are removed from one flaked surface or single platform and as a result most of the flakes have broad parallel dorsal scars or simple striking platforms. Phillipson (1976a:25-26) has classified these as "unilateral single-platform core" while Clark and Kleindienst (1974:90) refer to them as "unspecilialized

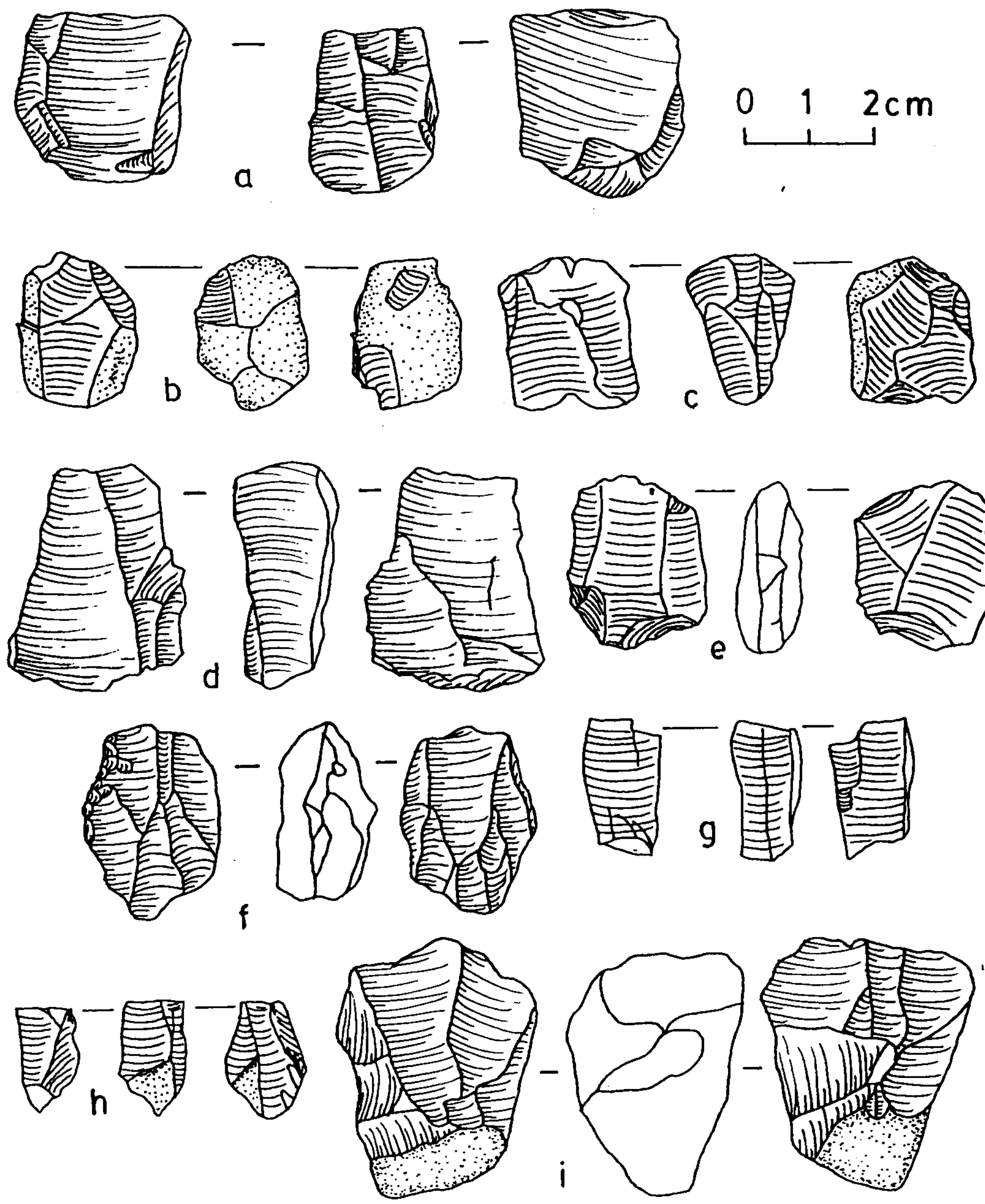


Figure 6.9. Pahi cores: a – e, opposed double platform core; f, opposed double platform core scraper; g-h, divers single platform core; i, adjacent double platform core.

single platform core". On rare occasions flakes may be struck around the entire circumference of the platform (Mehlman 1989:143), and these have been termed by Phillipson (1976a:26) as "bilateral single platform core". Flakes removed from this category may have both parallel and convergent dorsal scar patterns. Divers single platform cores were widely distributed in the Pahi assemblages representing 17.2% of the total analyzed cores (Table 6.9). In the LSA/IA contexts they occur at a frequency of 6.0 – 22.5%, while in LSA deposits they range from 4.2 – 18.6%.

Single platform core scrapers

Divers single platform cores which demonstrate small negative scar patterns as the result of retouch are termed single platform core scrapers. Only one such core was recovered in the Pahi samples from an LSA/IA context (Table 6.9) and its platform had a plain surface. The specimen had a length of 34.0 mm, breadth of 26.0 mm and a width/length ratio of 1:1.30 (0.82).

Opposed double platform cores (Figure 6.9. a-e)

Cores with two striking platforms on opposing ends or sides of a piece are known as opposed double platform cores. The striking platform planes in these cores are often parallel or approximately parallel to each other and their surfaces may be plain or faceted (Mehlman 1989:143). Flakes produced from this type of core may demonstrate bi-directional or opposing flake dorsal scar patterns. These are equivalent to what Clark and Kleindienst (1974:91) call "two platforms" or what Phillipson (1976a:26) terms "double platform core". Opposed double platform cores were widely distributed in the sites of Baura, Lusangi and Markasi Lusangi representing 12.1% of the total analyzed cores

(Table 6.9). They represent a frequency of 8.6 – 26.4% in the LSA/IA and 7.8 – 24.3% in LSA levels.

Opposed double platform core scrapers (Figure 6.9. f)

Opposed double platform cores, which demonstrate small negative scar patterns as the result of retouch, are termed opposed double platform core scrapers. The single specimen collected from the Pahi assemblages was from an LSA/IA context (Table 6.9) and had a facetted platform and length of 29.0 mm, a width of 20.0 mm and a width/length ratio of 1:1.45 (0.69).

Adjacent double platform cores (Figure 6.9. i, 6.10. a)

Adjacent double platform cores have two adjacent striking platforms. The platform planes are often perpendicular and their surfaces may be facetted, plain or a combination of both. Since flakes are removed from one platform at a time some may bear negative flake scars removed from the adjacent platform. These normally form a perpendicular alignment to the long axis of the succeeding flake(s) from the adjacent striking platform. Cores of this type were widely distributed at Pahi representing 7.6% of the total analyzed cores (Table 6.9). They occur at a frequency of 2.3 – 7.8% in LSA/IA and 5.6 – 10.4% in LSA contexts.

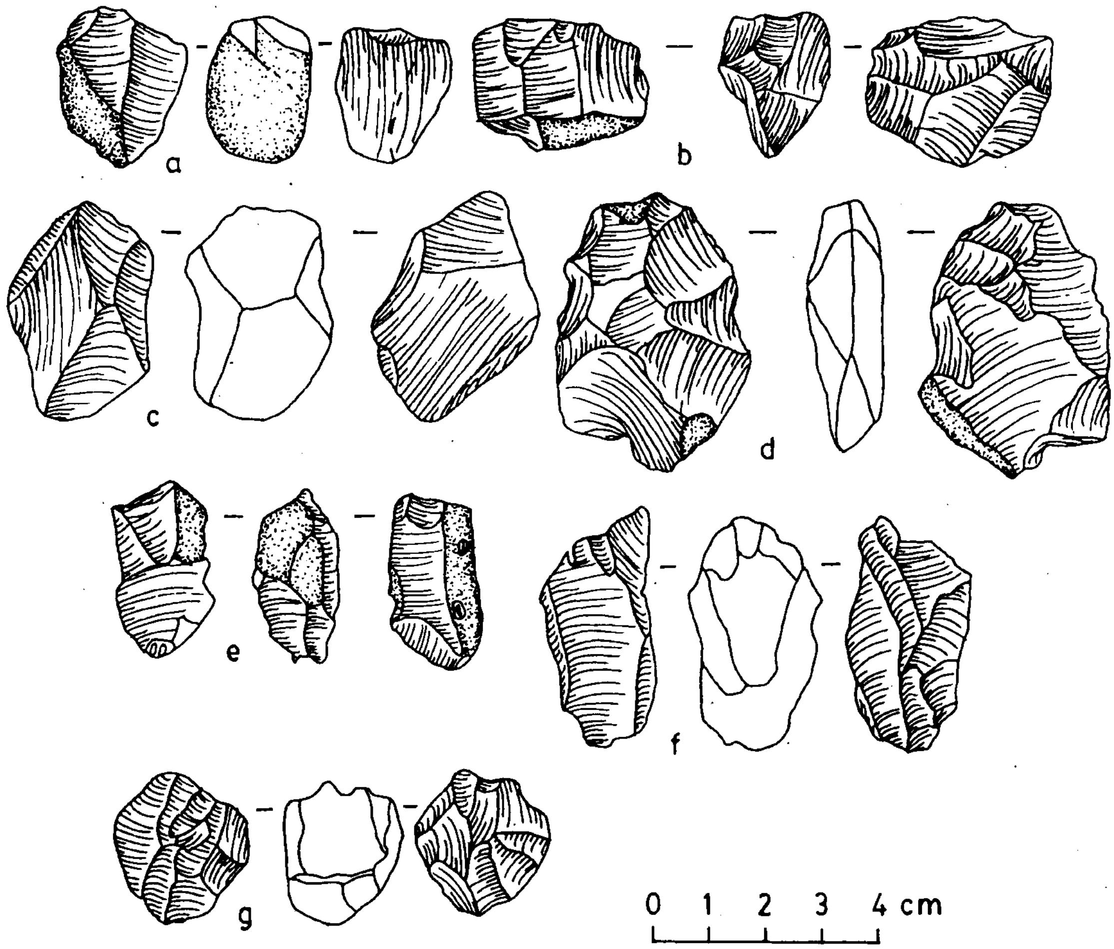


Figure 6.10. Pahi cores: a, adjacent platform; b-c, multiple platform; d, platform/peripheral; e-f, bipolar; g, amorphous

Adjacent double platform core scrapers

Adjacent double platform cores with small negative scar patterns anywhere along the periphery as the result of retouch are termed opposed double platform core scrapers. Three specimens were recovered from LSA contexts at Baura 1 and one was from an LSA/IA level at Markasi Lusangi 2. They represent 0.4% of the total cores analyzed in detail (Table 6.9).

Multiplatform cores (Figure 6.10. b-c)

Multiplatform cores are characterized by three or more striking platforms and are normally flaked over the entire surface. Shapes range from polyhedral to nearly amorphous. Multiplatform cores are equivalent to what Phillipson (1976a:26) calls "polyhedral cores" or a subset of what Clark and Kleindienst (1974:89-91) refer to as "formless or multidirectional cores". Cores of this type were widely distributed in the Pahi assemblages representing 5.2% of the total analyzed cores (Table 6.9). They occur at a frequency of 3.0 – 5.7% in the LSA/IA and 2.1 – 10.3 % in LSA contexts.

6.6.2.3. Intermediate Cores

This category of cores demonstrates combined features of several other types. Included here are platform/peripheral, platform/peripheral core scraper, platform/bipolar, platform/bipolar core scraper and bipolar/peripheral cores. Although most of these types were identified in Lake Eyasi and Nasera sites (Mehlman 1989:371-422) only the platform/peripheral type was recovered in Pahi assemblages.

Platform/Peripheral cores (Figure 6.10. d)

Platform/peripheral cores demonstrate features that are intermediate between platform and peripherally worked cores. Most of the cores recovered in Pahi samples had one main platform from which flakes were struck but were also worked bifacially on the periphery. Cores of this type may sometimes grade into Levallois blade cores but one of the most important distinguishing features is the absence of negative flake scars that qualify blade production (Mehlman 1989:144-5). Cores of this type were uncommon in Pahi samples. All eight specimens were recovered from Baura 1 and represented 0.7% of the total analyzed cores. One of the cores was excavated from an LSA/IA context where it represents 0.4% while seven (1.3%) were from an LSA context (Table 6.9).

In the LSA levels of Nasera and Lake Eyasi rock-shelters patterned platform cores (II) and intermediate cores (III) represented a frequency of 24.4 - 36.6 % of all cores (Mehlman 1989:371-422). In the Pahi sites a similar combined frequencies range from 32.9 – 47% for the LSA/IA and 35.4 -54.2% for the LSA (Table 6.9)

6.6.2.4. Bipolar cores

As mentioned earlier bipolar cores grade into *outil écaillés* because both show battered or crushed edges and are by-products of bipolar flaking. However there are important differences between *outil écaillés* and bipolar cores, one of them being that *outil écaillés* demonstrate very thin flake scars on their edges indicating some form of retouch rather than removal of flakes for tool manufacture. Furthermore, Nelson (1973:208-226) has indicated that *outil écaillés* were made from relatively small chunks, an aspect that disqualifies them as cores.

Bipolar cores (Figure 6.10. e-f)

Bipolar cores are a special form of opposed platform core which have shattered or crushed surfaces at one or both ends resulting from the application of the bipolar technique (Clark and Kleindienst 1974:91). Cores of this type may have flakes removed from one or both platform faces. The core may appear pillow shaped as a result of flaking at opposite ends and crushing from resting on an anvil (Mehlman 1989:147). The flake scar patterns may show step-flaking or splintering (Clark and Kleindienst 1974:91). Placement of the core on an anvil during flaking results in longitudinal splitting while others disintegrate or shear apart along weaker planes. Bipolar cores are well represented at Baura, Lusangi and Markasi Lusangi sites representing 50.5% of the total analyzed cores (Table 6.9). They occur at a frequency of 50.4 – 62.6% in LSA/IA and 44.9 – 62.5% in LSA deposits.

Bipolar core fragments

Bipolar core fragments are fragmentary pieces which may have resulted from the use of the bipolar technique. They normally represent only one of the opposite crushed platforms or a crushed edge. This type of cores was only recovered from Baura 1 in an LSA context and represented only 0.6% of total analyzed cores (Table 6.9).

At LSA levels of Lake Eyasi and Nasera rock-shelters bipolar cores (*i.e.*, bipolar cores and bipolar core fragments) occurred at a frequency of 37.4 - 61.9% of total cores (Mehlman 1989:371-422). At Pahi sites, bipolar cores and bipolar core fragments range from 50.4 – 62.6% in LSA/IA levels and 44.9 – 62.5% in LSA contexts. They constitute 51.1% of total analyzed cores (Table 6.9). In other sites from central Tanzania bipolar cores are reported to represent 20.61-68.01% of the total recorded cores (Masao 1979:163). This indicates that bipolar cores dominate all other core types in the LSA of central and northeast Tanzania.

6.6.2.5. Amorphous cores (Figure 6.10. g)

Amorphous cores have negative flake scars with random orientation. Normally flakes are removed from any convenient margin or point. Archaeologists have assigned different names to this type of core, for example Clark and Kleindienst (1974:91) refer to them as "formless cores", Phillipson (1974a:26) "irregular cores" while Nelson (1973) uses the term "informal and pebble cores". Amorphous cores were not well represented in the Pahi assemblages. Most were recovered from Baura 1 and a few at Lusangi 1 where they represent 3.0 – 3.4% in the LSA/IA and 7.8% in the LSA (Table 6.9). Overall amorphous cores represent 4.8% of all analyzed cores. At LSA levels of Lake Eyasi and Nasera rock-shelters a frequency of 21.7 - 8.2% out of total cores was recorded (Mehlman 1989:371-422), while other sites in central Tanzania indicate a range of 6.78-10.95% (Masao 1979:163).

6.6.3. Debitage

The term debitage is used here to denote lithic artifacts that are the by-products of tool making and core flaking. Included in this category are angular fragments, flakes and blades. The category debitage has been given different names by different authors. Nelson and Posnansky (1970:150) use the term "debris" while Clark and Kleindienst (1974:88-89) refer to it as "waste".

6.6.3.1. Angular fragments

Angular fragments are debitage that lack bulbs of percussion. These include by-products of flaking such as distal flake fragments (chips), core fragments and chunks that cannot be categorized as tools, cores or flakes/blades. In some cases angular fragments can be divided into subcategories such as "utilized/trimmed and non-utilized" but due to time limitations this was not attempted in the Pahi lithic assemblages. As indicated in Table 6.10, 15,931 (53.6%) angular fragments were examined. In other sites in central Tanzania angular fragments range from 24.09 - 82.27% of total excavated lithic artifacts, with most being above 68.02% (Masao (1979:26-82).

Table 6.10. Summary of excavated lithic artifacts

Artifact type	Amount	%
Tools	685	2.3
Cores	2733	9.2
Flakes/blades	10,363	34.8
Angular fragments	15,931	53.6
Non-flaked stone	14	< 0.1
Total	**29,726**	**100.0**

6.6.3.2. Flakes

Flakes are lithic artifacts that demonstrate a striking platform and bulb of percussion. In general flakes are differentiated from blades on the basis of dimensional criteria (see below). For the purpose of this presentation, flakes were divided into three categories: "whole flake" "trimmed/utilized flake", and "flake talon fragment". "Whole flake" refers to those which have unaltered distal, proximal or lateral sections. The "proximal" end bears the striking platform and bulb of percussion. The term "trimmed or utilized flake" is used here to indicate whole flakes that demonstrate features resulting from trimming or utilization. It should be emphasized that trimming features such as retouch scars that are demonstrated on these flakes differ from those found in tools in that they are marginal and irregularly placed. The term "flake talon fragment" implies a talon portion of a broken flake with unmodified edges. In the analyzed debitage whole flakes occur at a range of 83.3 – 90.3% in LSA/IA contexts and 86 – 88% in LSA deposits indicating that the Pahi assemblage was dominated by flakes rather than blades (Table 6.11). Trimmed/utilized flakes and flake talon fragments were rare in the Pahi assemblage. Trimmed/utilized flakes occur at a frequency of 2.8 – 3.4% in LSA/IA and

1.4 – 3.1% in LSA levels, while flake talon fragments represent 0.2 – 1.0% in the LSA/IA and 0.9 – 2.8% in the LSA.

All flakes were measured except for flake talon fragments. The mean dimensions, standard deviations and form ratios of flakes and blades are described in Appendix C20 – C25). The whole flakes from LSA/IA levels have slightly longer mean lengths of almost 1.0- 4.0 mm more than those assigned to LSA but there is no significant differences in mean breadths between the two cultural contexts (Appendix C20 – C25). The reason for longer mean lengths for whole flake specimens in the LSA/IA assemblages is unknown because such differences are not pronounced in shaped tools or cores (Appendix C1 – C19).

The mean dimensions of whole flake (all whole flakes included) was 16.1 (±6.9) x 13.0 (±6.3) x 5.2 (±2.8) mm with a mean width/length ratio of 1:1.23 (0.81). This ratio indicates that on average flakes were relatively broad. A tendency for flakes to have similar mean length and width values also has been noted at Nsongezi Rock-shelter where the mean width/length ratio of flakes was found to be 0.83 (Nelson and Posnansky 1970:153-54). In another case, Mehlman (1989:658) calculated a flake width/length ratio of 0.81 – 0.91 for specimens recovered from the LSA levels at Nasera Rock-shelter. Other sites from central Tanzania report flakes with width/length ratios ranging from 0.66 – 0.74 (Masao 1979:170). This indicates that flakes from Masao's (1979) sites were relatively thinner than those of the Pahi sites. The different width/length ratios between Masao's sites and the assemblage studied here may be the result of different measurement

Table 6.11. Frequency of debitage (flakes and blades) from the LSA/IA and LSA Levels at Baura 1, Lusangi 1 (Rock-shelter P44) and Markasi Lusangi 2 (Rock-shelter P1)

Debitage type	Site Name							
	Baura 1, 2 and 3 (All Units)		Lusangi 1, 3 and 4 (All Units)		Markasi Lusangi 2 (All Units)		**Total (All sites and levels)**	%
	Affiliated cultural assemblage		Affiliated cultural assemblage		Affiliated cultural assemblage			
	LSA/IA	LSA	LSA/IA	LSA	LSA/IA	LSA		
Whole flake	373 (90.3)	1074 (87.1)	80 (83.3)	376 (86.0)	574 (84.4)	169 (88.0)	2646	86.7
Trimmed/utilized flake	14 (3.4)	19 (1.5)	-	6 (1.4)	19 (2.8)	6 (3.1)	64	2.1
Flake talon fragment	1 (0.2)	34 (2.8)	1 (1.0)	4 (0.9)	2 (0.3)	-	42	1.4
Whole blade	24 (5.8)	106 (8.6)	15 (15.6)	51 (11.7)	85 (12.5)	17 (8.9)	298	9.8
Trimmed/utilized blade	1 (0.2)	-	-	-	-	-	1	<0.1
Total	**413(100.0)**	**1233(100.0)**	**96(100.0)**	**437(100.0)**	**680(100.0)**	**192(100.0)**	**3051**	**100.0**

* Numbers in parenthesis are percentages

criteria. Masao (1979:170) did not treat blades differently from whole flakes in completing his width/length ratio calculations. This may have resulted in greater differences between mean width and length values (since blades are by definition, twice as long as they are wide). Otherwise the general width/length ratios from sites excavated by Masao and from the Pahi assemblages suggest that flakes were end-struck *i.e.*, when the flake's length measured perpendicularly to the striking platform exceeds or equals the breadth (Clark and Kleindienst 1974:89; Masao 1979:168).

On the average, flakes from Pahi sites appear to be very small in size. This seems reasonable when their dimensions are compared to the average size of cores that were collected from the sites. Most were small and only a small number measured more than 50 mm in length. Out of 2752 of the flakes analyzed in detail, including whole flakes, trimmed/utilized flakes and flake talon fragments only 474 (17.2%) had cortex which implies most of the flakes were removed from the inner parts of cores after the cortex was removed. However this figure may not represent exact number of the flakes with cortex because sometimes it is difficult to distinguish cortical and non-cortical surfaces in some quartz flakes unless the initial core began as a pebble.

6.6.3.3. Blades

Blades are flakes that are at least twice as long as they are wide. They can be subdivided into whole blades, trimmed/utilized blades, blade talon fragments and trimmed/utilized blade talon fragments. Blade talon fragments and trimmed/utilized blade talon fragments were not recovered in Pahi lithic assemblages. The term "whole blade' refers to those which have unaltered distal, proximal and lateral sections.
Trimmed/utilized blades bear evidence of trimming or utilization which is more marginal

and irregularly placed than those observed in tools. In the Pahi assemblages both whole blades and trimmed/utilized blades were relatively very rare compared to whole flakes. As has been observed by Masao (1979:90, 168) LSA industries in central Tanzania seem to be dominated by flake rather than blade industries. In the debitage assemblage studied here the percentages of whole blade ranged from 5.8 – 15.6% in LSA/IA and 8.6 – 11.7% in LSA levels (Table 6.11). Trimmed/utilized blades were very rare in Pahi site assemblages. Only one utilized/trimmed blade was recovered in the entire Pahi project (Baura 1 Unit 2) (Appendix B8). This does not necessarily imply that blades were not used by LSA peoples of Pahi but may reflect a problem relating to identification of minute use wear patterns. Quartz is a very hard raw material and as a result most use wear is not easily observable with a hand lens. Furthermore, since the Pahi region is rich in quartz deposits, lithic artifacts might have been used only a few times and then discarded. As a result few use wear traces would have been left on the artifacts. The mean dimensions, standard deviations and form ratios of blades are described in Appendix C20 – C25. In contrast to whole flakes the mean measurements of whole blades do not show any definite difference between the LSA/IA and LSA cultural assemblages. The mean breadth of the blades indicates that blades were relatively narrower than flakes.

6.6.4. Non-flaked Stone

Lithic artifacts that are characterized by the presence of natural cortex on most surfaces are classified as non-flaked stone. They have surfaces which have been pecked, crushed or ground. Most recovered specimens were commonly made of coarse quartz bearing a brownish grey cortex. Four categories of non-flaked stone were identified in the Pahi assemblages: hammer stone, edge anvil, pestle rubber and sundry ground stone

(Table 6.12). All pestle rubbers and ground stones (except for one pestle rubber from Level 9 at Markasi Lusangi 2 Unit 2) were recovered from LSA/IA contexts, suggesting an increase in grinding activities during that time possibly brought about by the introduction of grain cultivation (Table 6.12).

6.6.4.1. Hammerstone

Hammerstones are used as hammers to strike flakes from cores. Most hammerstones recovered from Pahi sites were oblong to spherical in shape. Two of the four recovered specimens had bruises at their extreme opposite edges. One had a bruised end while the other end was crushed. Another specimen had both ends crushed. Only

Table 6.12. Summary of non-flaked stones from Baura and Lusangi

Site name	Unit	Level/ layer	Component affiliation	Type of non-flaked stone				**Total**
				Hammerstone	Edge anvil	Pestle rubber	Sundry ground stone	
Baura 1	1	4	(LSA)	-	1	-	-	**1**
	3	3	(LSA/IA)	-	-	2	-	**2**
Lusangi 1	2	4	(LSA/IA)	1	1	1	1	**4**
Markasi Lusangi 2	1	2	(LSA/IA)	1	-	-	-	**1**
	2	4	(LSA/IA)	1	-	1	-	**2**
	"	9	(LSA)	-	-	1	-	**1**
	3	2	(LSA/IA)	-	-	1	-	**1**
Lusangi 3	1	1	(LSA/IA)	-	-	1	-	**1**
	"	5	(LSA)	1	-	-	-	**1**
Total				**4**	**2**	**7**	**1**	**14**

length and width measurements were taken in these specimens. Mean dimensions of three hammerstones are 81.1 x 62.3 mm. A final specimen has an almost spherical shape and its diameter is 87.2 mm.

6.6.4.2. Anvil Stones

Edge anvil

According to Mehlman (1989:152) anvils can be categorized into three types: edge, pitted and edge and pitted anvils. Only edge anvils were recovered at the Pahi sites. Edge anvils are blocks of relatively hard coarse quartz stones which provide a solid base for striking cores during flaking or retouch. The difference between edge and pitted anvils is that the latter has one or more irregular pecked surface depressions. Edge and pitted anvils are intermediate forms which share properties, common to pitted and edge anvils. Most Pahi edge anvils had at least one flat side. Another shared aspect is the presence of crushed or bruised sections along the edge with random flake scars removed during flaking. Only two edge anvils were recovered from the Pahi site assemblages and their mean dimensions are 119.4 x 91.2 x 53.4 mm.

6.6.4.3. Pestle Rubbers

Pestle rubbers were normally used to grind materials in querns. Most pestles collected from Pahi sites were oblong to sub-spherical cobbles with at least one surface ground or rubbed smooth. Pestles were the most frequently encountered non-flaked stone artifacts (Table 6.12), however most were fragmentary. Seven pestles were recovered with mean dimensions of 92.7 x 78.4 x 53.9 mm.

6.6.4.4. Other Ground Stones

Sundry ground stone

One fragmentary piece that could not be categorized to any known type of ground stone was recovered from Level 4 at Lusangi 1 unit 2 in association with a hammer stone, anvil and pestle rubber. Two sides of this artifact were smoothed from grinding activities and it measured 79.4 x 65.4 x 43 mm.

6.7. Lithic Raw Materials

Raw material identifications were made for all excavated tools, cores and flakes/blades except angular fragments. Identification of raw materials was conducted on artifacts from the following contexts: Baura 1 Units 1, 2, 3 and 4; Lusangi 1 Units 1, 2, and 3; Markasi Lusangi 2 Units 1, 2, 3, and 4 and Lusangi 3 Unit 1.

Over 99% of the lithic artifacts recovered from the Pahi site assemblages were made from quartz. This observation is similar to that made by Masao (1979:40, 61) at the sites of Majilili 2B and Kandaga A9 in Kondoa. Both clear and cloudy quartz was used at all Pahi sites. However there are some differences in the quality of cloudy quartz among sites. The cloudy quartz from Lusangi 1 and Markasi Lusangi 2 is more fine grained (texture) than that of Baura. Only two obsidian artifacts were recovered, a circular scraper from Level 4 of Baura 1 Unit 2 (Table 6.13) and a flake from Layer 2 of Markasi Lusangi 2 Unit 3. All obsidian artifacts were small not exceeding 9 mm in length and 7 mm in width. Four chert artifacts were also encountered in the samples. Three of these were collected from Level 5 at Baura 1 Unit 1, two of which were flakes and one was a core. The other chert artifact was a flake from Level 4a of Baura 1 Unit 3. Finally five basalt

Table 6.13. Frequency of lithic raw materials in shaped tools

Type of Shaped tool	# of clear quartz	%	# of cloudy quartz	%	Obsidian	%	**Total**
Small convex scraper	7	25.9	20	74.1	0	0.0	**27**
Convex end scraper	31	47.0	35	53.0	0	0.0	**66**
Convex double end scraper	2	5.9	32	94.1	0	0.0	**34**
Convex end and side scraper	30	34.5	57	65.5	0	0.0	**87**
Circular scraper	0	0.0	0	0.0	1	100.0	**1**
Nosed end scraper	0	0.0	1	100.0	0	0.0	**1**
Convex side scraper	45	48.4	48	51.6	0	0.0	**93**
Convex double side scraper	17	22.4	59	77.6	0	0.0	**76**
Sundry end scraper	0	0.0	4	100.0	0	0.0	**4**
Sundry end and side scraper	1	100.0	0	0.0	0	0.0	**1**
Sundry side scraper	5	35.7	9	64.3	0	0.0	**14**
Sundry double side scraper	0	0.0	3	100.0	0	0.0	**3**
Concave scraper	3	8.6	32	91.4	0	0.0	**35**
Concavity	1	9.1	10	90.9	0	0.0	**11**
Notch	1	100.0	0	0.0	0	0.0	**1**
Sundry combination scraper	0	0.0	1	100.0	0	0.0	**1**
Convex side and concave combination scraper	0	0.0	1	100.0	0	0.0	**1**
Scraper fragment	1	100.0	0	0.0	0	0.0	**1**
Subtotal	**144**	**31.5**	**312**	**68.3**	**1**	**0.2**	**457**
Crescent	31	33.7	61	66.3	0	0.0	**92**
Triangle	1	100.0	0	0.0	0	0.0	**1**
Trapeze	0	0.0	1	100.0	0	0.0	**1**
Curve backed piece	5	26.3	14	73.7	0	0.0	**19**
Straight backed piece	4	50.0	4	50.0	0	0.0	**8**
Oblique truncation	2	40.0	3	60.0	0	0.0	**5**
Angle backed piece	0	0.0	1	100.0	0	0.0	**1**
Divers backed piece	0	0.0	3	100.0	0	0.0	**3**
Backed awl/drill/*percoir*	6	30.0	14	70.0	0	0.0	**20**
Concave backed piece	0	0.0	11	100.0	0	0.0	**11**
Subtotal	**49**	**30.4**	**112**	**69.6**	**0**	**0.0**	**161**
Unifacial points (**Subtotal**)	**2**	**28.6**	**5**	**71.4**	**0**	**0.0**	**7**
Angle Burins (**Subtotal**)	**0**	**0.0**	**5**	**100.0**	**0**	**0.0**	**5**
Outil écaillés (**Subtotal**)	**4**	**7.3**	**51**	**92.7**	**0**	**0.0**	**55**
Total	**199**	**29.1**	**485**	**70.8**	**1**	**0.1**	**685**

artifacts were recovered, two cores and three flakes. One core was recovered from Baura 1 Unit 1 Level 5 and another from Baura 1 Unit 3 Level 1. Two of the basalt flakes were recovered from Markasi Lusangi 2 Unit 2, Level 8 and 11 and another from Markasi Lusangi 2 Unit 3 Layer 2.

Table 6.13 illustrates the breakdown of shaped tools by raw materials in which 485 (70.8%) were made of cloudy quartz and 199 (29.1%) clear quartz while only one (0.1%) was made of obsidian. Analysis indicates that 31.5% of scrapers, 30.4% of backed pieces and 28.6% of unifacial points were made from clear quartz, while 68.3% of scrapers, 69.6% of backed pieces, and 71.4% of unifacial points were made from cloudy quartz. These figures illustrate that the selection of clear and cloudy quartz for making scrapers, backed pieces and unifacial points is very consistent. In all three categories cloudy quartz is the most frequently used material representing 68.3 - 71.4% while clear quartz forms 28.6 - 31.5% of tools. In the case of angle burins and *outil écaillés* the pattern is different. All angle burins are made of cloudy quartz while 92.7 % of *outil écaillés* were made of cloudy quartz.

A general comparison of raw material utilization in the major lithic artifacts categories (*i.e.,* tools, cores, flakes/blades and non-flaked stones) illustrated in Tables 6.14 – 6.17 indicates that the relative usage patterns of clear quartz *vs.* cloudy quartz at Baura and Lusangi are highly consistent. In the case of cores for example the use of cloudy quartz ranges from 92.5 - 100% with most sites representing over 94.2%. The use of clear quartz cores ranges from 0 – 7.5% with most sites representing over 5%. Furthermore, percentages of flakes/blades made out of cloudy quartz ranges from 78.9 - 94.9% while those made out of clear quartz ranges from 5.1 - 21%. As noted earlier, the majority of shaped tools are also made from cloudy quartz (Figure 6.11).

This variation in the use of cloudy *vs* clear quartz is based partly on the distribution and availability of these two raw materials. Although quartz is available

Table 6.14. Baura 1 (all units): raw materials frequency

	Cloudy quartz		Clear quartz		Others		**Total**
Artifact type	Frequency	%	Frequency	%	Frequency	%	
Tools	287	80.6	68	19.1	1	0.3	**356**
Cores	1494	94.8	78	5.0	3	0.2	**1575**
Flakes/blades	2424	78.9	644	21.0	3	0.1	**3071**
Non-flaked stones	3	100.0	0	0.0	0	0.0	**3**

Table 6.15. Lusangi 1 (all units): raw materials frequency

	Cloudy quartz		Clear quartz		Others		**Total**
Artifact type	Frequency	%	Frequency	%	Frequency	%	
Tools	116	68.2	54	31.8	0	0.0	**170**
Cores	516	94.2	32	5.8	0	0.0	**548**
Flakes/blades	1334	82.4	284	17.6	0	0.0	**1618**
Non-flaked stones	4	100.0	0	0.0	0	0.0	**4**

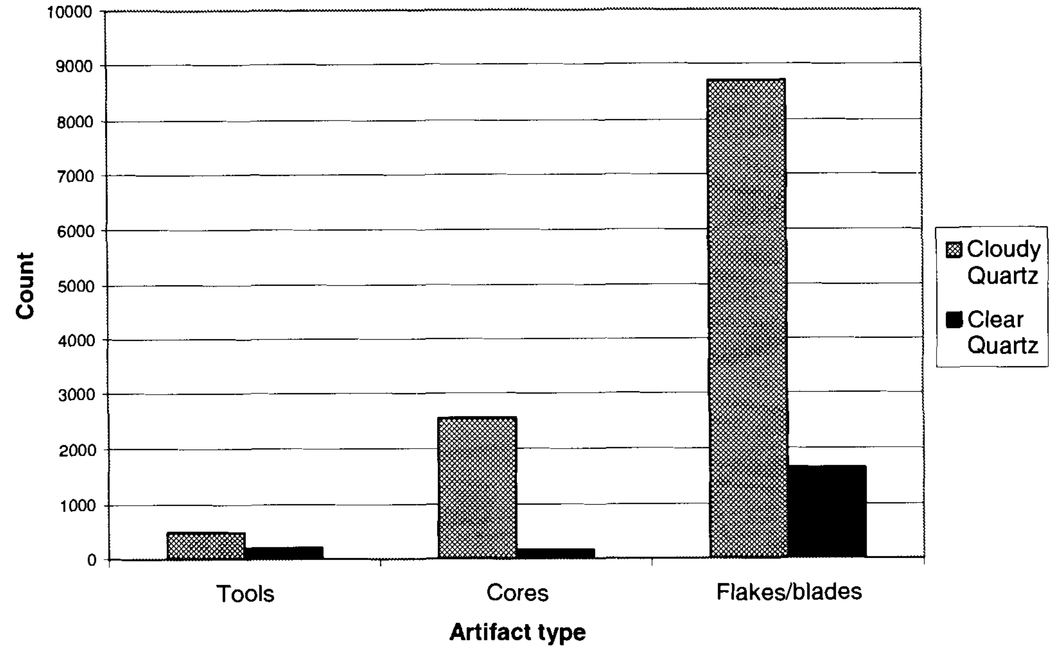
Table 6.16. Markasi Lusangi 2 (all units): raw materials frequency

	Cloudy quartz		Clear quartz		Others		**Total**
Artifact type	Frequency	%	Frequency	%	Frequency	%	
Tools	81	51.3	77	48.7	0	0.0	**158**
Cores	544	92.5	44	7.5	0	0.0	**588**
Flakes/blades	4857	87.2	705	12.7	4	0.1	**5566**
Non-flaked stones	5	100.0	0	0.0	0	0.0	**5**

Table 6.17. Lusangi 3 Unit 1: raw materials frequency

	Cloudy quartz		Clear quartz		Others		**Total**
Artifact type	Frequency	%	Frequency	%	Frequency	%	
Tools	1	100.0	0	0.0	0	0.0	**1**
Cores	15	100.0	0	0.0	0	0.0	**15**
Flakes/blades	94	94.9	5	5.1	0	0.0	**99**
Non-flaked stones	1	100.0	0	0.0	0	0.0	**1**

Figure 6.11. Comparison of raw material use per artifact (All excavated tools, cores and flakes/blades)



everywhere in the study area, clear and cloudy quartz types are unequally distributed with cloudy being the most common. Cloudy quartz exists in various sizes ranging from very large to small cobbles. In areas where clear quartz was available, the samples obtained were small cobbles the majority of which were smaller than 2 cm in length. As shall be noted later, although cloudy quartz is relatively more common in the area of research, and mostly used in the production of artifacts, analysis suggests that whenever clear quartz was available it was more preferred as a raw material. We did not locate a clear quartz quarry site. Local informants at Baura village informed us that there is a quarry for clear quartz (crystal) to the northwest where it was being quarried for commercial purposes. However due to time constraints it was not possible to visit the area.

Sources for volcanic raw materials (*i.e.*, basalt and obsidian) are unknown in central Tanzania. It is possible that these materials were transported from the northeast where such material is available or obsidian could have been obtained from as far as southwestern Kenya. Chemical analysis has determined that obsidian sources for northeastern Tanzanian archaeological sites are at Lake Naivasha and the Njorowa Gorge in Kenya about 320 km northeast of Lake Eyasi and 560 km northeast of Pahi (Mehlman 1989:197). Prehistoric people were forced to use these distant sources because the Tanzanian Rift Valley is dominated by basic and ultrabasic volcanics which produce poor quality trachytic obsidians that are generally unsuitable for artifact manufacture (Mehlman 1989:197).

Figure 6.11 is a summary of quartz raw materials used in making tools, flakes/blades and cores recovered from the Pahi assemblages. This figure indicates that 485 shaped tools were made out of cloudy quartz while 199 shaped tools were made from clear quartz. A total of 8709 flakes/blades were made out of cloudy quartz while 1638 flakes/blades were made from clear quartz. Two thousand, five hundred and sixty nine cores were of cloudy quartz while only 154 cores were of clear quartz. The ratio of shaped tools to flakes/blades is 1:8.2 for clear quartz and 1:18 for cloudy quartz. This implies that for every recovered clear quartz shaped tool there are 8.2 unretouched clear quartz flakes. Similarly for every recovered cloudy quartz shaped tool there are 18 unretouched cloudy quartz flakes. These ratios suggest that although clear quartz was less common than cloudy quartz at the investigated sites it was more preferred to make tools whenever it was available possibly because of its conchoidal fracture properties. Furthermore, the ratio of cores to flakes is 1:3.4 for cloudy quartz and 1:10.6 for clear quartz indicating that only 3.4 flakes were knapped from every cloudy quartz core compared to 10.6 flakes from every clear quartz core. This significant difference suggests that fewer flakes/blades were struck from cloudy quartz cores, implying that clear quartz cores were more heavily exploited for flake/blade production. Although no similar correlations in the use of raw materials was attested by Masao, he does state that "most of the clear quartz waste had been utilized, thus indicating some preference of raw material" (Masao 1979:40).

6.8. Core Reduction Strategy: Stages of Core Abandonment

Three stages of core abandonment are identified in the Pahi lithic assemblages: very early, premature and "exhausted". Several criteria were employed to assess the stages of core abandonment, including presence and size of platform, the extent of the flaked core surface and the size and shape of the core. The term "size" refers to whether the core is large enough to allow the establishment of new platforms (if none exist) or has adequate volume to allow positioning or handling for the production of additional flakes. A core is said to be "very early abandoned" when only a small percentage of the cortex has been removed. Cores of this stage are abandoned while they still have well-established platform surface(s) for flake removal. In terms of size, the cores abandoned at this stage still have adequate room/volume to allow positioning and handling of the core for additional flake removal.

A core is defined as "prematurely abandoned" when all or most of its cortex has been removed but it still has definite platform surface(s). In cases where platforms are absent, the cores in this category still have a room for establishment of new platforms to allow flake removal. Furthermore, cores abandoned at this stage have adequate room/volume to allow positioning and handling of the core for additional flake production. The main difference between "very early core abandonment" and "premature core abandonment" (apart from the presence or absence of cortex) is that in the latter, strategies to utilize the core are more advanced.

A core is said to be "exhausted" when no further possibilities for flake removal remain. Cores abandoned at this stage are small and do not have adequate room/volume to allow positioning and handling of the core for flake production. Some of the cores in this stage may have lost their platforms through exhaustive flaking and do not have adequate volume/space for the establishment of new platforms for flake removal.

As stated earlier quartz especially clear quartz, is ubiquitous in the area of investigation, and it occurs in two forms: surface pebbles and bedrock chunks. Because basalt and obsidian are exotic materials, little can be said as to how these raw materials were procured from their source. In most of the investigated areas cloudy quartz of various sizes and qualities occurs ubiquitously and its use did not involve long distance transport. Since the most common lithic working technology at Pahi was bipolar, which works well on materials of different sizes, it is suggested that both large and small cobbles were used efficiently depending on the size of the artifacts required as final products.

Most of the clear quartz in the Pahi study area occurs as small cobbles and chunks most of which are less than 2 cm in length. It is quite possible that clear quartz was quarried from distant sources. If so then some form of core reduction would have occurred at the quarry sites to reduce the cost of transporting materials back to camp sites. As a result the core to flake/blade ratios calculated above are likely to be influenced because some clear quartz cores or undesirable flakes/blades could have been left at the quarry site.

Core reduction examination involved only 1099 cores that were analysed in detail. Table 6.18 and 6.19 summarize the different stages of core reduction observed in the Pahi site assemblages (Table 6.18) based on raw material (Table 6.19). Table 6.18 indicates that 4.7% of cores were abandoned very early while 27.8% were exhausted. The majority of cores, representing 67.4%, were abandoned prematurely. When core reduction strategy is examined as a function of raw materials a significant distinction is observed between clear quartz and cloudy quartz (Table 6.19). None of the cores made from clear quartz

Table 6.18. Core reduction strategy: general comparison

Stages of core abandonment						
Too-early	%	Prematurely	%	Exhausted	%	**Total Cores**
52	4.7	741	67.4	306	27.8	**1099**

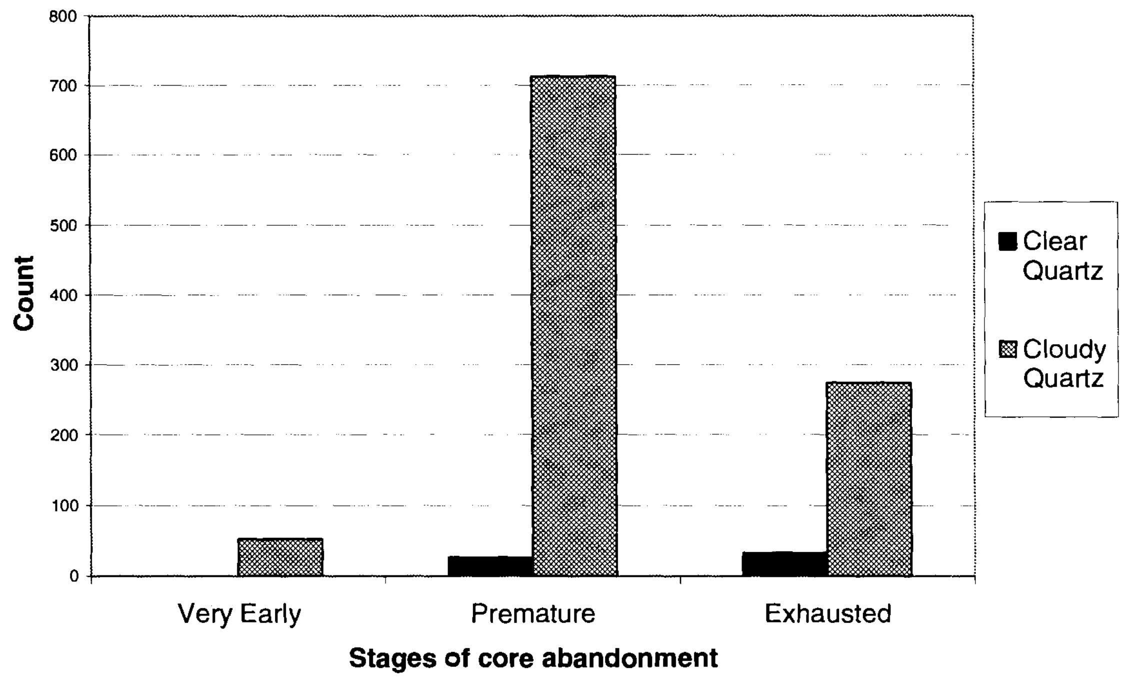
Table 6.19. Core reduction strategy: comparison between different raw materials

Raw material	Stages of core abandonment							
	Too - early	%	Prematurely	%	Exhausted	%	**Total**	%
Clear quartz	0	0.0	26	44.8	32	55.2	**58**	5.3
Cloudy quartz	52	5.0	712	68.6	274	26.4	**1038**	94.4
Basalt	0	0.0	2	100.0	0	0.0	**2**	0.2
Chert	0	0.0	1	100.0	0	0.0	**1**	0.1

were abandoned very early (Figure 6.12). Twenty-six (44.8%) clear quartz cores were prematurely abandoned while 32 (55.2%) cores were abandoned after being exhausted. A different pattern of core utilization is observed for cloudy quartz where 52 (5%) of cores were abandoned very early, 712 (68.6%) were prematurely abandoned and 274 (26.4%) were discarded after being exhausted. The 2 basalt and 1 chert core examined were all abandoned at a premature stage, however small sample sizes do not allow firm conclusions to be drawn on the pattern of their reduction strategy.

In conclusion it appears that there was more intensive exploitation of clear quartz cores in flake production because it is rare and possesses conchoidal fracture ability. This is also an indication that whenever available, clear quartz seems to have been preferred (see also Masao 1979:40). The majority of cloudy quartz cores were abandoned prematurely because cloudy quartz is ubiquitous in most areas of Pahi.

Figure 6.12. Comparison of core utilization in different Raw materials (Cores analyzed in detail only)



6.9. Pottery Analysis

Most of the pottery recovered in Pahi sites came from surface collections. A total of 1786 potsherds was collected from the survey and of these only 255 had diagnostic features such as rims and decoration motifs. A smaller quantity of pottery (1352) was recovered from excavations most of which was not diagnostic. Because the majority of excavated diagnostic pottery was recovered from isolated and undated contexts, it is not possible to seriate and reconstruct the chronological sequence. This problem was further aggravated by the fact that few studies have been undertaken on ceramics in central Tanzania. Exceptions of are found in Sutton (1968), Odner (1971b), Liesegang (1975) and Masao (1979) who provide short descriptions of IA pottery with very limited inter-site or regional comparisons. Lelesu pottery from Usandawe (south-west Kondoa) was assigned to EIA by Sutton (1968), while those of Kandaga and Haubi have been described by Liesegang (1975) and Masao (1979) as LIA. Furthermore, the problem of identifying the Pahi pottery is compounded by absence of equivalent parallels from other areas of Tanzania in which Pahi ceramics could be correlated. Due to the limited number of specimens recovered from excavated contexts, ceramics recovered from surveys were analyzed and described first. These, then were used as a comparative base for excavated specimens.

The main goal of Pahi ceramic analysis is to identify attributes and outline their relationship to other published types in Tanzania. To achieve this, the following attributes were examined: vessel part, vessel type, rim profile, rim size, type of temper, surface finish, types of decoration including their placements and potsherd thickness. The fragmentary nature of the pottery did not permit the identification of vessel type in most cases. In the absence of sufficient rims to establish concrete vessel types, most sherds could be grouped on the basis of decoration motifs.

Manufacture

All pottery examined in this project was manufactured by hand using a paddle and anvil technique to smooth the interior and exterior. A majority of the ceramics is made of moderately fine clay tempered with fine sand, quartz and some mica. Since quartz and mica are ubiquitous minerals in Pahi soils, it may not have been necessary to add temper to clays. The quartz inclusions in most of the pottery consist of moderately fine grains. The use of a similar type of clay (fine clay tempered with moderately fine grained sand, quartz and mica) at all Pahi sites indicates that pottery was made from similar raw materials. Since modern and older pottery consists of similar fabric it is likely that all pottery was locally made. However definite conclusions will require petrological studies.

The surface finish was either rough, slipped or burnished. The term "rough" means that the pottery surface was not modified further after vessel forming. The slips were applied using a fine aqueous clay wash, and no pottery was glazed or painted. Burnishing was probably done by using a smooth stone or other soft materials as bruising was not observed on burnished specimens. Most pottery was fired to brown and buff while a smaller number was grey and red brown. The majority had brown, black or gray cores. Some potsherds had a blackened surface resulting from cooking over a fire.

Vessel Forms

The few rims that are available indicate that most vessels were jars and hemispherical globular bowls, most of which were short necked. Although long-necked pottery was not recovered in the Pahi samples, such forms have been reported from Haubi (Liesegang 1975:96, Fig 2 a). A possible single carinated pot was found in STP 36 (Figure 6.18, e). Liesegang (1975:97) reports to have found a substantial number of carinated pots at Kandaga A9. Most vessels have everted rims with the exception of a few from Markasi 2 Unit 3 where vertical rims are evident. This is in contrast to results obtained by Liesegang (1975) on collections from Haubi, Kandaga, Kwa Mdee and Musia (Kondoa) which demonstrate considerable numbers of more or less vertical rims. All Pahi pots with straight rims were without necks. Most rims have rounded lips and a few are pointed while some specimens had thickened rims compared to their bodies. Potsherds with rims were categorized into three main groups depending on rim diameter. Rims whose diameter was ≤14 cm were regarded as small, those ranging from 15-24 cm were classified as medium, while large rim diameters were ≥25 cm. Analysis indicates that most vessels had wide openings relative to vessel body. The thickness of pottery walls varied from 5 – 19 mm.

Decorations

Four techniques of decoration were identified in the Pahi pottery namely, single impressions, incisions, comb stamping and rocking. Most of the single impressions were apparently executed by sticks with various shaped tips such as oval, semicircular, round, triangular, and rectangular forms; some used unshaped tips. A few of the single impressions were made using two tipped tools but the majority were single tipped. The impression method involved stabbing, rocking or walking the tool over the surfaces. In one potsherd the impression suggests that a piece of a basket or plaited cord roulette was used. The incisions were in most instances made by using sharply pointed objects, however blunt or broad ended equipment was also employed in some instances. The majority of comb stamping decorations were made by implements with four to seven (or more) shaped tines. The most common implement used is a rectangular tipped tool. Other types of decorations such as zig-zag designs were made by rocking a sharp implement on wet clay.

Classification of the Pahi pottery was based on motifs rather than decoration technique. A total of 14 (categories A –N, Table 6.20, see also Appendix D) distinct types of motifs were identified, including multiple lines or rows of comb stamping, zigzag incisions, fingernail impressions/curve incisions, thin incisions, bold incisions, irregular stamps/impressions, incised triangles, single row of combed stamps/dashes, double row

Table 6.20. Pottery motif categories: summary

Decoration Motif															
Cat.	A	B	C	D	E	F	G	H	I	J	K	L	M	N	**Total**
#	92	26	8	10	9	15	8	13	18	10	13	12	11	10	255
%	36.1	10.2	3.1	3.9	3.5	5.9	3.1	5.1	7.1	3.9	5.1	4.7	4.3	3.9	100%

of comb stamps, stamped triangles (wedges), oblique stamping, "V" incisions, band of incised lines, and wavy decorations. As mentioned earlier, these categories were established using pottery obtained during surface collections because excavation did not yield adequate sample sizes. All 14 motifs (which can also be referred to as design elements since they do not occur in combination with other characters) appeared individually on pottery and not as combinations. In some cases similar techniques and characters were used but the motif produced was different. For example, the stamping motif defined as category A (Figure 6.13 a), category G (Figure 6.14 d) and category H (Figure 6.15 b) are similar. The patterns of these motif categories vary from multiple rows (Figure 6.13 a,) double (Figure 6.15 b) and single (Figure 6.14 d) suggesting stylistic differences. It was not possible to determine whether the different decoration motifs represent traditions or phases because ceramics recovered from excavations was too fragmentary to reconstruct chronological sequences. Despite the problems in classifying Pahi Pottery there are some common properties shared by all specimens. As stated earlier, most have either everted or straight rims and, with the exception of one sherd that was carinated, the majority are wide open bowls and jars. Furthermore there were no painted wares and most seem to have been made of fine clay tempered with fine sand, quartz and mica.

In general, almost all pottery recovered from Baura and Lusangi do not have characteristics common to East African EIA pottery such as decoration patterns and rim morphology. Only one rim sherd from Baura had bevels, a feature that is commonly found in EIA pottery from Tanzania (Chami 1994; Soper 1971a: 44). This evidence is far too limited to make conclusive remarks. However, ongoing research at Lake Haubi has revealed pottery similar to that of the EIA (Lane, Mapunda, pers. com.). Indisputable evidence of EIA pottery (Lelesu pottery) has been reported from the Usandawe area (southwest of Kondoa) by Sutton (1968:169-172). As we discussed in Chapter 5 pottery dates to 1030 ±40 BP at Markasi Lusangi 2 and 460 ±40 BP at Baura 1. The absence of clear EIA elements in the Pahi pottery and the available chronology from the IA levels at Pahi suggests that the ceramics may belong to the LIA period. A detailed discussion on the differences between Pahi and EIA pottery is provided in Chapter 7.

Category A : single impressions and comb stamping motifs (Figure 6.13. a-b)

Potsherds attributed to category A were the most frequently encountered type at both Baura (74) and Lusangi (18) and accounted for 36.1% of total diagnostic pottery recovered from the survey (Table 6.20). Most of the pottery in this category consists of large to medium and small size rim diameters jars with short necks and wide openings. The average diameter for pots with large rim diameters was 27 cm while the average for

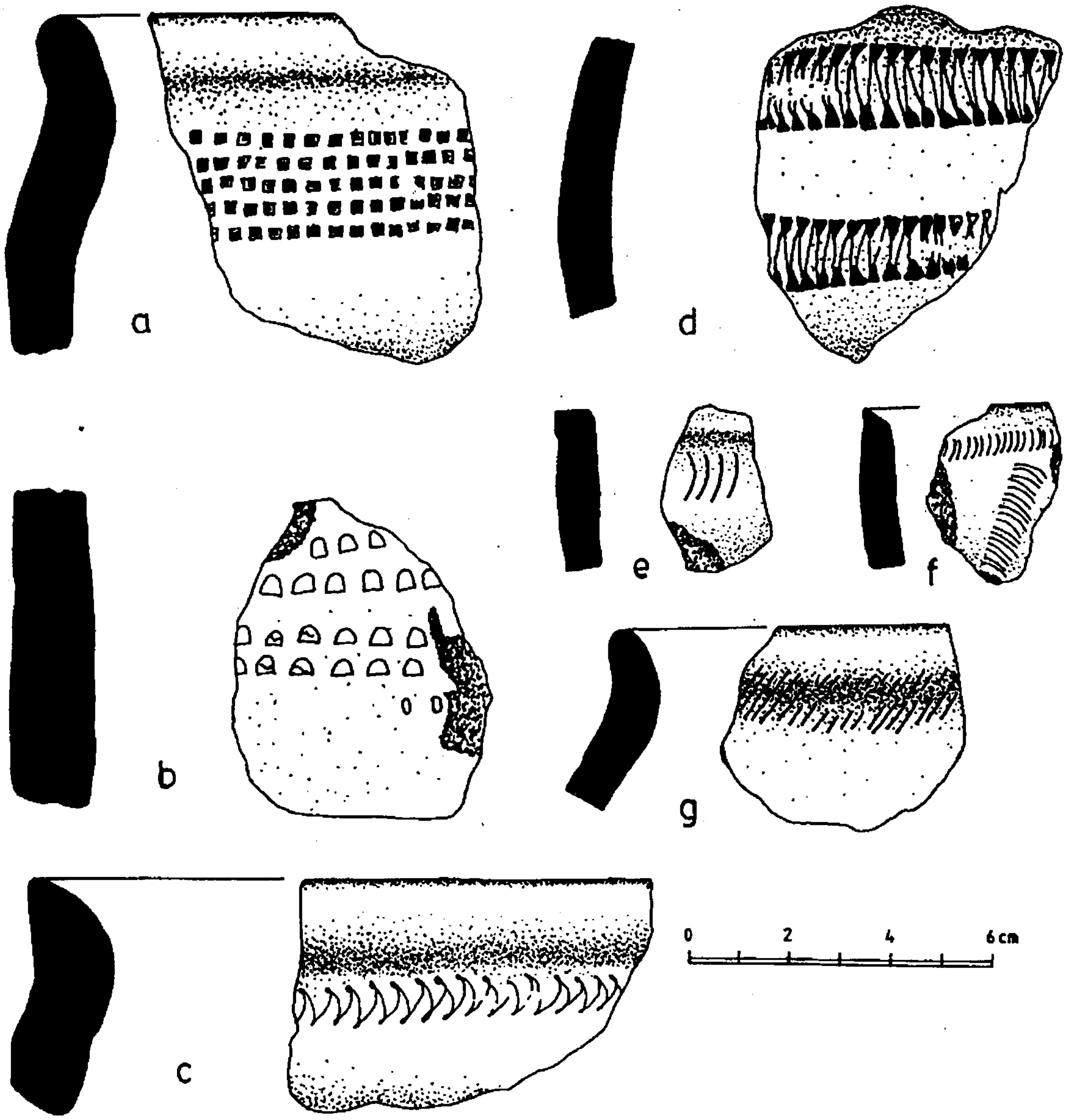


Figure 6.13. Pottery from Pahi survey around STPs (all from surface collection). a - b, Category A; c - d, Category B; e - f, Category C; g, Category D

medium and small size rim diameters was 18 cm and 10 cm respectively. All rims had rounded lips. Decorations involved single impressions and comb stamping which produced various effects depending on the shape of the tooth tips, including oval, square, hemispherical and spherical. One of the recovered sherds indicates that a piece of a basket or a plaited cord roulette was used to produce similar impressions. The majority of decorations appear as multiple rows or lines placed horizontally or vertically on the vessels. The most frequently occurring types were square and hemispherical impressions (Figure 6.13 a-b). The square comb patterns appear to be uniformly applied and spaced compared to other decorations. For example, the hemispherical comb stamp patterns were less uniform and sometimes appeared to be crudely applied using a single toothed implement. Most stamped decorations were applied to neck or shoulders. In contrast, Liesegang (1975:96, Fig. 2a) found some IA pottery of category A at Haubi with decorations covering an extensive area of the lower part of vessels. One of the key attributes in pottery category A is thick walls, in some specimens up to 16-19 mm (Table 6.21). Three (3.2%) of the recovered sherds were burnished on both sides while seven (7.6%) were burnished on one side. Fifteen (16.3%) were very rough with all sides unslipped, 53 (57.7%) were slipped with fine clay on both sides and 14 (15.2%) were slipped on only one side.

Category B: zigzag motifs (Figure 6.13. c-d)

Category B consisted of 26 (10.2%) potsherds distributed at both Baura (13) and Lusangi (13) (Table 6.20). The pottery consisted of large to medium size rim diameter

Table 6.21. Rim diameters and sherd thickness

Category	Rim Diameter						Range of sherd thickness in mm
	Small		Medium		Large		
	Sample #	Average Diameter in cm	Sample #	Average Diameter in cm	Sample #	Average Diameter in cm	
A	9	10	12	18	19	27	7- 19
B	-	-	5	19	8	32	8 - 16
C	1	-	-	-	-	-	6 - 8
D	1	12	2	20	2	32	8 -12
E	1	9	-	-	-	-	5 -13
F	2	11	4	18	5	29	10 -12
G	-	-	3	21	-	-	8 - 11
H	3	10	4	19	-	-	7 - 16
I	-	-	1	~ 18 - 20	-	-	6 - 16
J	1	13	-	-	1	~ 26 -27	6 - 12
K	-	-	-	-	3	32	14 - 17
L	-	-	-	-	-	-	8 -12
M	2	13	1	17	1	28	7 - 10
N	1	14	-	-	-	-	8 - 16

jars with wide openings. The average dimensions for large rim diameters was 32 cm and medium rim diameters was 19 cm. Potsherd thickness varied considerably ranging from 8 - 16 mm. The pots were decorated in zig-zag (rocked zigzag) designs in various treatments. Most decorations were applied at the neck or shoulder, however there were a few cases where decorations extended to other parts of the body. Decorations were commonly applied in a single row but occasionally more than one row was applied (compare Figure 6.13. c and d). Only two (7.7%) sherds were burnished on the outside. Four (15.4%) were rough with no slip, while six (23.1%) were slipped either on the inside or the outside, and 14 (53.8%) were slipped on both sides.

Category C: fingernail impression motifs (Figure 6.13. e-f)

Eight (3.1%) potsherds were assigned to category C, all of which were from Baura (Table 6.20). Only one small rim belonging to a bowl (Figure 6.13, f) was recovered, the rest were body-sherds. It was impossible to estimate rim diameter. The body sherds were also very small and thin-walled (6 - 8 mm). Judging from the only rim available and the thickness of the sherd walls, the vessels were small. The rim-sherd consisted of a straight rim with no neck and with an oblique lip (Figure 6.13. f). Decorations in this category consisted of thin fingernail impressions applied either vertically/obliquely or in horizontal rows. Because of the small number of sherds recovered it was not possible to establish the extent of the body covered with decorations beyond upper sections of pots. None of the pottery was burnished. Four (50%) of the recovered sherds had no slip on the inside, while four (50%) had slip on both sides.

Category D: thin incised motifs (Figure 6.13. g; 6.14. a)

Category D consisted of ten (3.9%) potsherds most of which were recovered from Baura with only one from Lusangi (Table 6.20). They had large to medium and small size rim diameters with wide openings. All rims represented jars. The average dimension for large rim diameters was 32 cm while that of medium and small were 20 cm and 12 cm respectively. All rims recovered in this category had rounded lips (Figure 6.13. g; 6.14. a).

Decorations were applied on the neck and involved thinly incised vertical or oblique lines. The treatment of the incised lines was diverse, including straight and curved forms. The necks of the vessels were generally short and large rim diameters averaged 32 cm while those of medium and small were 20 cm and 12 cm respectively.

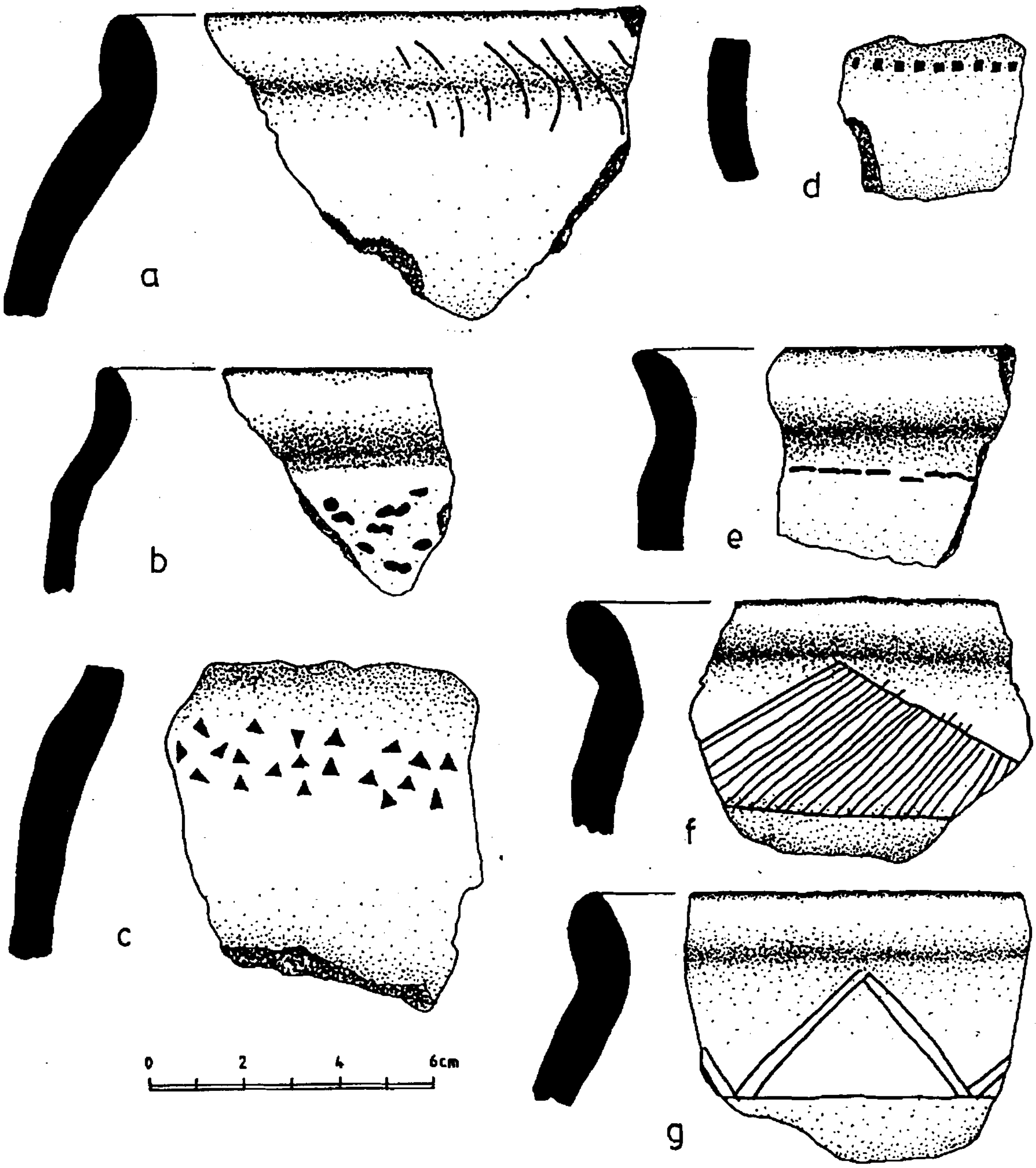


Figure 6.14. Pottery from Pahi survey around STPs (all from surface collection). a, Category D; b - c, Category E; d - e, Category G; f - g, Category F

One (10%) of the sherds was burnished on both sides while two (20%) were either burnished on the inside or outside. Three (30%) of the sherds had slip on both sides, two (20%) had slip applied to the inside or the outside, and two (20%) of the sherds were rough with no slip on both sides. Some appeared to be very crudely made.

Category E: random/irregular stamped/impressed motifs (Figure 6.14. b-c)

Nine (3.5%) potsherds assigned to category E were recovered, all of which came from Baura. Only one rim representing a jar was found and as a result it is not possible to establish relative rim diameters. The only rim available had a diameter of 9 cm which suggests a small pot. The rim was everted with a rounded lip (Figure 6.14. b). Category E vessels had thin to moderately thick walls, ranging from 5 - 13 mm. Most sherds represented shoulders and necks between which decorations were placed. However this observation is provisional because only one rim was represented. Decorations have different styles, but all occur as random or irregular stamping or impressions. The most common patterns are oval, rectangular and triangle stamps. Only two (22.2%) of the potsherds were burnished and all had triangle stamped decorations. The burnishing was either applied to both sides or one side only. Four (44.5%) of the sherds were slipped on both sides while three (33.3%) were rough without slip.

Category F: incised triangular motifs (Figure 6.14. f-g)

Category F consisted of 15 (5.9%) potsherds recovered from both Baura (10) and Lusangi (5). This category consists of large to medium and small rim diameters with short necks and wide openings. All rims represented jars and had rounded rim lips. Sherd thickness ranged from 10 - 12 mm. The potsherds are decorated with incised triangles which occur between the neck and shoulder. In some cases triangles are made of single/double outlines without shading the interior while in others the inside was hatched with parallel lines. Two (13.3%) specimens were burnished on both sides while three (20%) were either burnished on the inside or outside. Three (20%) sherds had slip on the inside or outside while seven (46.7%) had slip on both sides.

During fieldwork three complete pots with similar decorative motifs were observed at Pahi town which were collected by a farmer. All vessels were globular jars with wide openings and short necks. One vessel was large with a rim diameter of 26 cm while the other two were of medium size with rim diameters of 16 cm and 21 cm respectively. Like the samples collected from survey the vessels had decorations placed between neck and shoulder and all had everted rims. All vessels were slipped on both sides. The similarities between the survey samples and the pottery owned by the villager suggests that while the tradition may have originated in prehistory, it continues to the present. Modern pottery is used for cooking as well as storage of grains.

Category G: single row of round/rectangular stamped motifs (Figure 6.14. d-e)

Eight (3.1%) category G potsherds were recovered were from Baura (Table 6.20). These specimens resemble category "H" (below), but decoration varied. Instead of double line stamping/impression of category H, only a single line is applied in category G. All rim diameters were of medium size with an average dimension of 21 cm. The walls of the pottery are moderately thick (8 - 11 mm). All rims were everted and represent jars. Decoration patterns involved horizontal stamped/impressed line of dashes or small squares and were applied between the neck and shoulder. None of the recovered pottery was burnished. Two (25%) of the sherds had slip on the outside or the inside, five (62.5%) were slipped on both sides, and one (12.5%) was rough with no slip.

Category H: double row of round/rectangular stamped motifs (Figure 6.15. a-b)

Category H consists of 13 (5.1%) sherds recovered from both Baura (8) and Lusangi (5). The recovered samples were fragile and very fragmentary with no shoulder sherds represented. Rim diameters ranged from 9-21 cm and were all from jars. The average dimension for medium rim diameters was 19 cm while that of small rim diameter was 10 cm. Sherd thickness ranged from 7 - 16 mm indicating that some vessels had very thick walls. Five (71.4 %) of the rims were everted while the rest were vertical. Necks appeared to be long in some specimens and very short in others. Decorations consisted of round or rectangular stamps/impressions applied in double lines horizontally on the neck. Two (15.4%) sherds were burnished on both sides while three (23.1%) were burnished on the inside or outside. Four (30.7%) had slip on both sides, three (23.1%) were slipped only on one side, and one (7.7%) was rough without slip.

Category I: multiple regularly stamped triangles (figure 6.15. c-e)

Eighteen (7.1%) potsherds defined as category I were recovered from Baura (12) and Lusangi (6) survey areas. Five of the recovered sherds were rims, however they were too fragmentary to attempt a reconstruction of vessel diameter. One of the rims measured 18 - 20 cm in diameter representing a medium size. All rims seem to have been everted

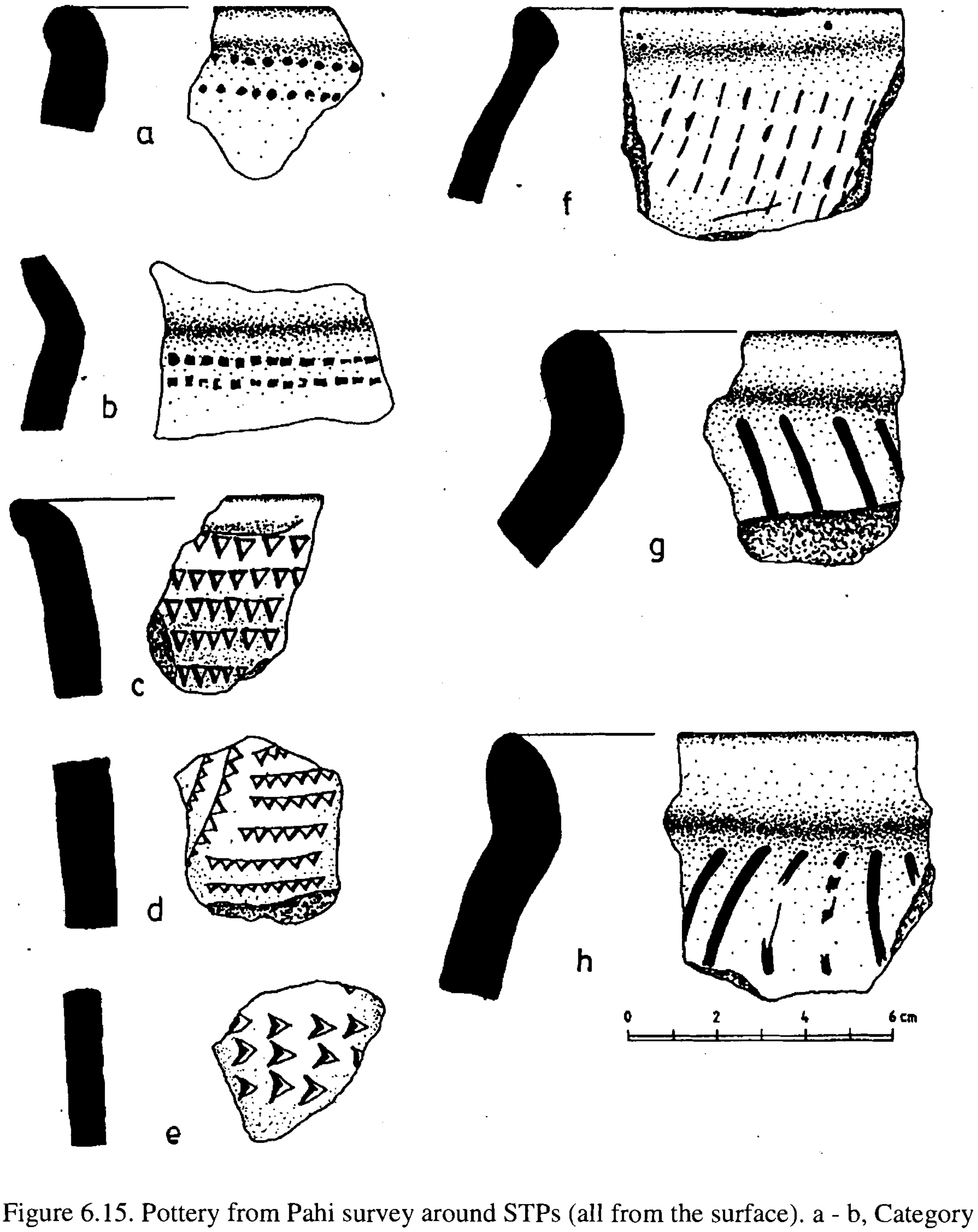


Figure 6.15. Pottery from Pahi survey around STPs (all from the surface). a - b, Category H; c - e, Category I; f, Category J; g - h, Category K

with one belonging to a bowl and the rest probably to jars. Most vessels had short necks while a few had no necks at all. Sherd thickness varied tremendously from very thin to thick (6 - 16 mm). It was impossible to establish the extent of body decorations due to the small size of the sherds, however all body and rim sherds were decorated almost throughout. Judging from this pattern it is possible that decoration covered an extensive area of vessels. The decoration involved a series of regularly stamped/impressed triangles arranged in parallel bands or in a series of rows (Figure 6.15. c-e). A small number had irregularly stamped/impressed bands of triangles. The triangle decorations in this category can be contrasted to those of category E which are stamped individually in irregular fashion but never in bands or lines (compare Figure 6.14 c and 6.15 c-e). Burnishing on both sides was noted in 14 (77.8%) of the recovered sherds, while four (22.2%) had slip on both sides. Most specimens were made out of moderately fine clay tempered with fine sand and quartz, however one was made with exceptionally coarse temper. A large percentage of potsherds had mica in their fabric, more than any of the other categories.

Category J: oblique/parallel incised dash motifs (Figure 6.15. f)

Category J consists of ten (3.9%) potsherds all of which were from Baura (Table 6.20). Only two rim-sherds belonging to jars were recovered while the rest were body-sherds. One had a diameter of 26 - 27 cm while the other was 13 cm. The rims represent vessels with wide openings and rounded lips. The rims indicate that vessels had short necks. Sherd thickness ranged from 6 - 12 mm. Decoration involved parallel lines of incised dashes applied obliquely between the neck and the shoulder. Three (30%) of the sherds were burnished either on both sides or on one side of the sherd while one (10%)

was rough without slip. Two (20%) shreds had slip only on one side while four (40 %) had slip on both sides.

Category K: bold incised motifs (Figure 6.15. g-h)

Thirteen (5.1%) potsherds assigned to category K were recovered, ten of which were from Baura while Lusangi produced three (Table 6.20). Only three rims indicating to short necked jars were present while the rest of the specimens were body sherds. All rims were everted with wide openings and thick walls (14-17 mm) with an average diameter of 32 cm indicating that they were from large pots. Decorations involved bold incisions of straight or curved lines applied vertically or obliquely, most of which were on the neck. Three (23.1%) potsherds were burnished, four (30.7%) had slip applied only on one side, and six (46.2%) had slip applied to both sides.

Category L: 'V' like incised motifs (Figure 6.16. a-b)

Category L consists of 12 (4.7%) potsherds, five of which were recovered from Baura and seven from Lusangi (Table 6.20). This category is characterized by stylized V - like incisions in single and multiple rows (compare Figure 6.16. a and b). Because only body sherds were recovered it was impossible to estimate the extent to which vessels were covered with decorations or to establish rim diameters. All specimens were slipped with fine clay. Sherds with slip on one side numbered 3 (25%) while those slipped on both sides were 9 (75%). Body sherds had moderately thick walls ranging from 8 - 12 mm.

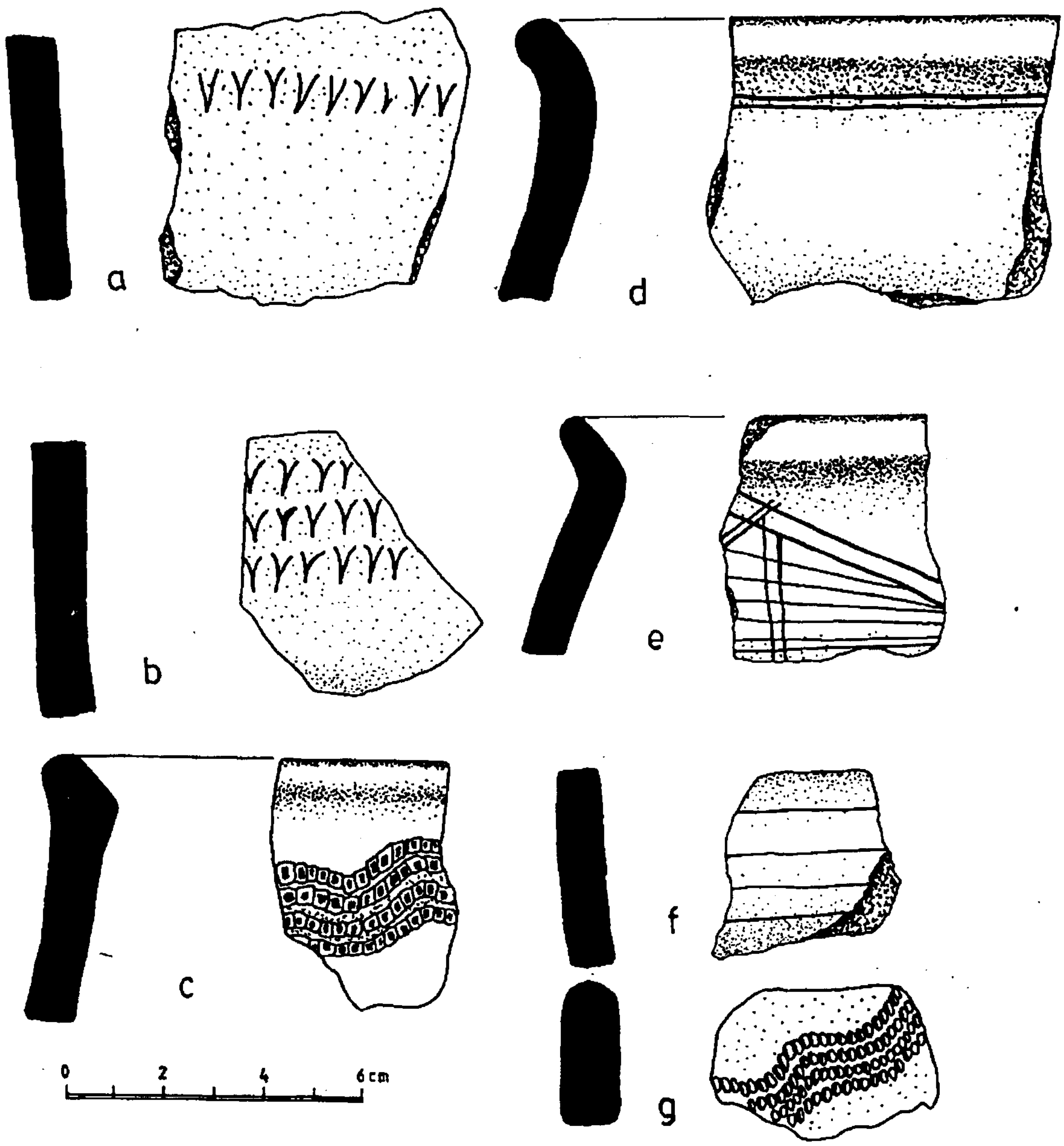


Figure 6.16. Pottery from Pahi survey around STPs (all from surface collection). a-b, Category L; d-f, Category M, c & g, Category N

Category M: other incised motifs (Figure 6.16. d-f)

Eleven (4.3%) potsherds assigned to category M were recovered at Baura (7) and Lusangi (4). Four of these were everted rim sherds belonging to jars, of which one had a large size rim diameter (28 cm), one was medium (17 cm) and the other two were small (13 cm). The sherds indicated the vessels had moderately thick walls ranging from 7 - 10 mm. Decorations involved incised lines applied to produce various motifs. Some sherds were decorated with a band of two incised lines applied on the neck, and in others several parallel horizontal incised lines. Yet another type of incised line involved crosshatching to produce different motifs. The recovered samples indicate that incisions were applied to cover the upper parts of vessels. Three (27.3%) sherds were burnished on both sides, two (18.2%) were slipped only on one side, and six (54.5%) were slipped on both sides.

When the decorations of Category F and M are compared some similarities are apparent in that all consist of more or less straight incised lines. However there are significant variations. Some vessels have parallel incisions while others have intersecting or crossing incisions. However differences between category F and M also suggest that they may belong to distinct traditions. In the first case, category F decorations are found in modern Pahi ceramics. They also were found in association with ceramics of category M in an archaeological context that dates to 200 BP (Masao 1979, Liesegang 1975). However while category F decorations continued to be produced until recent times, decoration motifs of category M are not found in contemporary ceramics. Secondly, decorations of category F resemble a tradition of EIA pottery found along the East African coast (Chami 1994, 1998) as well as several areas of the interior of Tanzania (Mapunda 1995) where they are dated to 1725 – 1050 BP (Chami 1994:91). However, EIA traditions are characterized with bevelled rims while the entire Pahi pottery sample lacks this feature. It can be concluded that pottery category F includes decorations that survived in East Africa for a long time but experienced changes in vessel form including loss of bevels and flutes on rims. Based on these arguments it would be worthwhile to treat category F and M as separate at least for the moment.

Category N: wavy motifs (Figure 6.16. c & g)

All ten (3.9%) category N sherds were collected from Baura. Only one rim belonging to a jar was recovered while the rest were body sherds. The rim had a diameter of 14 cm. Decorations were of a wavy design applied by using various implements. One tool produced oval/round impressions while another made rectangular comb-like impressions similar to those of category A. The quality of decorations varied enormously from one sherd to another. Some decorations were crudely made suggesting that the implement was dragged over the surface of the pot during application. It was difficult to determine the extent of the vessel body covered by decorations because only small sherds were recovered. However, judging from the body and rim sherds available, decoration was applied to several parts of the pot. Only one (10%) of the sherds was burnished on the inside. Two (20%) were slipped on one side only (inside or outside) while seven (70%) were slipped on both sides.

Excavated Pottery

A total of 1352 sherds were recovered from excavations most of which lacked diagnostic features such as rims and decorations. Almost all sherds were recovered from LSA/IA contexts. This is to be expected because with few exceptions pottery does not occur in East African LSA cultural assemblages. Also, most excavated sherds were recovered from isolated and undated contexts. This is a problem that eliminates the possibility of developing chronological or seriational sequences based on Pahi samples. The following describes diagnostic pottery recovered from both STPs and trench excavations and relates them to categories developed from survey surface collections.

STP excavations

All diagnostic ceramics from STP excavations were obtained from the Baura area (Figure 6.17 and 6.18). With the exception of one rim, all specimens were bodysherds. The rim sherd was straight and probably belonged to a bowl (Figure 6.18, b). The rim section was thinner compared to the rest of the body and the lip was rounded. One of the bodysherds (Figure 6.18, e) belonged to a carinated vessel, a unique occurrence in the Pahi project. Only decorative categories A (Figure 6.17 a – f, 618 c-d) and I (Figure 6.18, a-b, e-f) are represented in the specimens with the majority belonging to category A. This may suggest that category A type ceramics represents a widespread tradition.

Trench Excavations

Trench excavations at Baura and Lusangi yielded varying quantities of both diagnostic categories and miscellaneous pottery that were not represented in survey collections (Table 6.22). Specimens included jars (Figure 6.19, g, h and m) and several bowls, all of which came from Markasi Lusangi 2 (Figure 6.20, c-d, f-g and i-k), while the rest were body sherds.

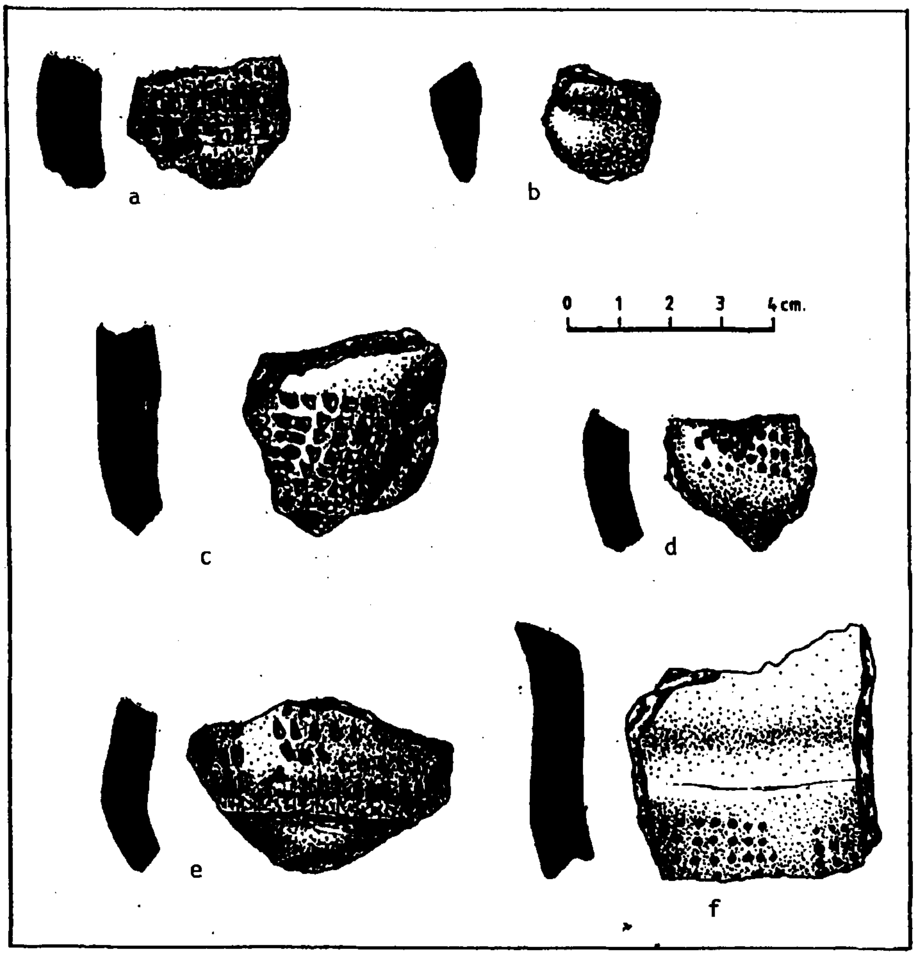


Figure 6.17. Pottery excavated from STPs (Baura): a-b, STP 15 (Level 35-45); c, STP 6 (Level 25-30), d, STP, 31 (Level 10-15), e-f, STP 37 (Level 30-40)

Identified Categories

The pottery identified from the trenches included categories A, D, E, I, L and M. As was the case for the STPs, pottery category A was the most common form encountered (Table 6.22). Category M occurred at a higher frequency at Markasi Lusangi 2. As shown in Table 6.22 none of the ceramic data indicate clear patterning in stratigraphical sequences. Also there is no tendency for a particular variety of pottery to

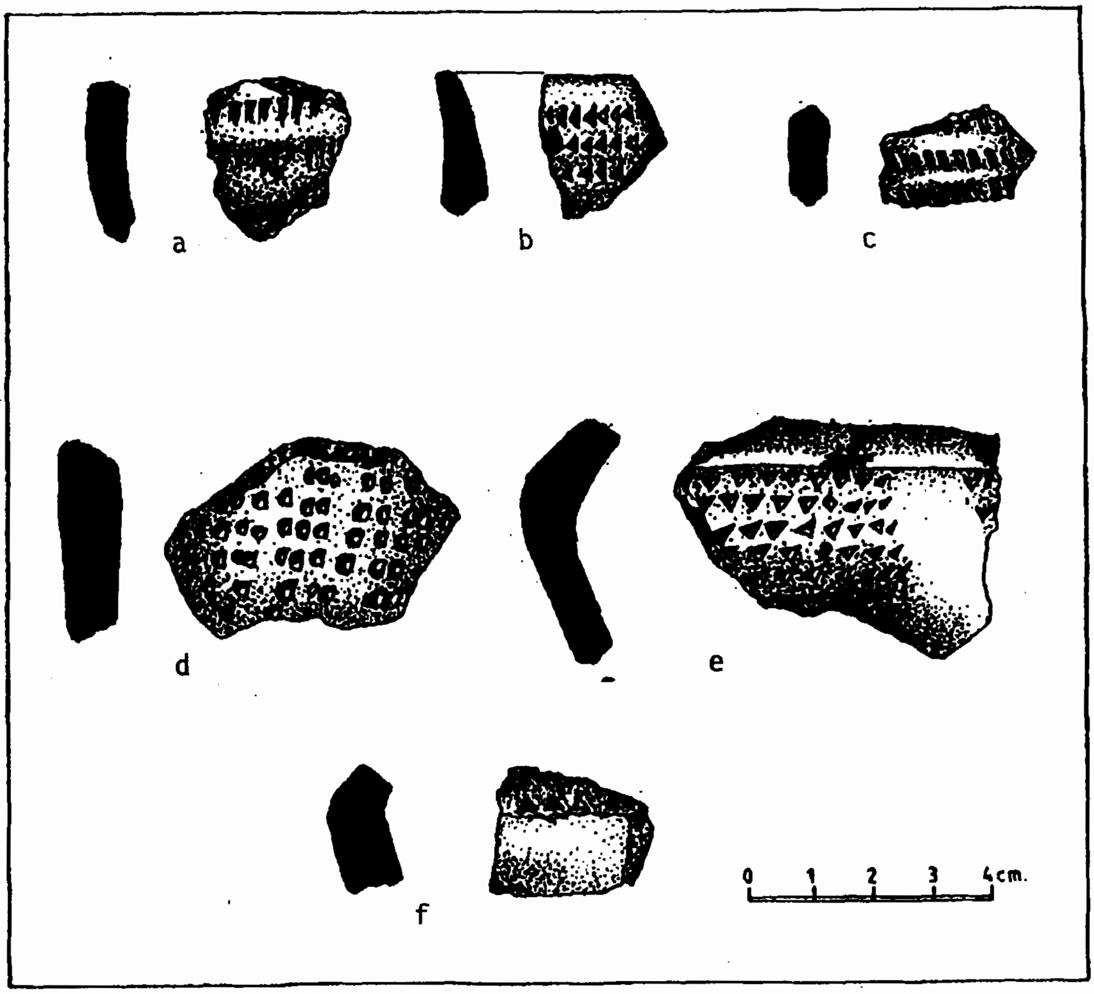


Figure 6.18. Pottery excavated from STPs (Baura): a, STP 31 (Level 5-10); b–c, STP 37 (Level 30-40); d, STP 3 (Level 10-15); e-f, STP 36 (Level 25-30)

be associated with a specific category. For example category A occurs in almost similar frequencies from the surface to the lower levels. This suggests that category A was long lived and possibly recently abandoned.

Table 6.22. Summary of excavated pottery categories

Site Name	Unit	Level/ Layer	Category and quantity	# of Miscellaneous sherds
Baura 1	2	2	A (2)	-
	3	1	A (1)	-
	"	2	A (2)	-
Baura 2	1	3	A (1)	-
Baura 3	1	1	E (3)	-
	"	2	E (1)	1
Lusangi 1	2	1	-	1
	"	2	I (1)	-
	3	1	A (1)	-
	"	2	A (1)	-
Markasi Lusangi 2	1	Surface	A (1)	-
	"	1	I (2), M (1)	-
	"	2	D (1), I (1), M(1)	-
	2	1	M (1)	-
	"	2	L (1)	-
	"	4	-	1
	3	1	M (1), E (1)	-
	"	2	E (1), M (1)	3
Lusangi 3	1	1	A (1), D (2)	-
	2	1	A (2), I (1)	-

Miscellaneous Pottery

Six miscellaneous pottery sherds were recovered, five of which were from Lusangi while Baura produced one. Two techniques of decoration are noted in the miscellaneous sherds including impressions/stamping and incisions. Four of the miscellaneous sherds had distinct decorations each with its own motif, while the remaining two, one from Baura 3 Unit 1 Level 2 (Figure 6.19, e) and another from

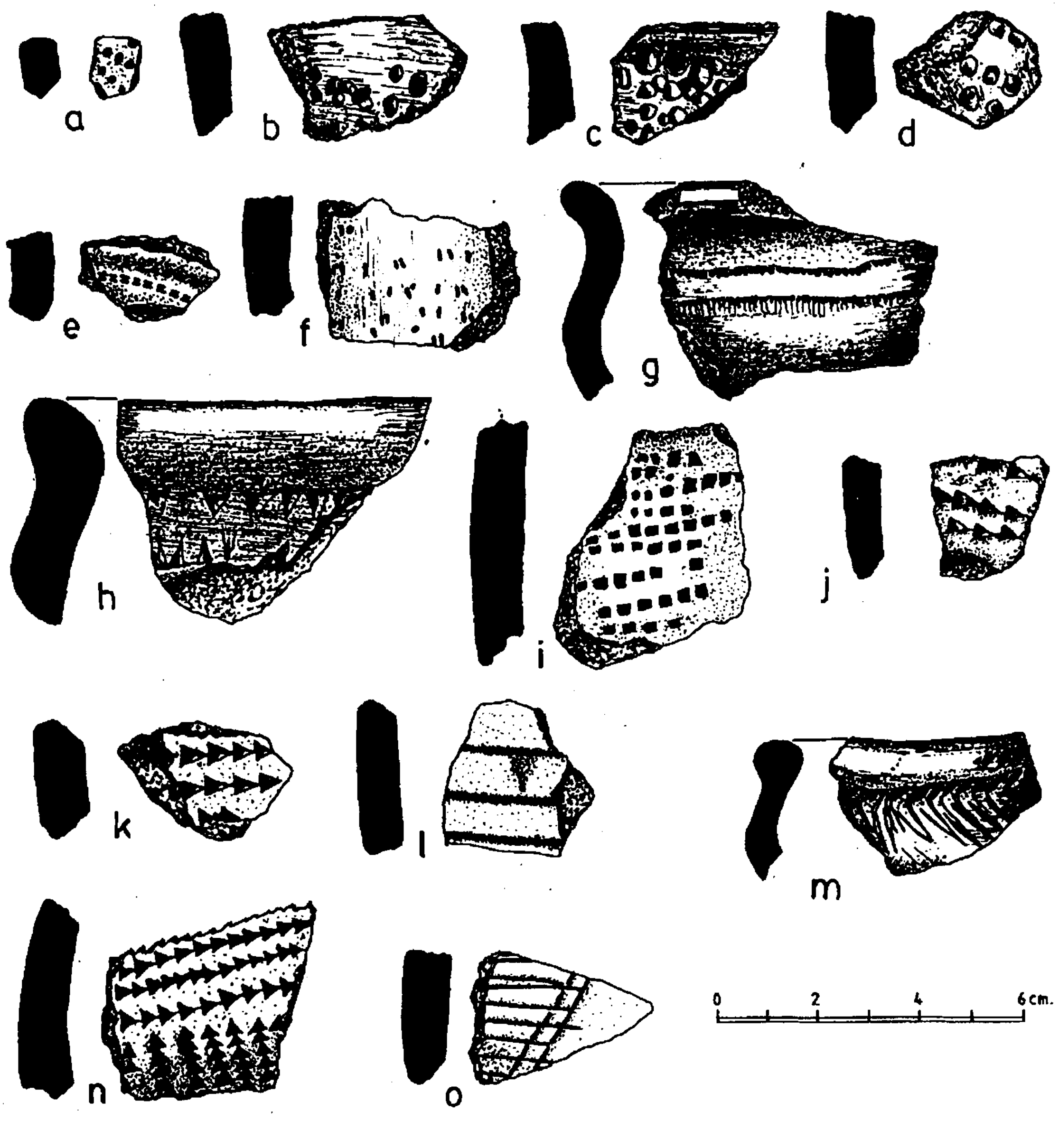


Figure 6.19. Pottery from excavation units (Some of them are miscellaneous of which no examples were recovered from survey, *e.g.*, Fig. e & m). Baura 1 Unit 2 Level 2, a; Baura 3 Unit 1 Level 1, b-d; Level 2, e-f; Lusangi 1 Unit 2 Level 1, g; Level 2, h; Markasi Lusangi 2 Unit 1 surface, i; Level 1, j-l; Level 2, m-o

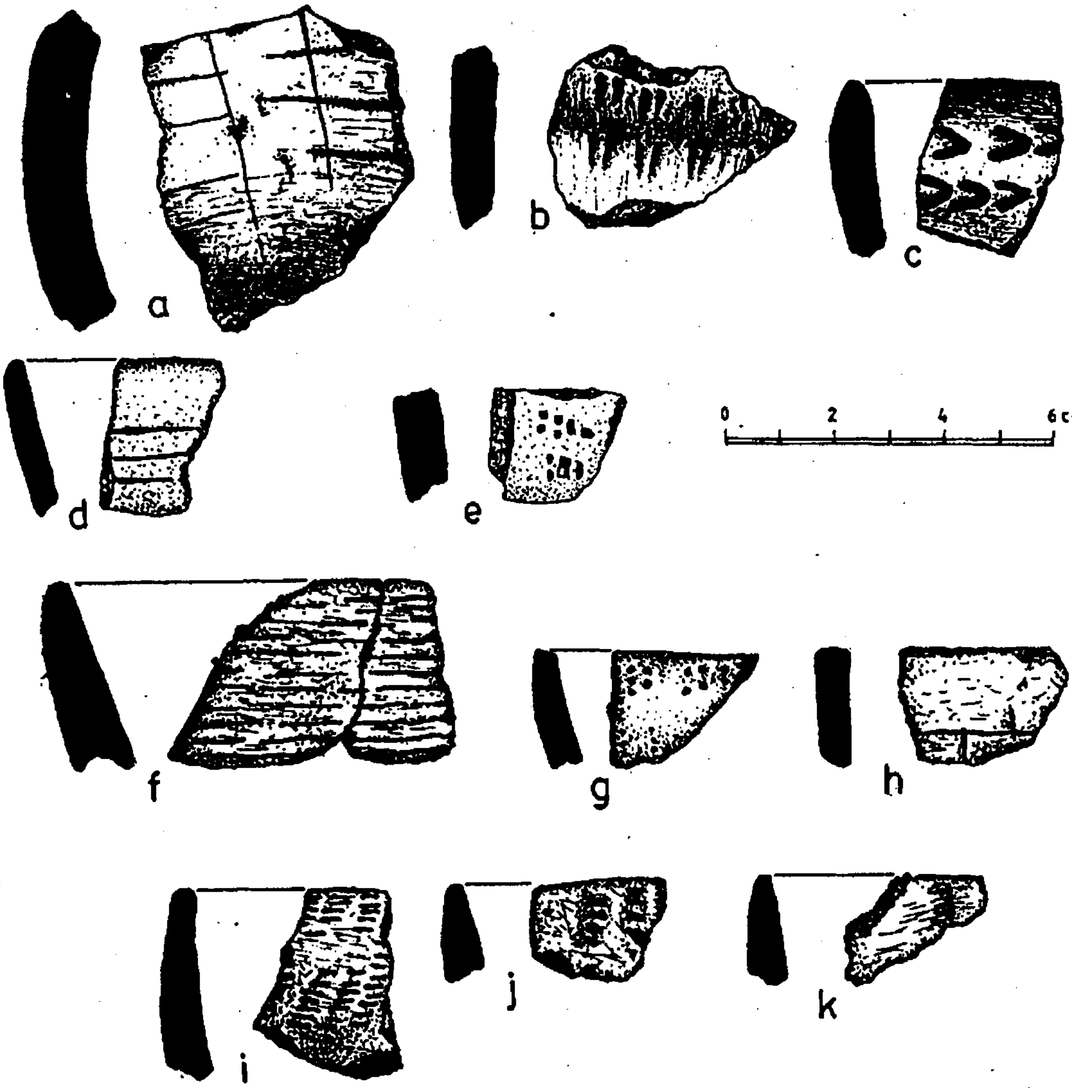


Figure 6.20. Pottery from excavation units (Some of them are miscellaneous of which no examples were recovered from survey, *e.g.*, Fig. b, f, i & k). Markasi Lusangi 2 Unit 2 Level 1, a; Level 2, c; Level 4, b; Markasi Lusangi 2 Unit 3 Layer 1, d-e; Layer 2, f-k

Markasi Lusangi 2 Unit 2 Level 4 (Figure 6.20, b) had a series of impressions produced by a double toothed implement. The sherd from Markasi Lusangi 2 comes from a context dated to 1030 ±40 BP. A jar sherd from Lusangi 1 Unit 2 Level 1 (Figure 6.19, g) had two patterns of decoration of which the upper motif consisted of a single row of rocked punctuates, while the lower consisted of a row of shallow vertical incisions. All were placed around the shoulder and seem to have run parallel around the vessel. Three miscellaneous potsherds all of which were from bowls were found in Markasi Lusangi 2 Unit 3 Layer 2. One was decorated with multiple channelled horizontal incisions (Figure 6.20, f), another by vertical bands of shallow incisions (Figure 6.20, i), and a third consisted of bands with four punctates each (Figure 6.20, j).

Summary of Ceramics

A clear characterization of Pahi pottery is not yet possible because of inadequate representations of body sherds to enable reconstructions. Because of this problem it was not possible to establish the lower body profile and extent of the body covered with decorations for most vessels. However from samples collected it is apparent that most decoration covered the region between shoulder and neck. The most common techniques of decorating involved stamping, single impressions/stabbing, incisions and rocking. In general, most vessels were made of fine clay tempered with fine sand, quartz and mica. Most of the pottery represents jars and bowls with wide openings, everted and straight rims. The vessels were probably made with hands with assistance of a paddle and anvil. Apart from decoration, final treatments of pottery included burnishing and slipping. Lack of adequate diagnostic pottery from the STPs and units excavated made pottery seriation impossible. Although a few pottery categories such as F have decorative designs similar to those of EIA, the Pahi pottery is different because of the absence of important EIA elements such as rim bevels and flutes. Given the work completed by Masao (1979:37-48) and Liesegang (1975) at Haubi and Kandaga, together with conclusions reached by the current project, the Pahi pottery probably belongs to the LIA. This conclusion is also supported by the radiocarbon dates secured in this study (see Chapter 5).

6.10. Zooarchaeological Remains

Identification of the Pahi zooarchaeological remains was completed by Paul Watene of the National Museum of Nairobi, Kenya. A total of 3,955 bones were recovered of which 3864 (97.7%) were from LSA/IA contexts while 91 (2.3%) were from LSA levels (Tables 6.23 and 6.24). Most of the bones were highly fragmentary, and as a result few specimens could be assigned to species level. All remains of identified animal species were from LSA/IA contexts. Identifiable domesticates include domestic fowl (*Gallus gallus*) and cow (*Bos taurus*), while wild species consist of hyrax (*Heterohyrax brucei*), ostrich (*Struthio camelus*), giraffe (*Giraffa camelopardalis*), warthog (*Phacochoerus aethiopicus*) and vervet monkey (*Chlorocebus aethiops*). Since most units did not yield large quantities of bone (see Table 6.25) and most were non diagnostic, the following discussion is limited to a site-by-site comparison.

Baura 1, 2 and 3

All bones recovered from Baura units were from LSA/IA contexts which represent 1.4% (57) of all recovered bones (Table 6.25). Two bones belonged to chicken (*Gallus gallus*), four were unidentifiable and 51 were of undetermined mammal (Table 6.23, Appendix E). The chicken bones were recovered from Baura 1 unit 3 Level 2. In addition Baura sites also yielded 46 fragments of gastropod shells. Excavation of the

Table 6.23. Faunal identification from the LSA/IA contexts

Site	Unit	Level/ Layer	Mammal								Bird		Undetermined bone	Gastropod	Total
					Bovidae		Equidae								
			Vervet Monkey	Giraffe	Domestic cattle	Undetermined Bovidae	Warthog	Undetermined Equidae	Rock Hyrax	Undetermined Mammal	Chicken	Ostrich eggshell			
B1	2	1	-	-	-	-	-	-	-	4	-	-	-	-	4
		2	-	-	-	-	-	-	-	8	-	-	-	6	14
	3	2	-	-	-	-	-	-	-	26	2		-	38	66
		3	-	-	-	-	-	-	-	-	-	-	4	-	4
Subtotal			**-**	**-**	**-**	**-**	**-**	**-**	**-**	**38**	**2**	**-**	**4**	**44**	**88**
B2	1	1	-	-	-	-	-	-	-	1	-	-	-	-	1
Subtotal			**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**-**	**-**	**1**
B3	1	1	-	-	-	-	-	-	-	11	-	-	-	2	13
		3	-	-	-	-	-	-	-	1	-	-	-	-	1
Subtotal			**-**	**-**	**-**	**-**	**-**	**-**	**-**	**12**	**-**	**-**	**-**	**2**	**14**
L1	1	Surface	-	-	-	-	-	-	2	-	-	-	-	-	2
		1	-	-	-	-	-	-	-	2	-	-	-	-	2
		4	-	-	-	-	-	-	-	1	-	-	-	18	19
	2	2	-	-	-	1	-	-	-	3	-	-	-	-	4
		3	-	-	-	-	-	-	-	6	-	-	-	-	6
		4	-	-	-	2	-	-	-	-	-	-	-	-	2
		5	-	-	-	-	-	-	-	-	-	1	-	-	1
	3	2	-		-	3	-	-	-	-	-	-	-	-	3
Subtotal			**-**	**-**	**-**	**6**	**-**	**-**	**2**	**12**	**-**	**1**	**-**	**18**	**39**
ML2	1	Surface	-	-	-	-	-	-	-	4	-	-	-	-	4
		1	-	-	-	-	-	-	-	34	-	4	-	1	39
		2	-		-	1	-	-	-	30	-	-	-	-	31
		3	-		-	1	-	-	-	-	-	-	-	-	1
	2	1	-	-	-	-	-	-	-	1	-	-	-	-	1
		2	-	-	2	-	-	-	-	-	-	-	-	-	2
		4	-	-	-	1	-	-	-	-	-	-	-	-	1
	3	1	-	1	-	13	-	1	-	1774	-	2	-	3	1794
		2	-	-	-	1	4	-	-	1655	-	-	-	1	1661
	4	1	-	-	-	-	-	-	-	1	-	-	-	-	1
		2	-	-	-	-	-	-	-	96	-	-	-	-	96
		3	-	-	-	-	-	-	-	7	10	-	-	-	17
Subtotal			**-**	**1**	**2**	**17**	**4**	**1**	**-**	**3602**	**10**	**6**	**-**	**5**	**3648**

Table 6.23 continued---

Site	Unit	Level/ Layer	Mammal								Bird		Undetermined bone	Gastropod	Total
					Bovidae		Equidae								
			Vervet Monkey	Giraffe	Domestic cattle	Undetermined Bovidae	Warthog	Undetermined Equidae	Rock Hyrax	Undetermined Mammal	Chicken	Ostrich eggshell			
L3	1	1	-	-	-	4	-	-	-	26	1	-	-	-	31
		2	1	-	-	-	-	-	-	6	-	-	-	-	7
		3	-	-	-	-	-	-	-	1	-	-	-	-	1
	2	1	-	-	-	1	-	-	-	30	-	-	-	1	32
		2	-	-	-	-	-	-	-	-	1	-	-	-	1
Subtotal			**1**	**-**	**-**	**5**	**-**	**-**	**-**	**63**	**2**	**-**	**-**	**1**	**72**
L4	1	2	-	-	-	1	-	-	-	-	-	-	-	1	2
Subtotal			**-**	**-**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**2**
Grand Total			**1**	**1**	**2**	**29**	**4**	**1**	**2**	**3728**	**14**	**7**	**4**	**71**	**3864**

Abbreviations: B1 = Baura 1, B2 = Baura 2, B3 = Baura 3, L1 = Lusangi 1, ML2 = Markasi Lusangi 2. L3 = Lusangi 3, L4 = Lusangi 4

Table 6.24. Faunal identification from the LSA contexts

Site	Unit	Level/Layer	Mammal		Gastropod	**Total**
			Undetermined Bovidae	Undetermined Mammal		
LP1	1	7	1	-	-	**1**
ML2	3	3	-	87	1	**88**
L3	1	5	-	1	-	**1**
		8	1	-	-	**1**
Total			**2**	**88**	**1**	**91**

Abbreviations: B1 = Baura 1, B2 = Baura 2, B3 = Baura 3, L1 = Lusangi 1, ML2 = Markasi Lusangi 2. L3 = Lusangi 3, L4 = Lusangi 4

Machaga cave in Zanzibar suggests that chicken was brought to East Africa during the first millennium BC (Chami 2001a & d).

Lusangi 1

Bones from Lusangi 1 amounted to 0.6% (21) of all recovered bones (Table 6.25). Most (20) were from LSA/IA contexts, 12 of which were of undetermined mammal, six undetermined bovid, and two of rock hyrax (*Heterohyrax brucei*) (Table 6.23 and Appendix E). The rock hyrax bones were recovered from Unit 1 at the surface. The single bone specimen from LSA levels belonged to undetermined bovid (Table 6.24). One ostrich (*Struthio camelus*) eggshell fragment was also recovered from Unit 2 Level 5 (Table 6.23).

Markasi Lusangi 2

Over 96% (3724) of the total recovered bone came from Markasi Lusangi 2 (Tables 6.23 and 6.25). Most specimens were excavated from Unit 3 (Rock-shelter P1) which alone represented 91.2% (3536) of the bones recovered from the entire Pahi sample. In addition, the three units with highest bone frequencies are also from Markasi Lusangi 2 (Table 6.25).

Zooarchareological remains from Markasi Lusangi 2 Unit 3 (Rock-shelter P1) were exceptionally fragmented by the occupants of the rock-shelter. This was evident by the fracture pattern which consisted of straight broken edges. Very few bones were

Table 6.25. Relative quantity comparison of bones by excavation unit

Site name	B1				B 2	B3	L1			ML2				L3		L4
Unit	1	2	3	4	1	1	1	2	3	1	2	3	4	1	2	1
# Bones	0	12	32	0	1	12	6	12	3	70	4	3536	114	41	32	1
%	0	0.3	0.8	0	< 0.1	0.3	0.2	0.3	0.1	1.8	0.1	91.2	2.9	1.1	0.8	< 0.1

Abbreviations: B1 = Baura 1, B2 = Baura 2, B3 = Baura 3, L1 = Lusangi 1, ML2 = Markasi Lusangi 2. L3 = Lusangi 3, L4 = Lusangi charred, indicating that boiling may have been more a prevalent cooking technology used at Rock-shelter P1. This interpretation is also supported by the presence of large quantities of ceramic remains. Bones from two iron-working sites, Baura 3 Unit 1 Level 3 and Markasi Lusangi 2 Unit 4 Level 2 were charred, and this was clearly the result of smelting processes. The charred bones were outside the smelting furnaces but in association with slag.

Most specimens from Markasi Lusangi 2 (3637) were from LSA/IA contexts while only 87 were assigned to LSA. The bones from LSA/IA contexts included 3602 unidentified mammals, 17 were of undetermined bovid and one undetermined equid. The remainder were identified species including giraffe (1), domestic cattle (2), warthog (4) and chicken (10). The giraffe and warthog bones were recovered from Unit 3 at Layer 1 and 2 respectively, while those of domestic cattle were from Unit 2 Level 2, and chicken was found in Unit 4 Level 3. The chicken bones were associated with slag and it is suggested that the chicken was brought to the site for sacrifice. Chicken (Barndon 1996:66) and goats (Schmidt 1996b) are reported to be occasionally slaughtered in smelting sites to provide sacrificial blood to ensure a successful smelt.

Other faunal remains included 6 ostrich eggshell and 5 gastropods shell fragments from Unit 1 and 3 (Table 6.23 and Appendix E). Bone specimens (87) from LSA levels were all undetermined mammals (Table 6.24). In addition a single specimen of gastropod shell was recovered from the LSA contexts of Layer 3 in Unit 3.

One reason for higher bone concentrations at Markasi Lusangi 2 Unit 3 can be attributed to the fact that a rock-shelter may afford better preservation conditions. Apart from higher bone concentrations, Markasi Lusangi 2 unit 3 produced larger quantities of lithic and ceramic artifacts suggesting that it was occupied more often and for longer periods of time than adjacent open-air sites. However, in contrast Rock-shelter P44 at Lusangi 1 did not produce large quantities of bone despite comparably high lithic concentration. Regional variation in bone remains in rock-shelters was also noted by Masao (1979). For example, faunal remains were present at Kandaga A9 Rock-shelter, they were completely absent in Majilili 2B Rock-shelter (Masao 1979:48-61). As suggested by Masao (1979:57) this may reflect varying activities that took place at rock-shelters.

Lusangi 3

Lusangi 3 yielded 1.9% (73) (Table 6.25) of the total recovered bones, 71 of which were from LSA/IA levels while two were assigned to the LSA (Tables 6.23 and 6.24). Specimens dating to LSA/IA included 63 specimens of undetermined mammal, five undetermined bovid, one vervet monkey (*Chlorocebus aethiops*) and two chicken (Table 6.23, Appendix E). The vervet monkey bone was recovered from Unit 1 Level 2 and those of chicken from Unit 1 and 2, Levels 1 and 2 respectively. Other faunal remains included one gastropod shell. One of the bones from the LSA levels belonged to undetermined bovidae while another one belonged to unidentified mammal.

Lusangi 4

As discussed in Chapter 5, Unit 1 of Lusangi 4 yielded few cultural materials partly because it was placed at a location that was marginal to the main area of occupation. Only one bone of undetermined bovid and one gastropod shell fragment were recovered in LSA/IA levels at this site (Table 6.23).

Bone Preservation Conditions

Many of the bones recovered from Pahi sites were badly weathered and crumbling as they were being excavated. The fragmentary nature of specimens made species identification difficult or impossible. Overall, very few cranial elements or teeth were represented in the wild species. As observed in Table 6.26, 98.4% of the bones were non-cranial elements. Although teeth have a high potential for preservation, they are quite rare in the deposits. However since cranial parts provide less meat it is possible that if kills occurred elsewhere these elements were not carried back to camp.

Table 6.26. Bone counts by skeletal region

Site name	Unit	Skeletal region			Others: Undetermined non-skull bones	**Total**	%
		Skull	Axial skeleton	Limbs			
BPS1	2	-	-	-	12	**12**	0.3
	3	-	-	2	30	**32**	0.8
BPS2	1	-	-	-	1	**1**	< 0.1
BPS3	1	-	-	-	12	**12**	0.3
LPS1	1	1	-	2	3	**6**	0.2
	2	4	1	1	6	**12**	0.3
	3	3	-	-	-	**3**	0.1
MLP S2	1	2	-	-	68	**70**	1.8
	2	3	-	-	1	**4**	0.1
	3	9	-	11	3516	**3536**	91.2
	4		-	10	104	**114**	2.9
LPS3	1	2	3	5	31	**41**	1.1
	2	1	-	1	30	**32**	0.8
LPS4	1	-	-	1	-	**1**	< 0.1
Total		**25**	**4**	**33**	**3814**	**3876**	**100.0**
%		0.6	0.1	0.9	98.4	**100.0**	

Summary of Fauna

As stated earlier, all identified faunal remains including domestic fowl and cow; and the wild species such as hyrax, ostrich, giraffe, warthog, and vervet monkey, were recovered only from LSA/IA contexts. While the wild species are indigenous to East Africa and are found in most archaeological contexts from the MSA to IA (Mehlman 1989:199 - 650, Masao 1979:49-50, Marean 1992), all domesticated fauna were introduced to this area (Phillipson 1993a:119) and are associated with later industries which also had lithics and pottery, such as the Eburran (ceramic LSA) (Marean (1992:110, 123), PN (Robertshaw 1990a) or the IA (Phillipson 1993a:187-198). Evidence suggests that domestic animals were brought to Pahi during and after the introduction of the IA industry. This interpretation is supported by radiocarbon dates from LSA/IA levels at Markasi Lusangi 2 Unit 2 which indicate that cattle was introduced after AD 1010 and chicken at Unit 4 of the same site dates to at least AD 1270. All domestic fauna are found in contexts containing pottery, slag and lithics. Taking into account the mammalian remains (only identified species) at all Pahi sites it is apparent that the remains of wild mammals outnumber those of domestic mammals in LSA/IA contexts (Table 6.23). Similar faunal data were observed at the Kandaga A9 Rock-shelter where wild mammal bone was more common that those of domesticated mammals (Masao 1979:49-50). At that site, bones assigned to *Bos* were recovered from trench II and trench III layer 2 (Masao 1979:49-50) in contexts which are also associated with lithics, pottery and iron-working remains. Other evidence of *Bos* remains are known from Kirumi Isumbirira trench I level 2 (Masao 1979:89) and possibly from Kwa Mwango trench II level 1 (Masao 1979:74). These sites can be contrasted with high *Bos* producing sites like Nasera Rock-shelter, Ishimijega Rock-shelter and Jangwani (Mehlman 1989:510-13) and other PN sites where cattle, goats and sheep herding was an important subsistence focus. The low frequencies of domesticated animal remains in most Pahi sites suggest that these species were not economically significant during the IA and people continued to focus on wild fauna. The Kondoa area is said to have been infested with tsetse fly which was later eradicated by the British colonial government by forest clearance (Leakey 1983:124-5). It is quite possible that tsetse infestation at Pahi was the main hindrance for large scale mammal herding.

6.11. Chapter Summary

The analysis of shaped tools indicates that the LSA industry represented at Lusangi and Baura is comparable to other LSA assemblages documented in central and northeast Tanzania in many respects (Table 6.8). As is common at other sites, scrapers and backed pieces dominate the shaped tools (see also Masao 1979:197; Mehlman 1989:368-422). Both nosed end scrapers and notches were rare in the Baura and Lusangi sites as observed by Masao at Kandaga A9, Majilili 2B, Kwa Mwango and Kirumi Isumbirira (Masao 1979: 132-4, 138). Backed pieces are the second most frequent shaped tools after scrapers. Crescents are the most frequent of the backed pieces, a feature that is common in the LSA industry of central Tanzania (see also, Inskeep 1962:252; Masao 1979:197).

Similar to LSA sites in central and northeast Tanzania bipolar cores were the most frequent in Pahi assemblages, while radial/biconical, disc, pyramidal and Levallois cores were uncommon (Masao 1979:161-3; Mehlman 1989:143, 368-422). Raw material exploitation strategies indicate that clear quartz cores were more intensively exploited than cloudy quartz possibly because it was preferred and because of its relative scarcity in the study area. In the overall analysis, locally available quartz forms over 99% of the raw materials used in making lithic artifacts, while obsidian, chert and basalt were rare and unavailable locally. Assuming that the Pahi obsidian was obtained from the same Kenyan sources that supplied LSA populations of north-eastern Tanzania (Mehlman 1989:197) one would expect Pahi sites to have smaller quantities of obsidian than their northern counterparts which are much closer to the sources.

If angular fragments are disregarded, flakes dominate the debitage of Pahi assemblages. As has been suggested by Masao (1979:90, 168) the lithic industry in central Tanzania is a flake rather than a blade-based industry. Flakes in the sites discussed here demonstrate a smaller average length than those excavated from LSA counterparts in northeast Tanzania (Mehlman 1989:658). Consequently many tools made from such flakes were comparatively smaller than those of northeast Tanzania. Most querns and groundstones implements were recovered from levels with evidence of iron-working (Tables 5.21, 5.27, 5.29, 5.30, 5.31 and 5.33). This is probably associated with an increase in grain grinding activities, an aspect that may be indirectly associated with introduction of cultivation and grain consumption.

An overall examination of lithics indicate that there was no change in technology during the transition from LSA to LSA/IA. This is demonstrated by lack of significant divergence in mean dimension and form ratios of individual artifact types between the two assemblages. This conclusion is further supported by the fact that most lithic types found in the LSA industry appear in LSA/IA assemblage suggesting a continuous production of basic lithic artifacts despite the introduction of iron-working.

A chronological sequence to indicate pottery stylistic changes has not been attained in central Tanzania. This awaits further research from sites with better stratigraphic contexts containing diagnostic pottery. Based on dates from Markasi Lusangi 2 Unit 2 Level 4 (1030 ±40 BP) and Baura 1 Unit 2 Level 3 (460 ±40 BP), the Pahi pottery belongs to the LIA and bears no similarities with known types of EIA pottery (see also Masao 1979:37-48). No parallels are known to other areas of Tanzania (see Chapter 7). With regards to zooarchaeological remains, evidence suggests that wild species were the main source of meat supply during the LSA. However after the introduction of iron and pottery technology (AD 1010 - 1270) small quantities of domestic cattle and fowl were added to the diet although wild species continued to dominate the meat supply into the IA. Pahi sites therefore differ from those of northeast Tanzania where remains of domestic animals such as cattle and sheep were more common and were an important economic focus (Mehlman 1989:510-13).

CHAPTER 7: DISCUSSION

7.1. Introduction

This thesis has made three major contributions to the archaeology of central Tanzania. First, this project has completed extensive systematic survey and excavation of LSA and IA sites in the Pahi region for the first time (Chapter 3, 4 and 5). Previous researchers examined small isolated areas which precluded the development of a regional chronology (see for example Inskeep 1962 and Masao 1979). As a result this investigation has established well-defined LSA and IA site distribution patterns as well as stratigraphic sequences of the two industries in the Pahi region. Secondly, the Pahi research has established a clearer chronological picture of the IA industry. Previous investigations in Pahi defined the IA industry to be as recent as 200 years BP (Masao 1979) but results of the present work suggest the introduction of IA tradition in Pahi to be much older *ca.* 1030 ±40 BP. Although fieldwork in other areas of Kondoa such as Usandawe and Haubi has defined IA industries to be as old as 1800 BP (based on Lelesu pottery, see Mehlman 1989:523, Sutton 1968 and Soper 1971a & b) and 2000 BP (Lane *et al.* 2001), these chronological data remain tentative because they are not supplemented with detailed and comparative stratigraphical information. Finally, this work provides a comprehensive discussion of the possible interactions between LSA and IA peoples in the Pahi area. Apart from an earlier brief mention of LSA and IA interactions in central Tanzania by Masao (1979:51, 91) no detailed study on this issue has been attempted.

The Pahi survey and excavations have produced materials assigned to LSA and IA, however the stratigraphic sequences do not indicate a straight forward cultural development. The lowest stratigraphic sequences ("early phase") of all sites produced what can be refereed to as "pure LSA industry", dominated by lithic artifacts and lacking iron-working, ceramic remains and domesticated fauna. Upper stratigraphical sequences consist of mixed LSA and IA cultural elements. The earlier phase predates 1030 ±40 BP while the late phase (LSA/IA mixture) post dates that period although there may be some overlap as demonstrated by the date of 1660 ±100 BP (Beta 176186) Lusangi 1 Unit 1 (Table 5.26). The stratigraphic sequence of the late phase indicates that both LSA and IA artifacts were in use until recent times. As noted in Chapter 5 support for this stratigraphic sequence was not attained from the excavation alone but also from survey results.

This chapter examines the stratigraphic sequences both from the STP survey and site excavations and discusses the cultural practices which they reflect. Also included is an intra and inter-site comparative analysis of site distribution patterns as manifested by the survey and excavation results. The results are also compared to other sites in Africa. Finally the discussion focuses on the interaction between the Pahi LSA hunter-gatherers and IA farmers in the light of other examples from various areas of the world.

7.2. Survey and Excavation Results

7.2.1. Survey: Stratigraphical Sequence of Artifacts

Although survey results do not provide detailed stratigraphical information they do indicate a general sequence of deposits that are apparent in site excavations. In addition, the survey results provide a representative sample of artifact types found in the entire study area as well as an indication of the pattern of site distribution over the landscape.

At both Baura and Lusangi, pottery and lithic artifacts were the most frequent and widely distributed, followed by iron-working remains and related objects (Chapter 5). Lower stratigraphic assemblages in both areas are dominated by lithic artifacts, indicating that the areas were occupied by LSA peoples who possessed a lithic technology before the introduction of iron-working and pottery. In the case of Baura STPs for example, IA remains were obtained between 0-45 cm (Table 5.6). Even so, lithic artifacts were distributed from the surface to the lowest levels. This pattern was evident in excavations with a few exceptions where small amounts of IA materials were obtained below 45 cm bd.

In contrast Lusangi STPs did not establish a clear stratigraphical break between LSA and IA materials. In these units, upper levels were dominated by a mixture of LSA and IA cultural remains. However the stratigraphical distribution limit of IA cultural materials was more clearly established by the excavation results at Lusangi. Some units indicated that a few IA cultural remains extended to 100 cm below surface (see for example, excavation results from Lusangi 1 Unit 2 and Markasi Lusangi 2 Unit 3 in Chapter 5).

The fact that the stratigraphic distribution of cultural materials from STPs and excavation units show more or less the same sequence of LSA and IA cultural remains, indicates that both areas experienced comparable cultural developments. The chronological range of 1030 ±40 to 140 ±40 BP (Beta 176188 & 176187) for the IA industry at Lusangi suggests that the area received IA cultural elements earlier than Baura where the same materials dates from 460 ±40 to 120 ±50 BP (Beta 176184 & 176192). In addition, the association of LSA and IA cultural materials in the upper stratigraphic sequences at both Lusangi and Baura suggests that the later phases of cultural development included peoples who practiced both lithic and iron technology.

7.2.2. Excavations: Intra and Inter-site Comparisons

The Pahi excavation results generally support the survey finds and provide a more detailed picture of stratigraphic sequences of cultural remains. The excavations also investigated rock-shelters and iron smelting sites, enabling comparisons between non-iron smelting, rock-shelters and open-air sites. In all excavated areas (except Baura 2 and 3, where excavation led to the recovery of furnaces and evidence for iron-working, Baura 1 Unit 1 which produced exclusively LSA and Baura 1 Unit 4 and Lusangi 1 Unit 2 which yielded only a mixture of LSA/IA) the lowest levels produced exclusively LSA cultural remains while the upper levels yielded a mixture of IA and LSA materials. For the purpose of clarity this study will use the terms "Later Stone Age" (LSA) to refer the lower stratigraphic sequences that consist of exclusively LSA artifacts and "Later Iron Age" (LIA) for the upper stratigraphic sequences that consist of a mixture of LSA artifacts, iron-working and pottery remains. The LSA at Pahi (Baura 1 Unit 1) dates to 2500 ±40 BP (Beta 176185, Table 5.19) but the site of Kisese suggests that the LSA industry commenced as early as 18,190 BP (Deacon 1966:38; Inskeep 1962) and was widespread in central Tanzania by 3500 -1000 BP (Masao 1979:210). The LIA industry at Pahi (Markasi Lusangi 2 Unit 2) dates to 1030 ±40 BP (Beta 176188, Table 5.26) and continued until recent times. Although upper stratigraphic sequences at Pahi consist of a mixture of LSA and IA artifacts, the term LIA is preferred for these sequences because they indicate a radical change in cultural development from that of sole dependence on lithic technology based on hunting-gathering to one that includes not only lithic manufacture but the use and production of iron, pottery, animal keeping and possibly farming. As we shall see later rock art styles dating to the LSA and LIA indicate that the introduction of LIA at Pahi may also have involved a change in world views and cultural aspects of the LSA people. In addition, results indicate that the LSA is associated with a less diverse inventory of artifacts than the LIA. Lithic artifacts in LSA contents occur in large quantities with small amounts of red ochre, wild fauna and burned clay. In contrast, the LIA is associated with lithic artifacts, pottery, slag, tuyeres, furnace walls, furnaces, iron objects, wild and domesticated fauna, daubs, burnt clay, red ochre, white chalks, and ostrich egg shell. Lithic artifacts, pottery and the by-products of iron smelting remains, especially slag, are widely distributed in most excavated units. Bones are more frequent in LIA than in LSA levels. However this may be related to preservation conditions because LIA levels are relatively younger. In addition a rise in bone accumulations may result from population growth in the respective areas during the LIA or reflect a greater emphasis on sedentism. It is suggested here that increasing sedentism may have played an important role in bone accumulation since there is also a significant rise of pottery frequency moving upwards from lower LIA levels. This suggestion is further supported by the appearance of daub in the LIA levels and its complete absence in LSA contexts.

7.2.3. Rock-shelter *Vis-à-vis* Open Air Site Excavations

Excavations at Pahi were also designed to investigate and compare open-air sites and rock-shelters. Rock-shelters were found to have stratigraphic sequences and cultural materials similar to open air sites. One of the rock-shelters with results comparable to open air sites was Rock-shelter P1 (Markasi Lusangi 2 unit 3) (Chapter 5). Most of the artifacts obtained from open air sites, including lithic artifacts, pottery, slag, pieces of iron, tuyere, bones, ostrich egg shells, land snail shells, red ochre and burnt clay were also recovered from Rock-shelter P1. These results indicate that open-air sites and rock-shelters were occupied by people who engaged in similar activities.

The finds at Rock-shelter P1 indicate that iron-working activities took place at some rock-shelters. The slag remains were of small pieces, the majority of which were porous compared to those found at the nearby open-air smelting site of Markasi Lusangi 2 (Unit 4). This suggests that the slag was a by-product of forging activities rather than smelting. Forging occurred at Rock-shelter P1 after iron was smelted in nearby areas. Rock-shelter P1 was an ideal place for forging activities which are sheltered from direct sun and rain. Slag also has been found in association with lithics at Kandaga rock-shelters by Masao (1979:26). It has been suggested that slag could have been brought to Rock-shelter P1 for ritual activities (Mapunda, personal comm.). Research in southwestern Tanzania has indicated the use of iron-working remains including slag, tuyeres and furnaces for ritual, charm and healing purposes. This is because these materials are believed to have eternal power (Mapunda 1995:345-7). However the slag found in Rock-shelter P1 has textural and size differences from those found in the smelting site nearby and was associated with pieces of iron. This evidence indicates that it is a by-product of actual forging rather than ritual activities.

It should be noted that although there are indisputable similarities in artifact sequences between rock-shelters and open-air sites, there is a notable difference in the concentration of the artifacts. There was a significantly higher concentration of artifacts in rock-shelters. This difference is pronounced at Lusangi where lithics and faunal remains occur at significantly higher frequencies in rock-shelters. For example, the number of lithic artifacts collected from Rock-shelter P1 at Markasi Lusangi 2, was higher than those collected from all other units at Lusangi sites combined. Similarly, the total number of bones collected from Rock-shelter P1 alone was higher than the total collected from all excavated sites of Baura and Lusangi combined. As mentioned in

Chapter 5 the tendency for higher concentrations of artifacts within the rock-shelter indicates a preference in using these localities for lithic production as well as camping. This was so because rock-shelters offered several benefits such as windbreakers, shelters from rain and sun. They also acted as clearly identifiable geological feature where people returned on a regular basis. Furthermore, at Lusangi red ochre and white chalks were recovered only from rock-shelters. However in contrast, Baura 1 as an open site is exceptionally rich in cultural remains especially lithic artifacts. As mentioned earlier the concentration of artifacts at Baura 1 can be attributed to its easy access to a permanent water supply.

The persistent association of iron-working and lithic artifacts throughout upper stratigraphic sequences in Baura and Lusangi is an intriguing subject. One of the immediate questions that arises from this study is why did inhabitants continue to use stone tools while iron-working technology was available? In trying to answer this question informal inquiries were made among the Baura people about their knowledge of lithic artifacts. Most elders remember knapping flakes and used the sharp margins to make incisions on various parts of their body into which a form of local medicine was applied. None of the younger people used lithic flakes in this manner. Samples of formally classified tools were shown to elders including tools, flakes/blades cores and non-flaked lithic artifacts. Although none were able to differentiate formal tool functions from those of ordinary flakes, the majority of elders were able to associate various functions associated with flakes and non-flaked lithic artifacts. According to the elders in the past non-flaked lithic artifacts such as ground stones and rubber stones were used to grind cereals before modern mills were available. They also acknowledge that at the present time ground stones and rubber stones are occasionally used to prepare malt used for making local beer. Elders were also asked for the reasons for preferring to use of lithic flakes instead of iron tools that were already available. Most replied that they used whichever was more appropriate for a specific task, but that lithics were employed most often for incisions. It may be that lithic flakes were preferred because when freshly knapped they are more likely to be sterile than iron tools that are used in multi-purpose activities for longer periods. The tradition of using lithic flakes to make body incisions is not unique to Lusangi and Baura. The Wanyisanzu of Iramba district of Singida, Tanzania used sharp obsidian and clear quartz flakes to make body incisions instead of razor blades (Masao 1979). Although highly speculative it may be that this practice is a remnant of lithic technology passed down from LIA predecessors and perhaps used to support the continuous adoption of lithic artifacts observed in the LIA. The continuous use of lithic flakes to make body incision and the use of the ground stones for grinding grains supports this view since these artifacts were found in substantial quantities in LIA stratigraphical sequences. However knowledge about the use of shaped tools clearly has been lost.

7.3. Artifacts: Comparison Between Sites

7.3.1. Pottery

Pottery appears in Pahi *ca.* 1660 ±100 BP (Table 5.26). However this date from Lusangi 1 (Rock-shelter P44) may not be entirely reliable (see Chapter 5). Based on typology (see below) and the stratigraphic sequences, pottery does not seem to have been common in most sites until 1030 ±40 BP when it is also associated with iron-working. This period is defined as the beginning of the LIA in East Africa (Huffman 1989; Phillipson 1976a:212-4; Vansina 1994-5:25). Evidence for the association of iron-working and pottery is best attested at Baura 1 unit 4, Baura 3 Unit 1, Lusangi 1 unit 3, Markasi Lusangi 2 Unit 1, 2, and 3. An excavation of trench I, II and III at the nearby site of Kandaga A9 Rock-shelter by Masao (1979: 26-32) further confirms these findings. Because pottery and iron-working appear at roughly the same time, the most likely source for this transfer of technology are IA agriculturalists who are known to be in East Africa since the middle of the last millennium BC (Phillipson 1993a:187-98; Schmidt 1978). If this interpretation is correct this would imply that ceramic LSA pottery (Kansyore ware) used by LSA societies at about 5400 years BP and the PN pottery (Nderit/Narosura wares) by about 2200 BP (Mehlman 1989:45, 556-61) at Nasera Rock-shelter in northeast Tanzania did not make their way south despite the proximity of Nasera to Pahi (about 244 km). Lack of influence by the PN culture is also attested by the scarcity of domesticated faunal remains and stone bowls in Baura and Lusangi.

7.3.1.1. Inter-site Comparison

As discussed in Chapter 6 pottery typology was based on finds collected from survey, mostly from surface collections. Unfortunately few diagnostic pottery sherds were obtained from excavations and it was difficult to establish typological sequences for the Pahi sites. It should be recalled that almost all pottery from the Pahi sites was recovered from LIA levels (Chapter 5 and 6). Based on the survey at least 14 types of pottery were recovered at Baura and Lusangi which were identified on the basis of decorative motifs. A small number of pottery types recovered from surface surveys was also collected at excavations suggesting continuous production through time. For example pottery type A was found at Baura 2 unit 1 and at the site of Kandaga A9 Rock-shelter (Masao 1979:45, Figure 10b, a & e). Pottery category E was recovered from Baura 3 Unit 1, and at Markasi Lusangi 2 Unit 3 (compare Figure 6.14 b-c and 6.19 b-d & f and accompanied category E descriptions). Type I was found at Markasi Lusangi 2 Unit 1 and Lusangi 1 unit 2 (compare Figure 6.15 c-e and 6.19 j, k & n and accompanied category I descriptions). This type of pottery is reported from Kandaga A9 (Masao 1979:45, Figure 10b, d & g). Pottery category K was present at Markasi Lusangi 2 Unit 2, while pottery category M was collected at Markasi Lusangi 2 Units 1 – 3 (compare Figure 6.16 d-f and 6.19 l & o or 6.20 a & d and accompanied category M descriptions). Type M is also reported from at Kandaga A Rock-shelter (Masao 1979:46, Figure 10c). A number of miscellaneous pottery types that were not recovered from the survey were collected from the excavation. See for example Figure 6.19 e & m and Figure 6.20 b, f, i & k). Pottery type A seems to have been the most widely distributed, representing 36.1% of total diagnostic pottery, while categories C (3.1%) and G (3.1%) are least common (Table 6.20). Baura sites yielded more varieties of diagnostic pottery than Lusangi. For example pottery categories C, E, G, J and N were not represented in the survey collections at Lusangi.

Ceramic decoration and form were similar at all Pahi sites. With the exception of a few vessels with vertically oriented rims (Figure 6.13 e-f, 6.20 c-d, f, g, and i-k), most had flared rims and bowls were quite rare (Figure 6.20 c-d, f, g, and i-k). Most pots had wide mouth openings with diameters varying in size from small to large. The noted standardization in pottery making suggests that vessels were probably manufactured by the same or related communities. Most ceramics were made from moderately fine clay tempered with quartz. The presence of mica mineral in some sherds suggests that they were made locally since mica is a common mineral in the area of study. However, a single sherd coated with graphite has been collected at Haubi (4-5 km from Baura) (Mapunda, personal communication). The rarity of graphite pottery in Haubi, Baura and

Lusangi suggests that it was probably acquired through trade. Graphite wares are common in sites along the coast and interior of Tanzania (Soper 1967b:32). Overall pottery from Baura and Lusangi resemble those of Haubi and Kandaga A9 (see also Liesegang 1975, Masao 1979). Based on the proximity of these sites to each other there is no doubt that they were manufactured by closely related communities.

7.3.1.2. Comparison to Other Areas of Tanzania

Pottery has been used successfully to outline chronological developments and solve problems related to migration, diffusion/trade and ethnic identity (Chami 1994, 1998; Huffman 1980; Soper 1971a & b). The abundance and variability of pottery styles makes it a principle artifact category to recognize and trace cultures in the archaeological record. Huffman and Hubert (1994-5:31) state that "material culture can reflect (and be an active component of) group identity because it incorporates an arbitrary but nevertheless integrated and repetitive code of cultural symbols." According to Huffman and Hubert (1994-5:31) ceramic styles associated with a particular language family may make it possible to trace antiquity of the language family in question. For example apart from its use in chronometric dating, EIA pottery has been used to relatively date IA sequences in East and South Africa as well as assign IA traditions to ethnic groups and their movements through time. In one case a group of people who are alleged to be Bantu speakers (see Phillipson 1993a:198-205) were thought to be responsible for the widespread distribution of EIA pottery in East and southern Africa (Phillipson 1976b; Soper 1971a & b). However the use of pottery for such ends has been criticized. Sinclair *et al.* (1993) for example has cautioned on the over-dependence on pottery in the archaeology of the Bantu speaking people. They argue the use of pottery in isolation is inadequate device to define the limits and form of past societies. They therefore call for a multivariate approach to the archaeology of farming communities of southern and eastern Africa (Sinclair 1993:412).

Identification of IA pottery began as early as the 1940s when Leakey *et al.* (1948) coined the term "dimple based pottery" known later as Urewe ware referring to EIA ceramics of the interlacustrine region. However interest in IA pottery and its associated culture did not receive much attention until the 1960s when a "Bantu studies research project" was launched (Soper 1971c). By the end of the 1960s two other forms of EIA pottery were proposed to be derivatives of Urewe namely Kwale (1967a) and Lelesu (Sutton 1968) which were identified along the coast of Kenya and central Tanzania respectively. In 1971 a special volume on the East Africa IA was launched by the British Institute in Eastern Africa with several reports on IA pottery from various parts of East Africa. One report dealt with a comparative analysis of EIA pottery from East Africa based on rim forms, vessel form and decoration motifs (Soper 1971a). Three major EIA pottery types namely Urewe, Lelesu and Kwale were involved in that analysis which identified several shared features in the three groups. In terms of vessel form it was determined that open and hemispherical bowls were most common in each of the three groups. The rims were either bevelled or fluted or a combination of both, while the application of these features varied in frequency from one group to another. A very common form of decoration was cross-hatching, herring-bone and dentate stamping. Burnishing was also applied to a varying degree in each pottery type.

With the exception of burnishing, none of the above attributes seem to be present in the ceramic assemblages of Baura and Lusangi. Only one sherd collected close to STP 4 at Baura had bevels on the rim. However this evidence is too limited to support a claim for the presence of EIA pottery at Baura. The available chronology for the onset of iron-working at the sites of Baura and Lusangi would also support a designation of LIA rather than EIA pottery. Nevertheless, it should be noted that a few EIA sherds have been recovered at Haubi (Mapunda and Lane, Personal comm.). At the present time, Lelesu remains the only site in Kondoa where EIA (Lelesu) pottery has been clearly attested and in reasonable quantities (Sutton 1968:168-170). According to Phillipson (1976a:212) LIA pottery types in eastern and southern Africa have undifferentiated or tapered rims and are more heterogeneous than the EIA. At the beginning of the LIA undecorated pottery became more common. Also decoration became more areal, rather than banded and most was placed on the body of the vessel than on the rims. In southern Tanzania comb stamping is more common while cord-rouletting dominates in northern areas.

An inter-site comparison of IA pottery based on decorative motifs from Kondoa in the Dodoma region (Haubi and Kandaga) and Iramba in Singida region (Isanzu) determined that remarkable differences were evident (Liesegang 1975). It has been demonstrated that while the Haubi and Kandaga A9 pottery includes rocker or comb stamping, incisions and impressions, Isanzu pottery was decorated by twisted and plaited cord roulette and cord-impression (Liesegang 1975:97-104, see also Odner 1971b:160-3). As noted by Liesegang this work demonstrates that Kondoa LIA pottery is dominated by comb stamping, incisions and impressions with no roulette decorations. At this juncture it is safe to conclude that Kondoa and Iramba pottery belong to two different traditions.

Liesegang compared his pottery (Liesegang 1975, Figure 2g, pp. 96 and Figure 3i, pp. 98) to that of LIA in Engaruka (see Robertshaw 1986:17-20) about 160 km to the north (Sassoon 1967, pl. 8, Figure 1) and suggested similarity and contemporaneity. This type can be considered equivalent to the pottery in Markasi Lusangi 2 Unit 1 Level 2 illustrated in Figure 6.19 n. However it most likely that pottery type is rare at Engaruka because it is not represented in the samples collected by Robertshaw (1986:10-14) although one sherd (Figure 11, third right from top) may in some respects resemble that described by Sassoon (1967, pl. 8, Figure 1). One interesting aspect in the comparison of Kondoa and Engaruka pottery is the application of incisions. In Kondoa pottery most incisions are applied to produce sub-parallel lines or cross-hatching (see category M Chapter 5, Masao 1979:46, Figure 10c, Liesegang 1975:98, Figure 3h-k and Robertshaw 1986:10-12, Figure 9, 10 and 11) and triangular patterns (see category F in this thesis, Masao 1979:46, Figure 10c (a, c and d) and Liesegang 1975:98, Figure 3g). However, incised triangles are not common in Engaruka pottery. Furthermore, while incised lines that encircle the circumference of a vessel are common in Engaruka ceramics, very few sherds from Kondoa seem to share this aspect, and even where it applies, the patterns produced are different in each case. There is also a tendency for Engaruka pottery to be incised in deep grooves (see Robertshaw 1986:12, Figure 11 bottom most specimen, pp. 14 and Figure 13). On these grounds there are no convincing similarities between Pahi and Engaruka pottery.

Liesegang (1975:104) also raised concerns about the relationship between Haubi pottery to that of North Pare, which was studied by Odner (1971a). According to Liesegang the shared aspects between Haubi (LIA) and North Pare (EIA, see Odner 1971a) pottery are wavy lines, comb stamping and ridges. At Baura and Lusangi there is some pottery with decoration motifs similar to those of North Pare. The comb stamping/impression in pottery category A (Figure 6.13a) are very common in the pottery from North Pare and slopes of Kilimanjaro (see Odner 1971a: pp. 102, Figure 8b and pp. 116, Figure 19h; Odner 1971c:137, Figure 2a and c). There are also decoration similarities between the comb stamping of category G Figure 6.14d and specimen illustrated in Odner (19 71a:103 Figure 9, f and g). Furthermore, decoration style of pottery Category B (Figure 6.13. c-d) is commonly found on pottery reported by Odner from the slopes of Kilimanjaro and North Pare or Siiriainen (1971) from Gatung'ng'a in Central Kenya (see for example Odner (1971a:103, Figure 9a; 1971c:137-8, Figure 2b & e; and 3e) and Siiriäinen (1971a:209-14, Figure 5, 6f and 10c).

Despite these similarities a significant difference is noted between North Pare collections and those of Baura and Lusangi. Many North Pare sherds have bevelled or fluted rims which are an important feature of East African EIA pottery. As discussed earlier Pahi pottery lacks this feature. Compare for example Odner's (1971a:102) Figure 8a; Odner's (1971c:137) Figure 2a and pottery category A in Chapter 6 Figure 6.13 a. In addition, Odner (1971a:115) noted that there are pottery decoration techniques found in both EIA cultural contexts and later periods hence such techniques cannot be used to establish cultural affinities. In this respect the pottery from Kilimanjaro and North Pare are not comparable to those of Baura or Lusangi. It therefore appears important that apart from the styles of decoration, other aspects such as morphology, chronology, surface finish, manufacture technique and typological seriation must be completed before further comparisons can be made to Kondoa pottery.

7.3.2. Lithic Artifacts

Lithics are the most prevalent artifact recovered in Pahi sites. As mentioned earlier (see also Chapter 5 and associated Tables 5.18 – 5.35), lithic technology seems to have continued side by side with iron-working until recent times when the tradition was abandoned altogether. As will be noted later, this feature is not unique to Baura and

Lusangi but has been observed at Kandaga A 9, Kwa Mwango and Kirumi Isumbirira and sites from central Africa (see Masao (1979); Miller 1969; Musonda 1987; Phillipson 1976a; Siiriäinen 1977:181-4). It is not understood why lithic technology remained unchanged for such a long period despite the introduction of iron-working at the respective sites of Markasi Lusangi 2 (1030 ±40 BP) and Makwe (1200 BP) (Phillipson 1976a). Musonda (1987) and Phillipson (1976a:196) suggest that the technologies (LSA and IA) were practiced separately by two distinct groups of people. Phillipson (1976a:196) believes that the mixture of lithic, pottery and iron-working artifacts in the respective sites to be the result of exchange and the occupation of sites by both LSA hunter-gatherers and EIA agriculturalists at different times. Miller (1969) has suggested the possible adoption of iron-working by LSA hunter-gatherers. The following discussion on Pahi demonstrates that although lithic technology did not change for a long period there was a gradual reduction in lithic artifact production which commenced immediately after the adoption of iron-working and pottery.

7.3.2.1. Inter-site Comparison of Lithic Artifacts

General Comparison

With the exception of the LIA assemblage from Lusangi 1 where a close balance is demonstrated between cores and flakes/blades (Figure 7.1) all sites regardless of their assemblage affiliation (*i.e.*, whether LSA or LIA), show low percentages of shaped tools and cores compared to debitage (flakes/blades and angular fragments) (Figures 7.1 and 7.2). This suggests the presence of lithic workshops at all sites throughout LSA and LIA cultural assemblages. Indeed the similar proportions between shaped tools, cores and

Figure 7.1. Inter-site comparison of the major lithic artifact components from LIA levels

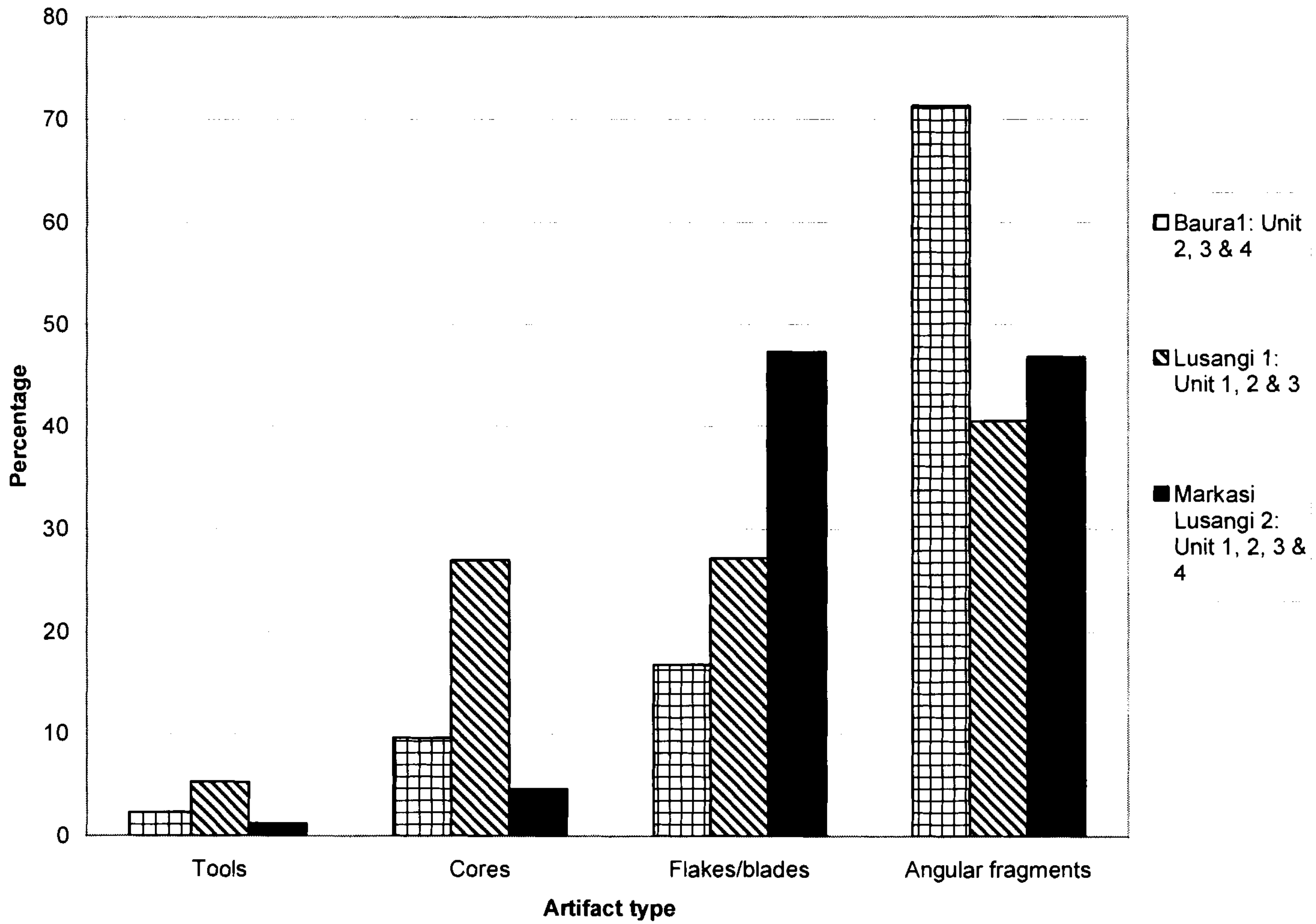
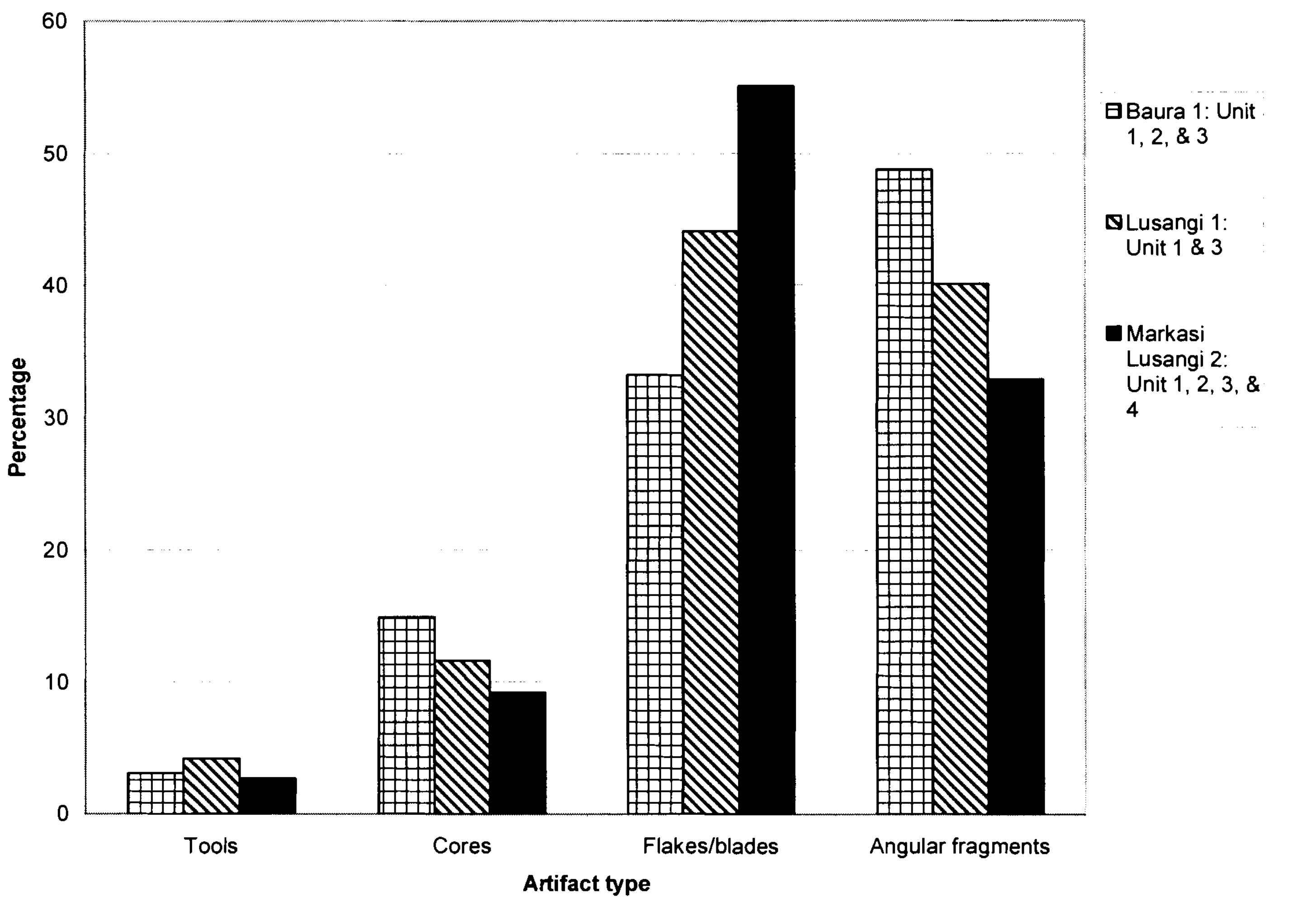


Figure 7.2. Inter-site comparison of the major lithic artifact components from LSA levels



debitage indicate performance of similar activities during LSA and LIA and certainly as suggested in Chapter 6 imply that there was little change in lithic technology between the two cultural traditions. There are differences in the relative proportion of debitage among sites as well as between LSA and LIA assemblages. In both LSA and LIA, Baura 1 yielded higher percentages of angular fragments than flakes/blades while Markasi Lusangi 2 yielded lower values of angular fragments than flakes/blades (Figure 7.1 and 7.2). At Baura 1 LIA flakes/blades and angular fragments occur at a frequency of 16.8% and 71.3% respectively while in LSA deposits they represent 33.2% and 48.8% respectively. Flakes/blades and angular fragments represent 47.3% and 46.8% respectively in LIA contexts at Markasi Lusangi 2 while in the LSA they represent 55.1% and 32.9% respectively. At Lusangi 1, a difference is observed between the proportion of debitage between the two assemblages where percentage of flakes/blades in the LIA is lower than that of angular fragments but higher in the LSA (Figure 7.1 and 7.2). Flakes/blades and angular fragments represent 27.2% and 40.5% in the LIA component respectively at Lusangi 1 while in LSA deposits they occur at 44.1% and 40.1% respectively. The consistently lower frequency of flakes/blades than angular fragments in both LIA and LSA components at Baura 1 could indicate that flakes/blades were carried away for use elsewhere or the processes of lithic working caused more production of angular fragments than at other sites. It is suggested here that the latter assumption is the most likely explanation. As mentioned in Chapter 6, the cloudy quartz materials used in making stone tools at Lusangi 1 and Markasi Lusangi 2 was of a finer texture than that of Baura and this could have affected the frequencies of flaked by-products. It is probable that it required more effort to produce quality flakes/blades from cloud quartz at Baura because the quartz used there fractured less conchoidally. As a result the knapping process at Baura resulted in the production of more angular fragments. Although the Baura, Lusangi and Markasi Lusangi sites can certainly be identified as camping and lithic industrial areas, the traditional belief that the locus of habitation is where the greatest density of tools and other debris is located has been challenged by Gallagher's (1977; see also Clark and Kurashina 1981:314-19) ethnographic study among the Gurage, Arussi-Galla and Sidamo where cores, shaped tools and debris are discarded in different places. In another example Gould (1966:43-4) determined that the Indians of Point St. George Site preferred to locate garbage far away keeping the areas around the living house free from trash and vegetation. The implication is that archaeologists may not fully understand the ratio of lithic components at sites before studying the entire pattern involved in processing tools from raw material appropriation to end products as well as the behavioral patterns of discarding wastes or exhausted tools. For example, the Gurage, Arussi-Galla and Sidamo leave cores at the quarry site after removing desired flakes (Gallagher 1977; Gould, Koster and Soutz 1971; but see Clark and Kurashina 1981). Flakes are then transported long distances to residences at the villages where they are processed into tools (Clark and Kurashina 1981; Gallagher's 1977). The debitage resulting from tool making is carefully collected and placed together in a pit to prevent accidents from stepping on these sharp debris.

Shaped Tools: Comparison of Single Tool Components

Shaped Tools Distribution on Component Basis

Comparative analysis of shaped tools is confined to one open air (Baura 1) and two rock-shelter sites (Lusangi 1 unit 1 Rock-shelter P44 and Markasi Lusangi 2 unit 3 Rock-shelter P1) because these are the only ones that produced sufficient sample sizes.

As observed in Figures 7.3 and 7.4 not all tool types are present in both LSA and LIA assemblages. For example a number of scrapers such as circular, nosed end, sundry end, notch, sundry combination and convex/concave combination as well as a backed piece (trapeze) are present only during the LIA. Few backed pieces such as triangle and angle backed occur only in LSA levels. This indicates that there is a higher diversity of shaped tools in the LIA than in the LSA. However as will be discussed later, the higher diversity of tools in LIA was confined to the initial transition stages from LSA to LIA. Diversity slowly declines as iron-working becomes more significant (see Figures 7.15 - 7.19).

Apart from the above discrepancy in distribution of shaped tools between LIA and LSA components, the overall data indicate similar occurrence of shaped tools in both cultural assemblages. As observed in Figures 7.3 and 7.4 the most common shaped tools at most sites during both periods are convex side scrapers, followed by convex end scrapers, *outil éccailés*, and backed *percoirs*. In both LSA and LIA, Lusangi 1 Unit 1 yielded the highest values for convex end scrapers. Although a number of shaped tools such as crescents, small convex scrapers, and straight backed pieces are represented at all sites they do not occur consistently during the LSA and LIA. For example while crescents are found in LSA levels of all sites they are not represented in the LIA at Lusangi 1 Unit 1. Small convex scrapers are found in the LIA of all sites but not represented in the LSA of Baura 1, while straight backed pieces are found in the LIA of all sites but not in the LSA of Lusangi 1 unit 1 and Markasi Lusangi 2 Unit 3. Also, some shaped tools occur in

Figure 7.3. Inter-site comparison of shaped tools from LIA levels

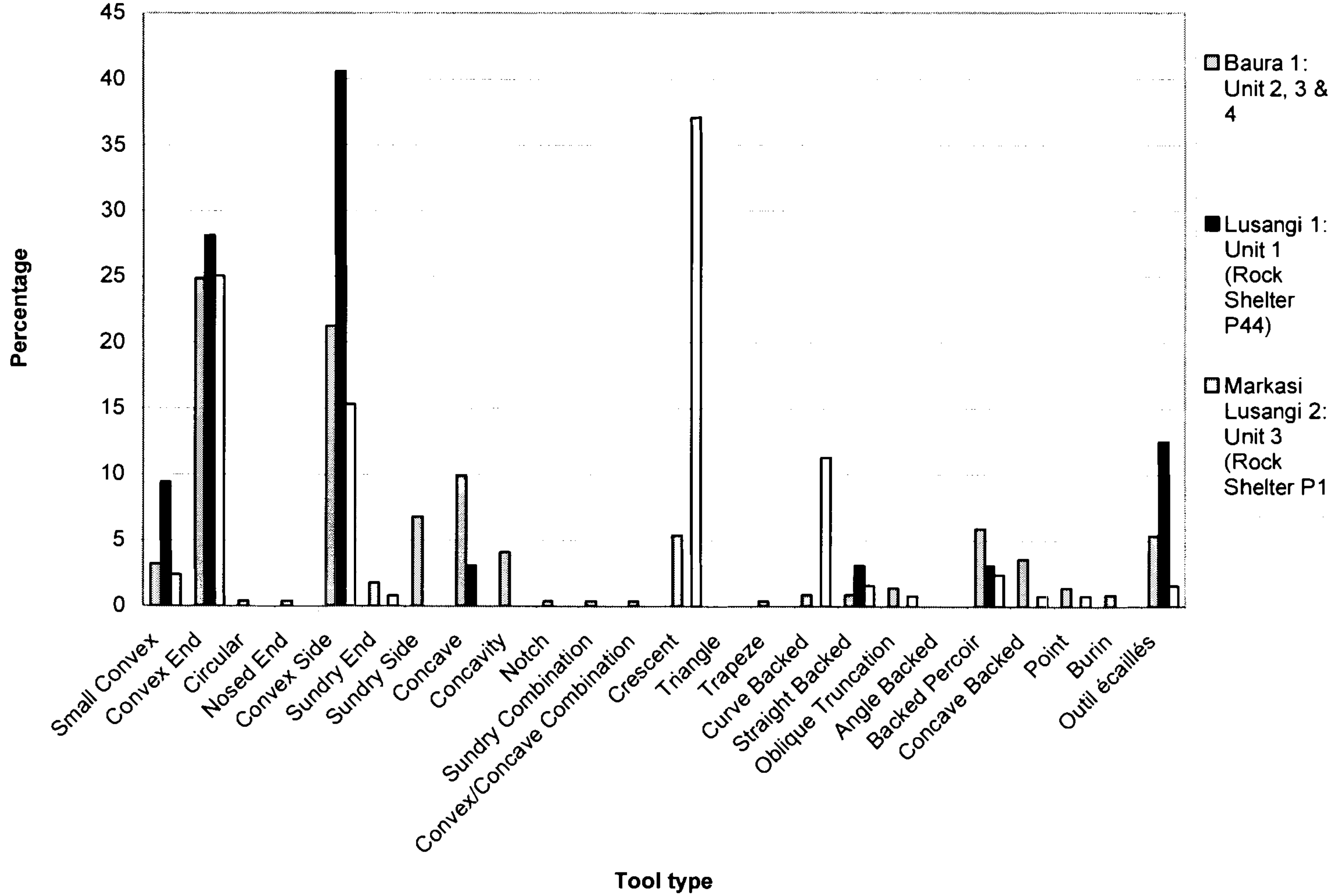
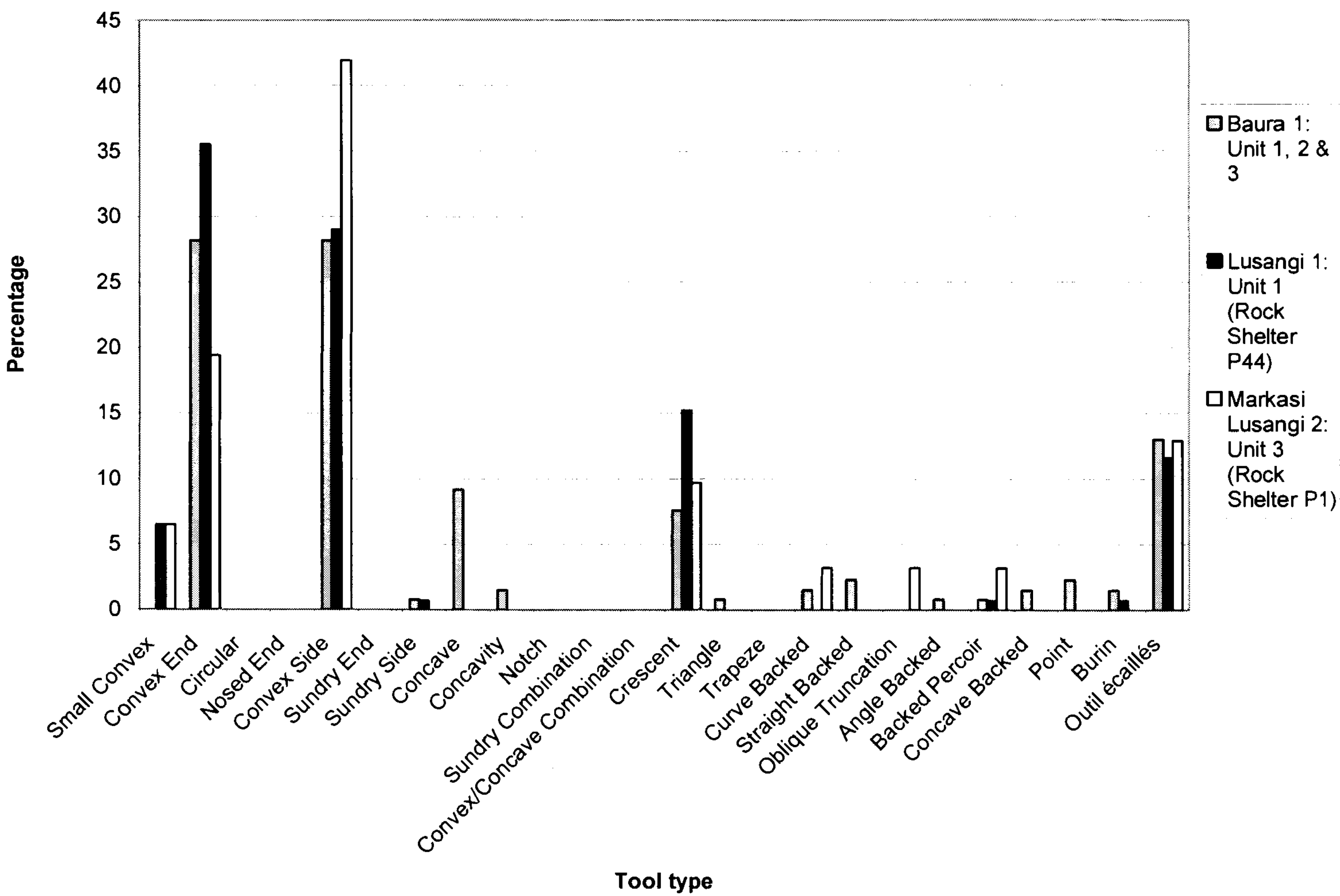


Figure 7.4. Inter-site comparison of shaped tools from LSA levels



different frequencies between the LSA and LIA. For example crescents occur at 37.1% in the LIA of Markasi Lusangi 2 Unit 3 while in the LSA they represent only 9.7% (Figures 7.3 and 7.4). The number of crescents from LIA levels in Markasi Lusangi 2 (n = 46) is almost four times that of Baura 1 (n =12). While the reasons for the varying distribution of shaped tools in the sites and cultural components cannot be easily pointed out, certainly they reflect differences in the diversity of performing certain activities not only at various localities but also at different times.

Shaped Tools Distribution by Sites

In the overall analysis the sites demonstrate great differences in diversity of tool types. Baura 1 shows higher diversity of shaped tools than other investigated sites not only during the LSA but also during the LIA. For example, the rock-shelter sites of Lusangi 1 (Rock-shelter P44) and Markasi Lusangi 2 (Rock-shelter P1) lacked circular, nosed end, concavity, notch, sundry combination and convex side/concave combination scrapers, triangles, trapezes and angle backed pieces (Figure 7.3 and 7.4). This difference is best illustrated in Tables 6.4 and 6.5 in Chapter 6. The reason for this variation between rock-shelters and open-air sites may reflect the fact that Baura 1 was a more multipurpose site involving habitation as well as hunting. These finds are contrary to suggestions that rock-shelters tend to show a greater diversity in tool types than open-air sites (Masao 1979:197; Nelson 1973).

Comparison of Major Tool Categories

Major Shaped Tools Categories Distribution on Component Basis

Figures 7.5 and 7.6 show a comparison of major tool categories for LSA and LIA cultural components at Pahi sites. The distribution of tools on a component basis indicates that scrapers, backed pieces and *outil écaillés* occur in both LSA and LIA contexts at all sites. In all cases scrapers dominate LSA and LIA levels, followed by backed pieces and *outil écaillés.* Points and burins are not consistently distributed in site deposits. Points for example are virtually absent in both LSA and LIA levels of Lusangi 1 and LSA of Markasi Lusangi 2. Similarly, burins are absent in LIA levels of Lusangi 1 and both LSA and LIA of Markasi Lusangi 2. There are also variations in the percentage distributions of artifacts among levels. As observed in Figure 7.6, scrapers occur at similar percentage frequencies in LSA deposits at Baura 1, Lusangi 1 and Markasi Lusangi 1. The same trend is observed for backed pieces and *outil écaillés* in the same level. However in the LIA (Figure 7.5) these tools show more pronounced difference in frequency at sites except for scrapers from Baura 1 and Lusangi 1. In contrast frequencies of points and burins in the LSA and LIA are similar regardless of site affiliation. The similarity in tool frequency patterns demonstrated in LSA sites may reflect the performance of similar activities while variations noted for the LIA indicate a shift towards localized activities in certain sites than others. It is possible that the introduction of iron-working during the LIA had a varying impact at the sites.

Figure 7.5. Inter-site comparison of major tool categories from LIA levels

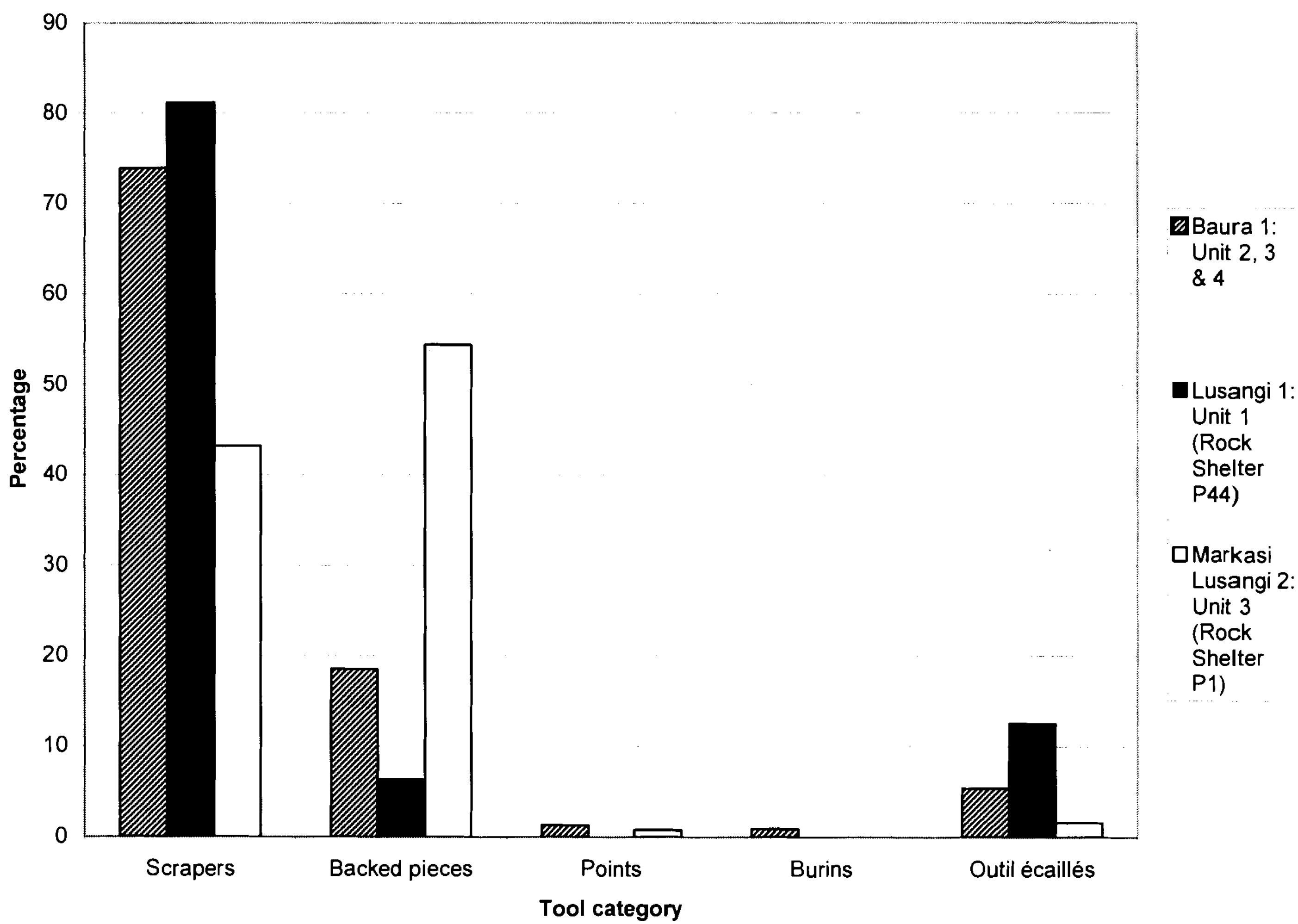
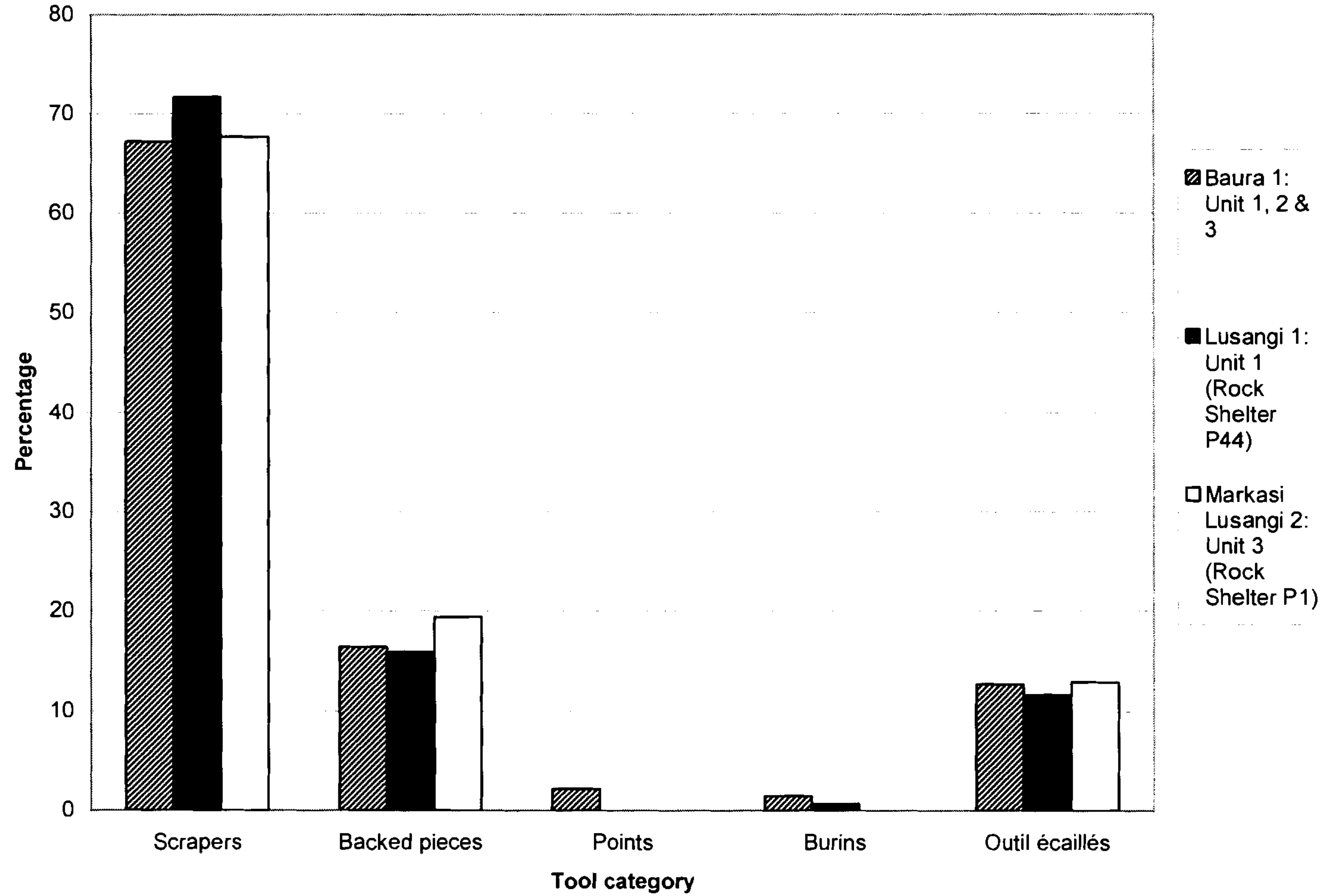


Figure 7.6. Inter-site comparison of major tool categories from LSA levels



Major Shaped Tools Categories Distribution by Sites

At all Pahi sites the most prevalent tools are scrapers, followed by backed pieces, *outil écaillés*, points and burins (Figures 7.5 and 7.6). The relative abundance of scrapers and backed pieces is comparable to other East African assemblages (see Mabulla 1996:332-390; Masao 1979:197; Mehlman 1989:369-438). Baura has all varieties of tool types represented. Points are virtually absent in Lusangi 1 Unit 1 (Rock-shelter P44), while burins are absent in Markasi Lusangi 2 Unit 3 (Rock-shelter P1). Consistently, Lusangi 1 Unit 1 (Rock-shelter P44) has a higher frequency of scrapers in both LSA and LIA while Markasi Lusangi 1 Unit 3 (Rock-shelter P1) is exceptionally rich in backed pieces. Apart from the lack of points at Lusangi 1 Unit 1 (Rock-shelter P44) and absence of burins at Markasi Lusangi 2 Unit 3 (Rock-shelter P1) no other major differences in distribution of major tool categories is observed between these localities and the open-air site of Baura 1. As pointed out in Chapter 6 points and burins are very rarely recovered in central Tanzania (Masao 1979:211), while burins occur in higher frequencies in northern East Africa particularly in Kenya and Uganda (Nelson and Posnansky 1970:135-6). The differences may be attributed to variations in activity carried out at the sites. A comparative study of LSA lithic artifact frequencies from various East African sites by Nelson (1973) indicated high inter-site variability. This led him to conclude that geographic variability in the LSA was the rule rather than the exception. Tools from other parts of central Tanzania account for 2.63-5.53% of lithic assemblages (Masao 1979:97). In contrast to the Pahi project Masao's work concentrated exclusively on rock-shelters and his tool proportions included both shaped and unshaped tools (Masao 1979:97-9). As mentioned in Chapter 6 unshaped tools are treated as utilized flakes/blades in this thesis and this may explain the discrepancies between Masao's (1979) frequency figures and those observed at Pahi sites. In general shaped tools at Pahi occur at a relative proportion of 0.3 to 4.4% of lithic assemblages (Chapter 5) and support the observation that central Tanzanian sites have relatively lower proportion of shaped tools compared to other East African sites (Masao 1979:97-8, 211).

Cores

Cores Distribution on a Component Basis

With the exception of cores such as pyramidal cores, single platform core scrapers and opposed double platform core scrapers which are absent in LSA and part peripheral, disc, Levallois and bipolar core fragments which are absent in LIA contexts, all types of identified cores are represented in both components although in varying frequencies. The most frequent type of cores in all levels (*i.e.*, LSA and LIA) include bipolar, followed by opposed, divers, adjacent and multiple (Figures 7.7 and 7.8). Platform peripheral cores occur in both LSA and LIA levels at Baura but are absent from other sites. Radial/biconical cores occur only at LSA of Markasi Lusangi 2 and LIA levels of Lusangi, while amorphous cores are only represented in LSA deposits at Baura and the LIA of Baura and Lusangi. As can be observed in Figure 7.7 and 7.6 the majority of core types especially the most common ones such as bipolar, opposed, divers, adjacent and multiple occur in both LSA and LIA. This supports the suggestion that lithic technology did not undergo significant changes between the LSA and LIA.

Figure 7.7. Inter-site comparison of cores from LIA levels

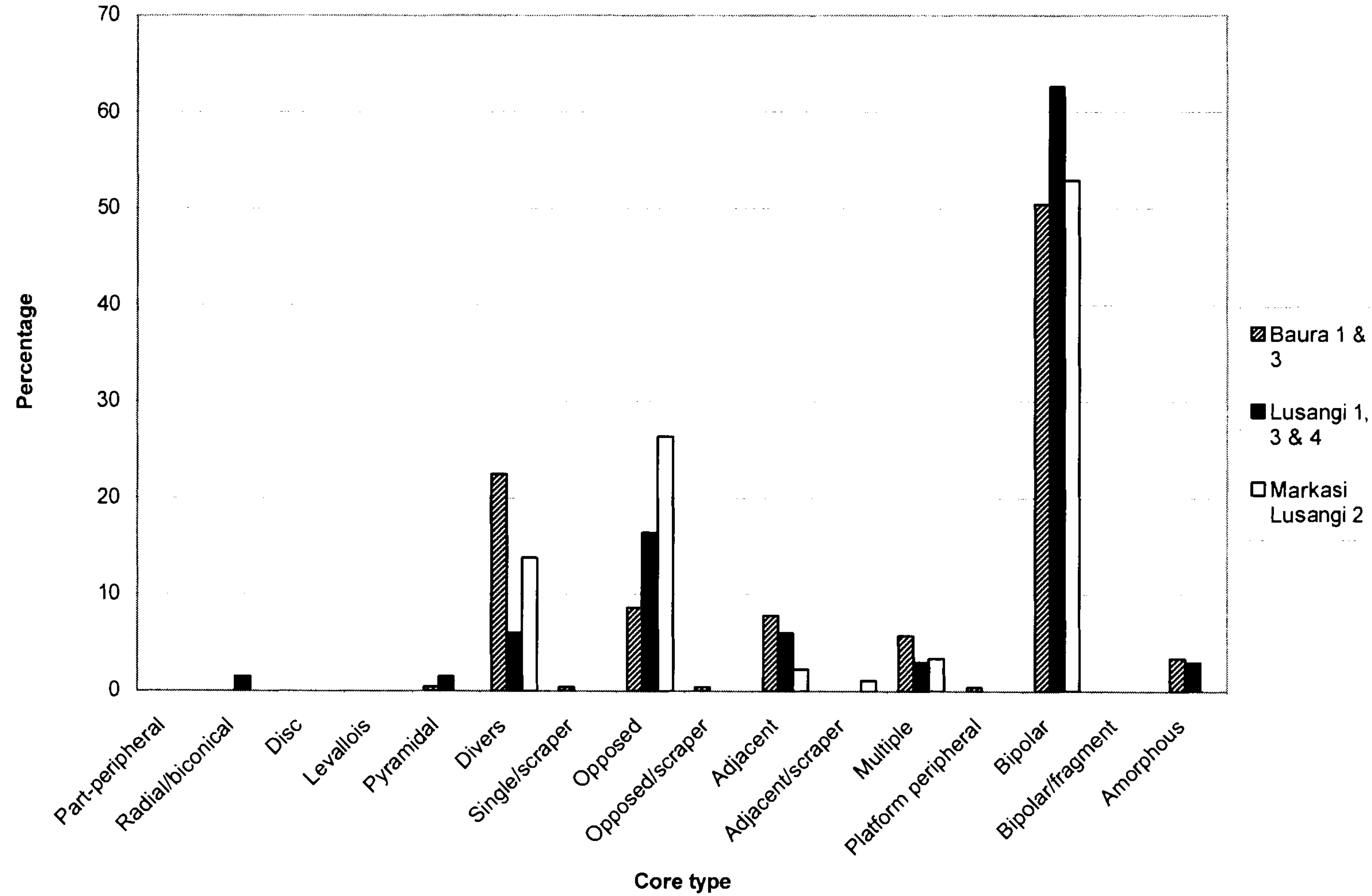
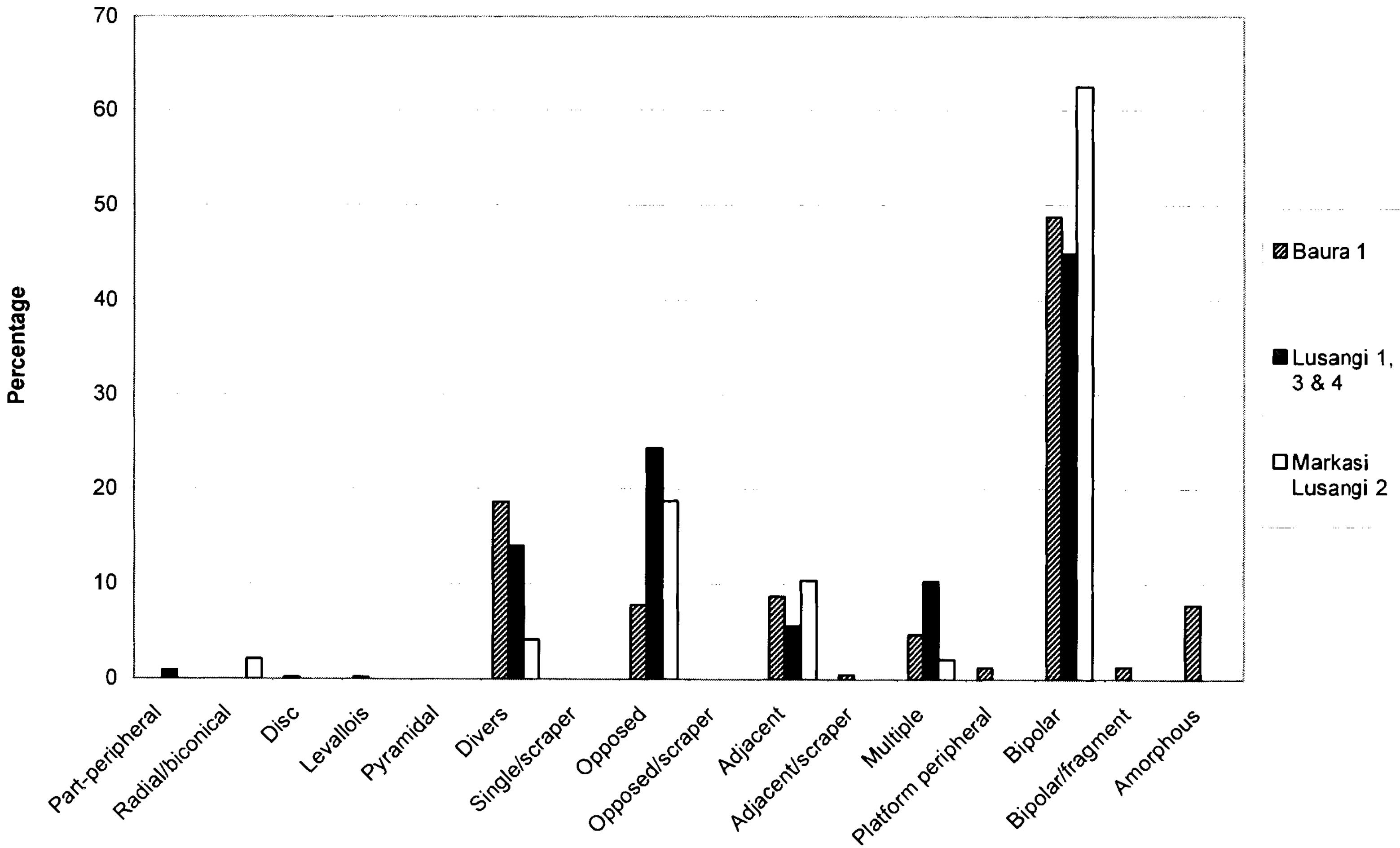


Figure 7.8. Inter-site comparison of cores from LSA levels



Core Distribution by Sites

Bipolar, opposed double platform, single platform, adjacent double platform and multiple platform cores were common components at all excavated Pahi sites (see Figures 7.7 and 7.8). Cores such as disc, Levallois, platform peripheral, single platform core scrapers and opposed double platform core scrapers were only recovered at Baura, while part peripheral and radial cores were present only at Lusangi and Markasi Lusangi 2 respectively. Amorphous cores were absent at Markasi Lusangi 2. In general Baura had the highest core diversity, followed by Lusangi and Markasi Lusangi 2. Overall the most frequent cores at all three sites were bipolar, followed by opposed double platform, single platform, adjacent double platform and multiple platform cores. Part peripheral, radial/biconical, disc and pyramidal cores were extremely rare representing less than 2.1% at the sites where they occur. Bipolar cores were the most frequent core type with frequencies ranging from 44.9% - 62.6%. This is to be expected since bipolar core predominates in LSA industries (see also Masao 1979: 163; Mehlman 1989:371-422) and marks the appearance of bipolar technology that replaced the Levallois and radial technology prevalent during the MSA (Mehlman 1989:269-272, 368). The rarity of the radial, disc and Levallois cores at the Pahi sites indicates the presence of a mature LSA industrial complex.

7.3.2.2. Intra-site Comparison of Lithic Artifacts

In this section both cumulative and spatial variability of artifact distribution within sites is examined.

Cumulative Comparisons of Artifacts at the Unit Level

Artifact Distribution on a Component Basis

Figures 7.9 and 7.10 indicate the frequencies of lithic artifact types for LSA and LIA components of Baura 1. As stated in Chapter 5, Unit 1 yielded exclusively LSA remains while Unit 4 yielded only LIA. As a result, to some extent the conclusions for comparison between LSA and LIA components in at Baura 1, depend on the inferences drawn from Units 2 and 3 because these units yielded both components. As observed in Figures 7.9 and 7.10 proportions of artifact types are the same for LSA and LIA contexts: angular fragments dominate followed by flakes/blades, cores and tools. This reflects similar processes of lithic knapping (also influenced by the use of the same raw materials) during the LSA and LIA which ultimately led to deposition of similar proportion of lithic artifacts.

Figures 7.11 and 7.12 indicate the comparison of the intra-site lithic variability in Lusangi 1 for LSA and LIA components. As stated in Chapter 5, Unit 2 yielded exclusively LIA artifacts therefore comparison between the LSA and LIA assemblages will largely be centered on Unit 1 and 3 because these units yielded both LSA and LIA deposits. The proportions of lithic artifacts in the LSA and LIA are quite different. Analysis of LIA materials from the three units indicates that Unit 2 has higher frequencies

Figure 7.9. Baura 1: Intra-site lithic artifact variability - LIA levels

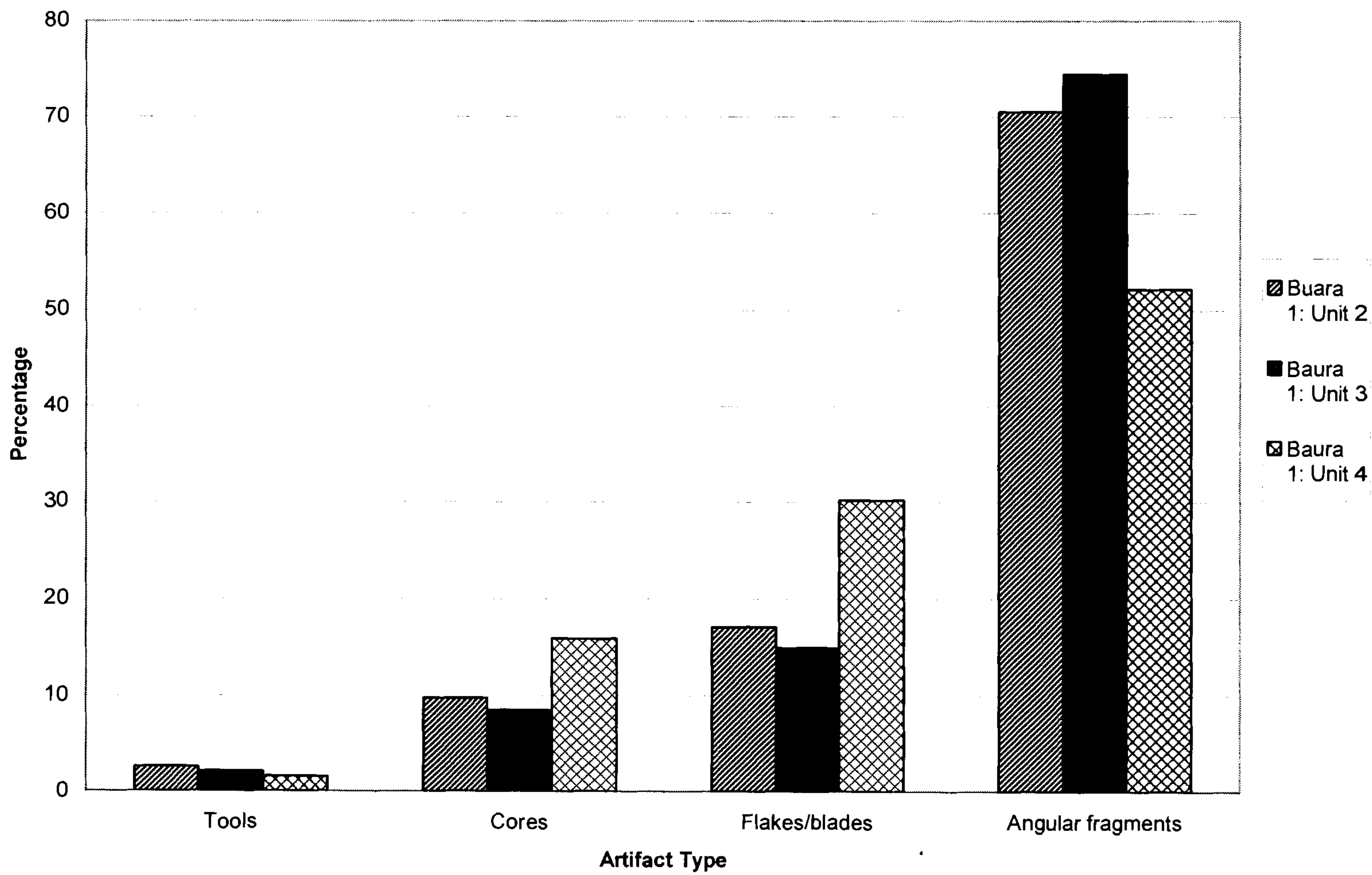


Figure 7.10. Baura 1: Intra-site lithic artifact variability - LSA levels

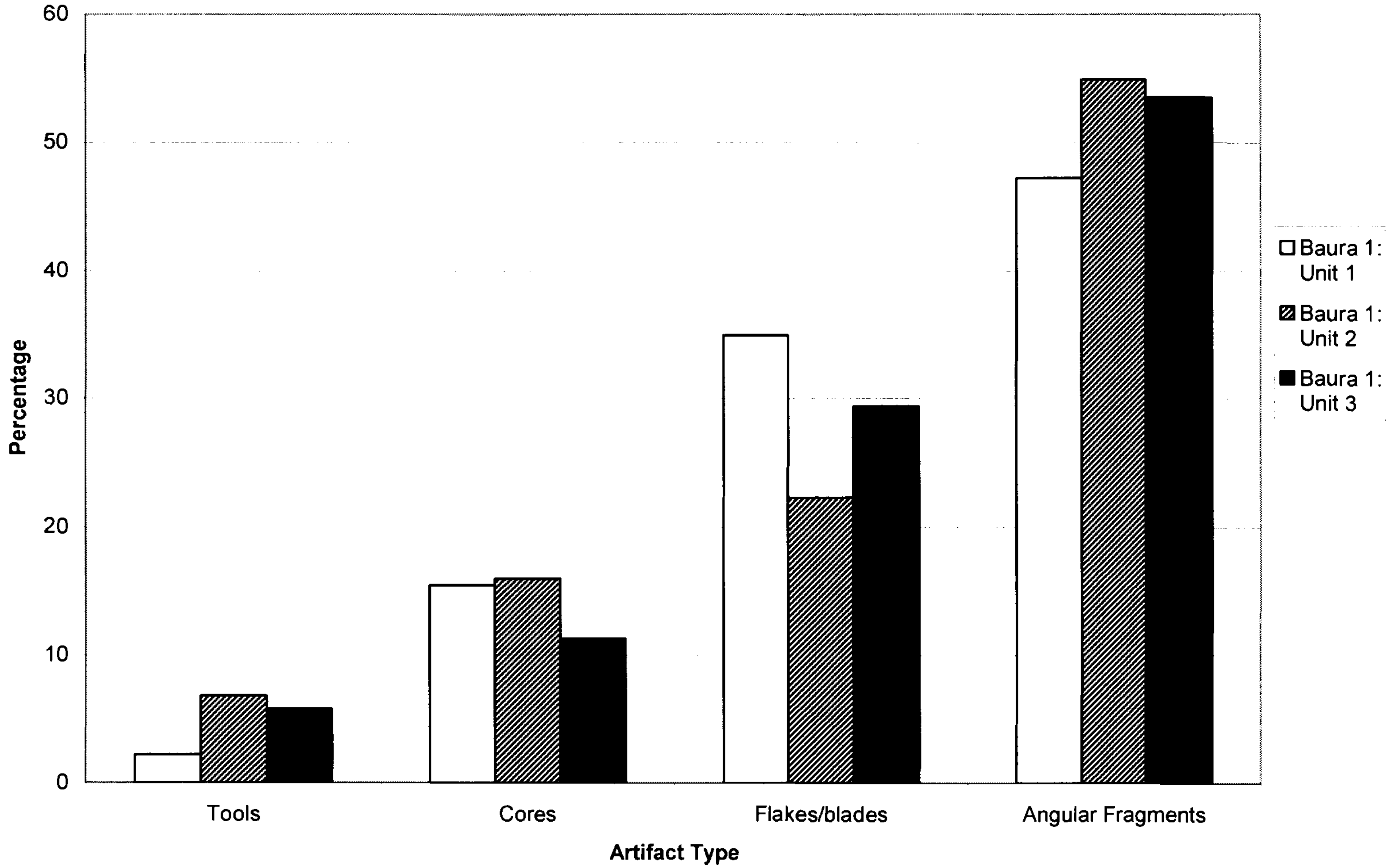


Figure 7.11. Lusangi 1: Intra-site lithic artifact variability - LIA levels

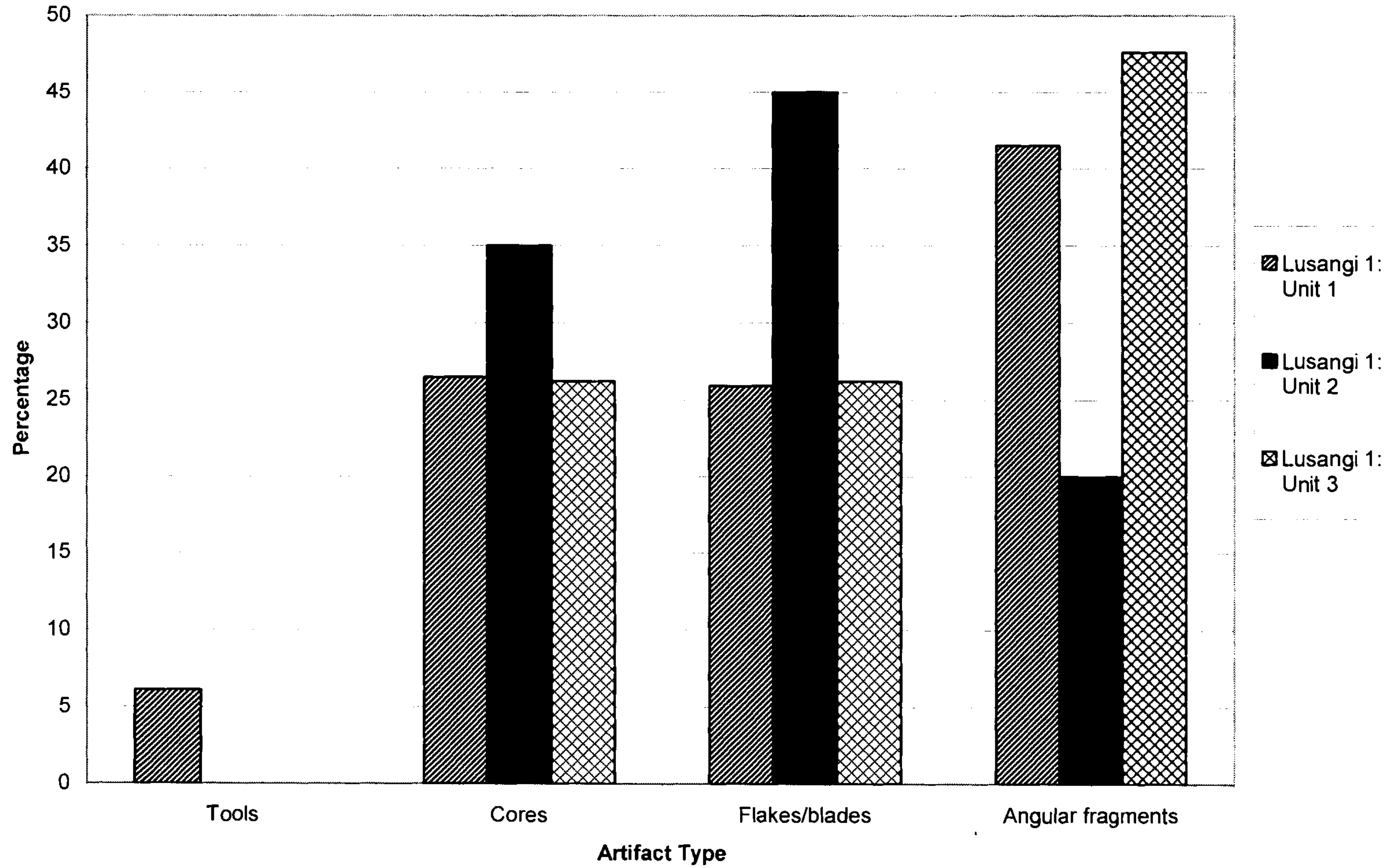
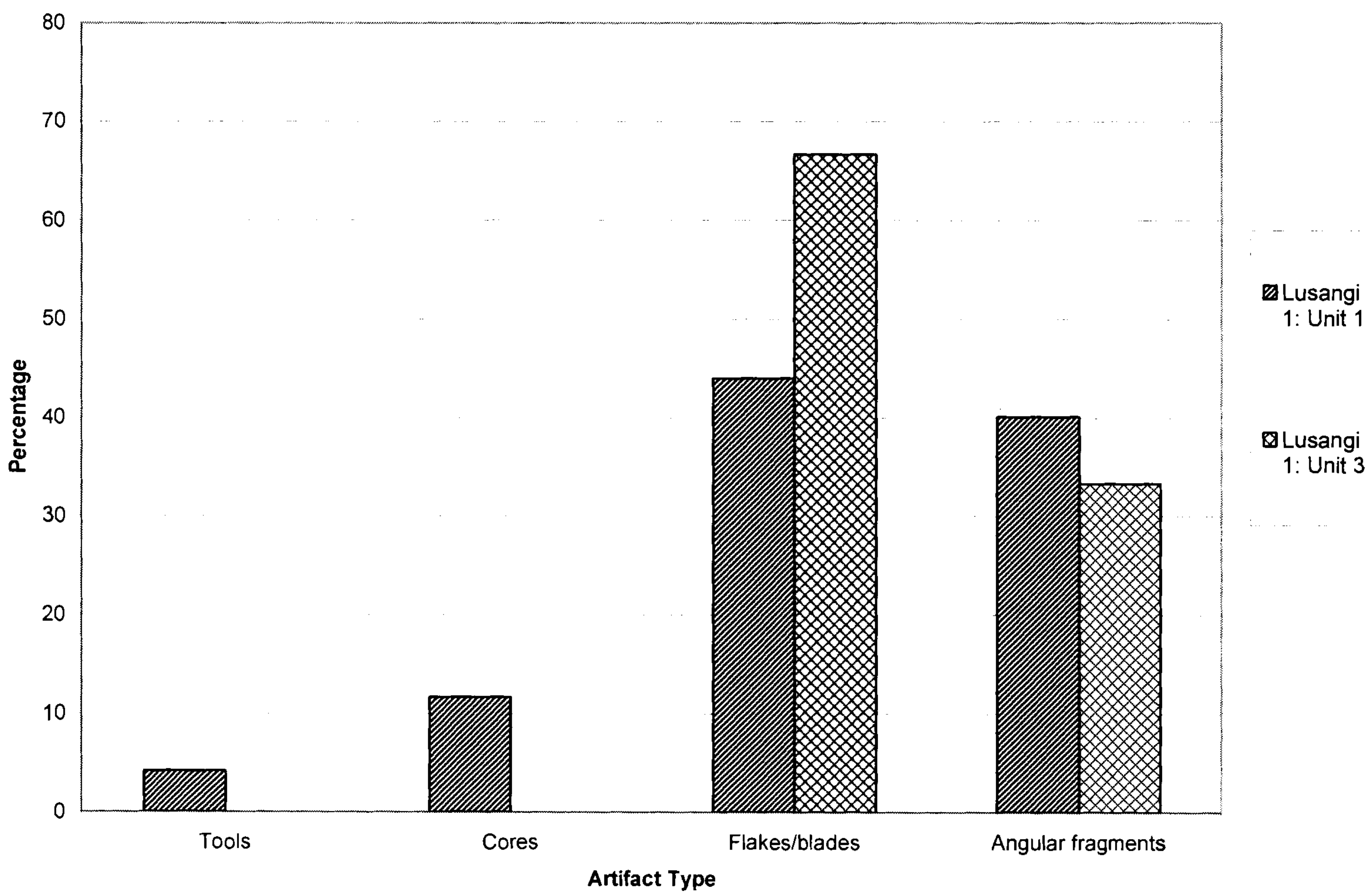


Figure 7.12. Lusangi 1: Intra-site lithic artifact variability - LSA levels



of flakes/blades and cores and lower proportion of angular fragments than Unit 1 and 3. The cause for the discrepancy between Unit 2 and the others may be related to site formation processes. As stated in Chapter 5 Lusangi 1 Unit 2 was probably formed as a result of deposition by rain water runoff and this must have affected the nature of the original deposits. The proportions of LIA lithic artifacts in Unit 1 and 3 are comparable in that both units have higher frequencies of angular fragments than flakes/blades and cores. Note the percentage balance of cores and flakes/blades in Unit 1 and 3. In the LSA the proportion of lithic artifacts differs significantly from that of LIA in that flakes/blades occur in higher frequencies followed by angular fragments, cores and tools.

Figures 7.13 and 7.14 illustrate the intra-site lithic artifact variability of LSA and LIA components at Markasi Lusangi 2. As was the case in Baura 1, Markasi Lusangi 2 units show similar proportions of lithic artifacts in LSA and LIA components. However, while Baura 1 has higher proportion of angular fragments (Figures 7.9 and 7.10) than the rest of the artifacts in its LSA and LIA contexts, Markasi Lusangi 2 produced higher frequencies of flakes/blades (except for Unit 3 which has similar frequencies for flakes/blades and angular fragments in LIA – Figure 7.13) followed by angular fragments, cores and tools in both LSA and LIA. These results are similar to those of the LSA of Units 1 and 3 at Lusangi 1 where flakes/blades occur in higher frequencies than the rest of the artifacts (Figure 7.12). As stated earlier this difference in proportion of lithic artifacts present at Baura and Lusangi sites was most likely influenced by the use of fine textured quartz at Lusangi and coarse quartz at Baura. The use of coarse cloudy quartz at Baura could have led to production of more angular fragments than at Lusangi where fine textured cloudy quartz was the most common raw material.

Figure 7.13. Markasi Lusangi 2: Intra-site lithic artifact variability - LIA levels

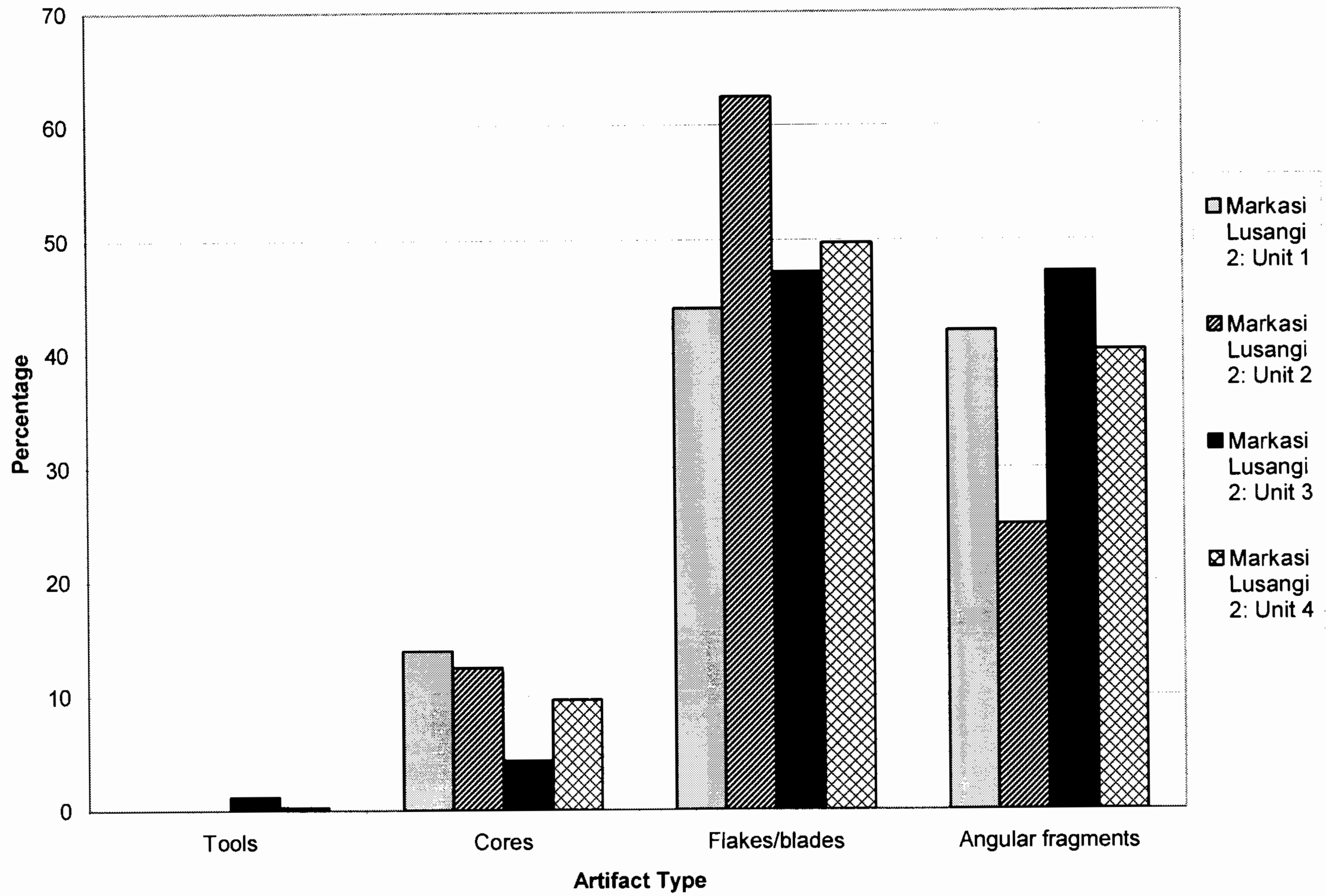
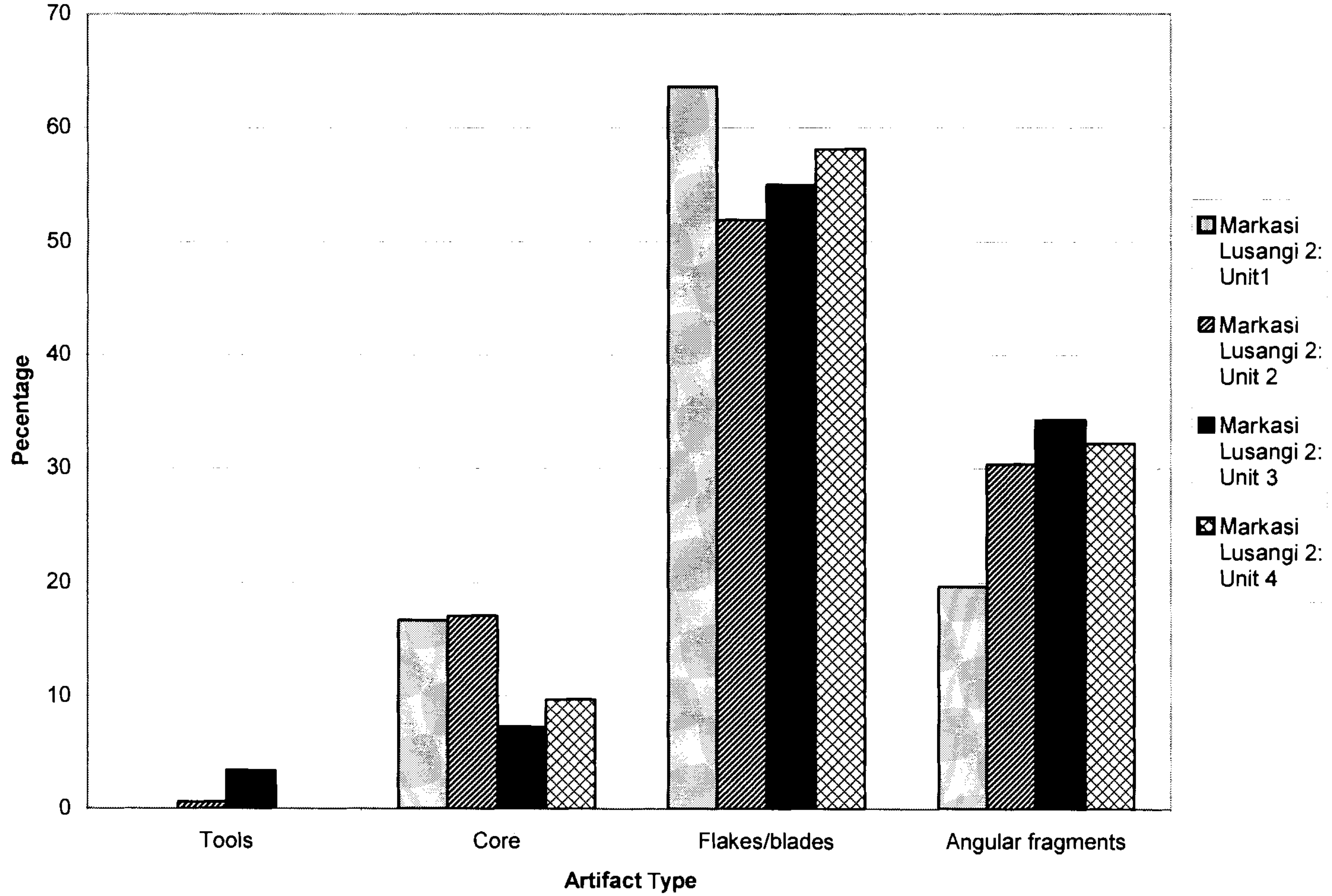


Figure 7.14. Markasi Lusangi 2: Intra-site lithic artifact variability - LSA levels



Stratigraphical Comparisons of Individual Units

Stratigraphical Frequency of Tools, Cores and Flakes/Blades

When the stratigraphic distribution of lithic artifacts within each site is compared (Figures 7.15 – 7.19) several interesting trends are apparent. With the exception of Unit 4 at Baura 1, all units have smaller quantities of lithic artifacts in their lower levels followed by an increase in the middle levels during the LSA - LIA transition before the frequency drops again towards upper stratigraphic levels. The diversity of shaped tools through time also follows a similar trend. The term "diversity" as used here simply refers to the number of tool varieties per level. Interestingly, a significant increase in the number of lithic artifacts is observed immediately before the appearance of iron-working and pottery or during the initial stage of LSA/LIA transition after which there is a pronounced decline (see Figure 7.15 – 7.19 & Table 5.20, 5.21, 5.22, 5.25 and 5.31). The introduction of iron and pottery at Baura 1, Units 2, 3 and 4 commenced at Level 4, 4a and 5 respectively. At Lusangi 1 Unit 1 (Rock-shelter P44) and Markasi Lusangi 2 Unit 3 (Rock-shelter P1) the same technology commenced at Level 4 and Layer 2 respectively. The increase in production of lithic artifacts during the LSA - LIA transition reflects the establishment of permanent settlements in the area possibly accompanied by an increase in population. Most likely an increase in sedentism would have led to more concentrated deposits of lithic artifacts compared to a nomadic way of life. That the LIA was associated with sedentism is supported by the appearance of daubs at this period (see Chapter 5). The later decline in lithic production can be attributed to the introduction of iron-working which began to replace lithic technology.

Figure 7.15. Baura 1: Unit 2 - Stratigraphical frequency of shaped tools, cores and flakes/blades

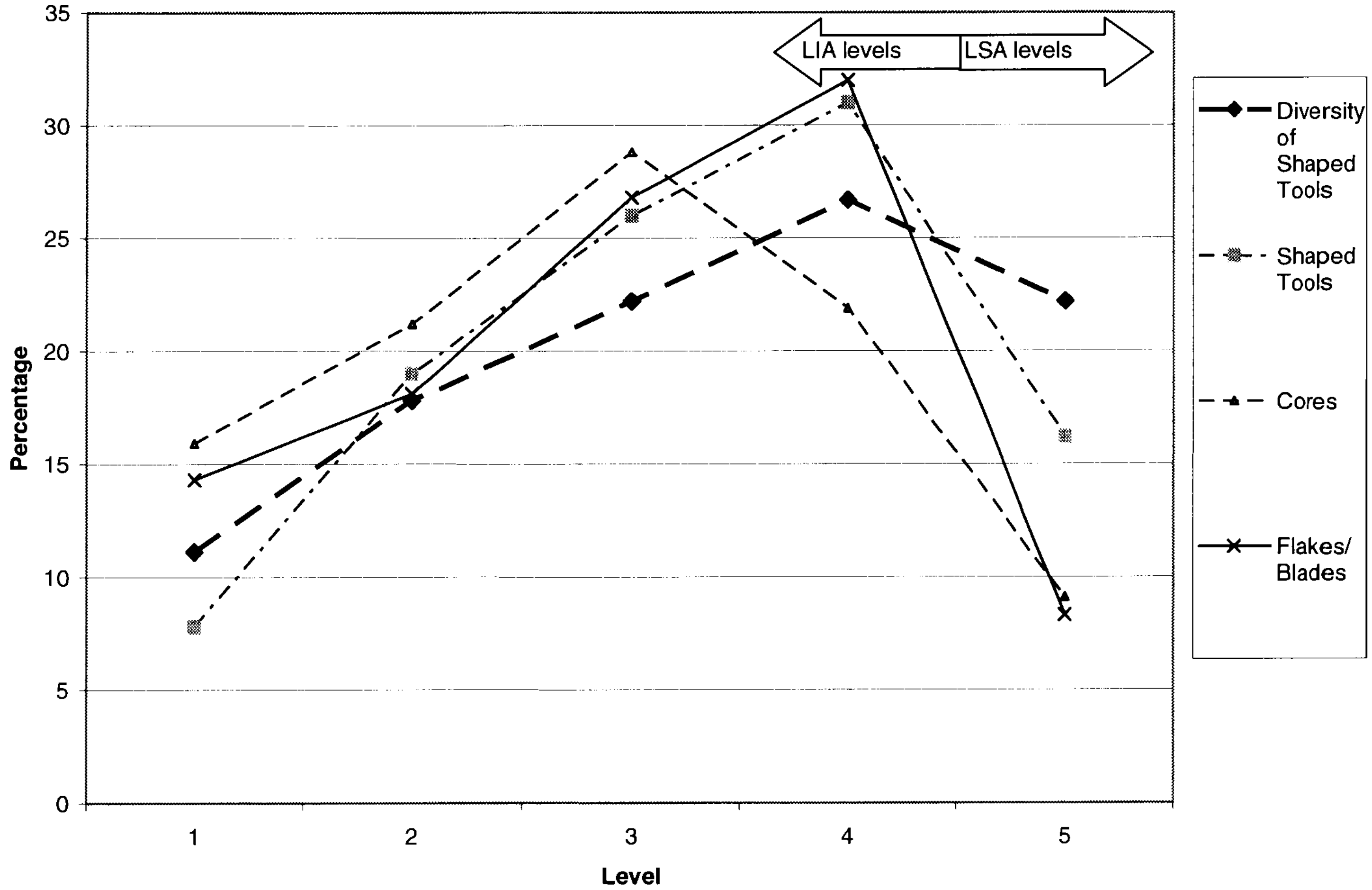


Figure 7.16. Baura: Unit 3 - Stratigraphical frequency of shaped tools, cores and flakes/blades

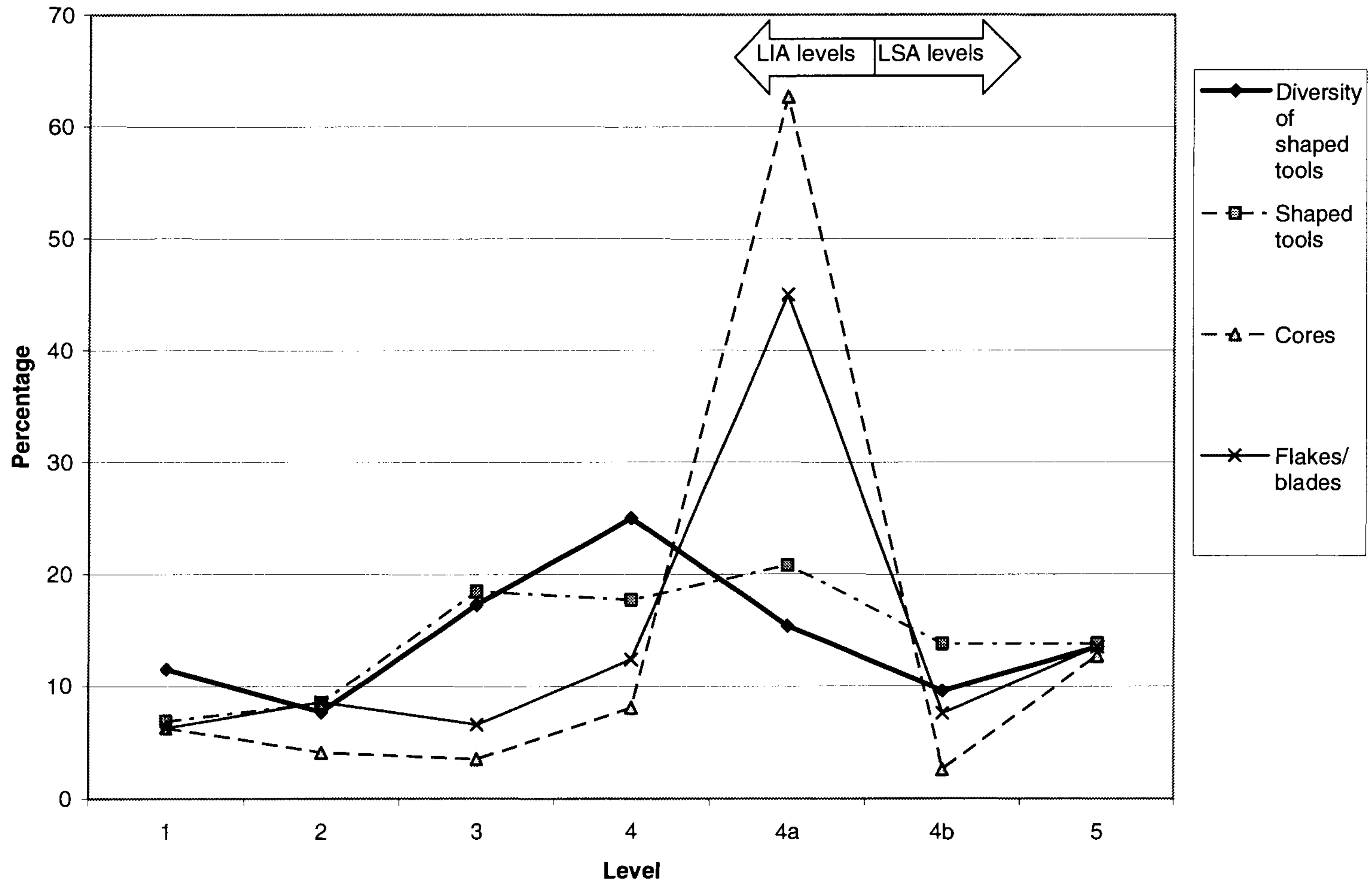


Figure 7.17. Baura 1: Unit 4 - Stratigraphical frequency of shaped tools, cores and flakes/blades

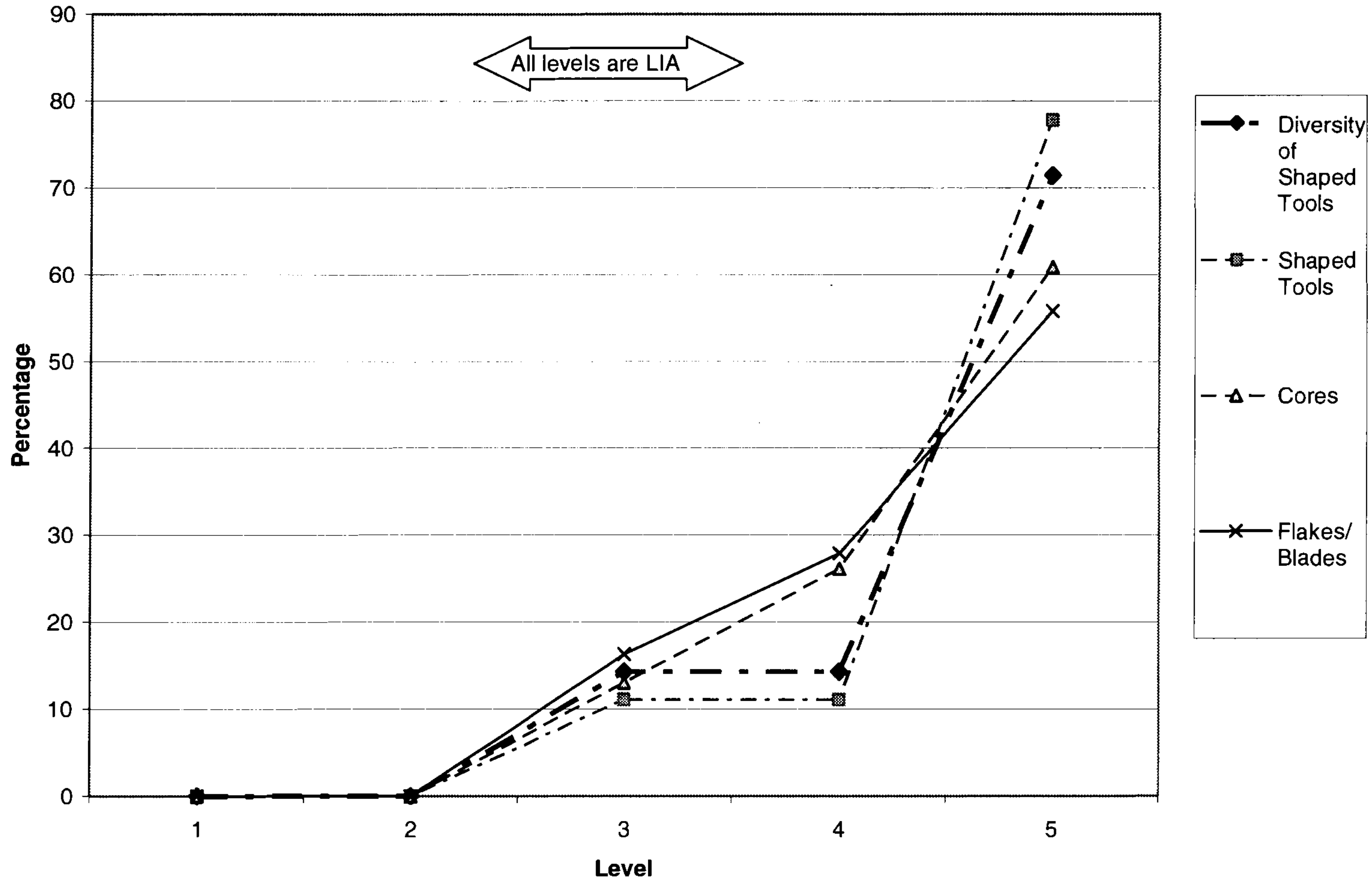


Figure 7.18. Lusangi 1: Unit 1 (Rock-shelter P44) - Stratigraphical frequency of shaped tools, cores and flakes/blades

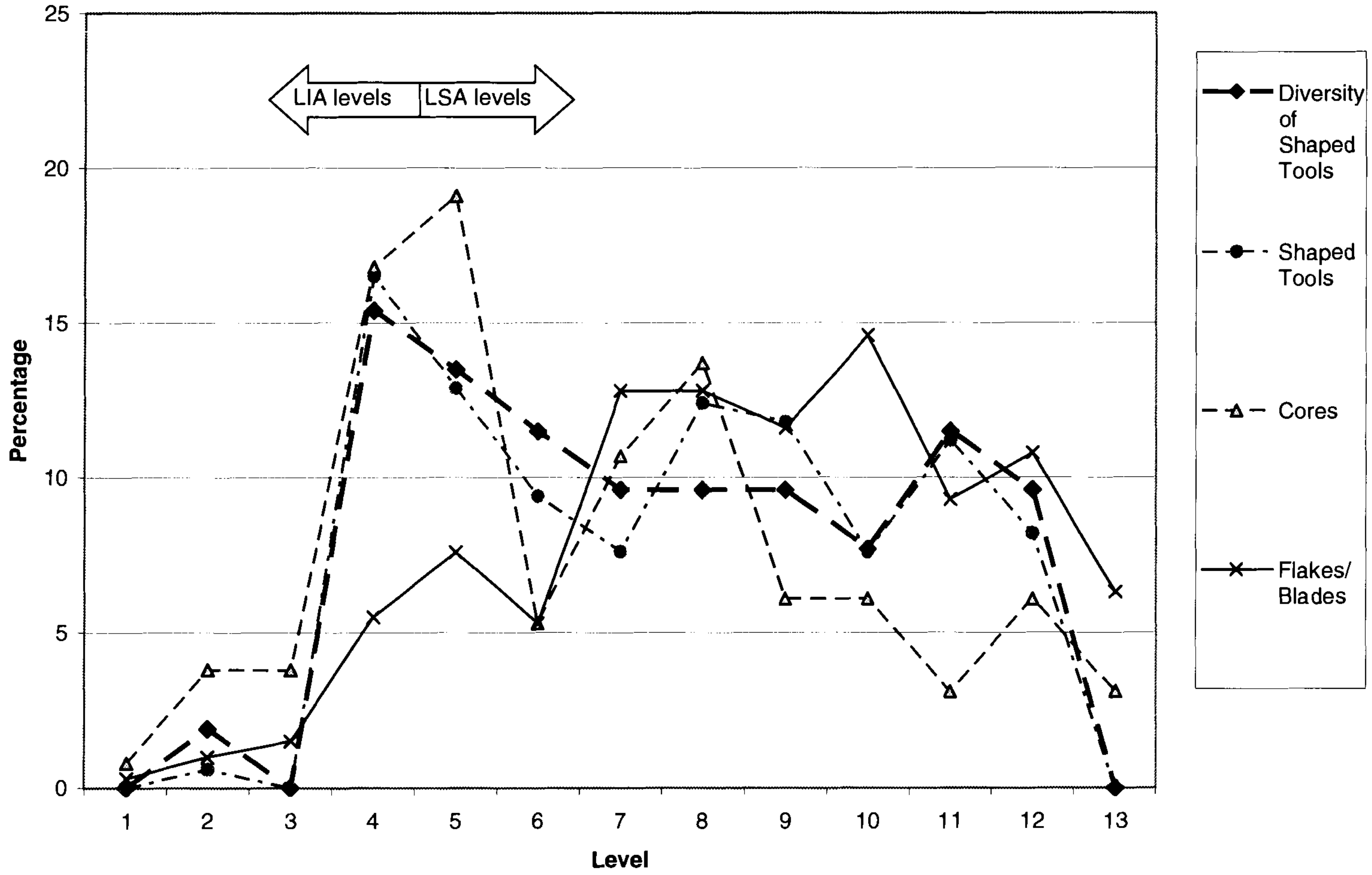
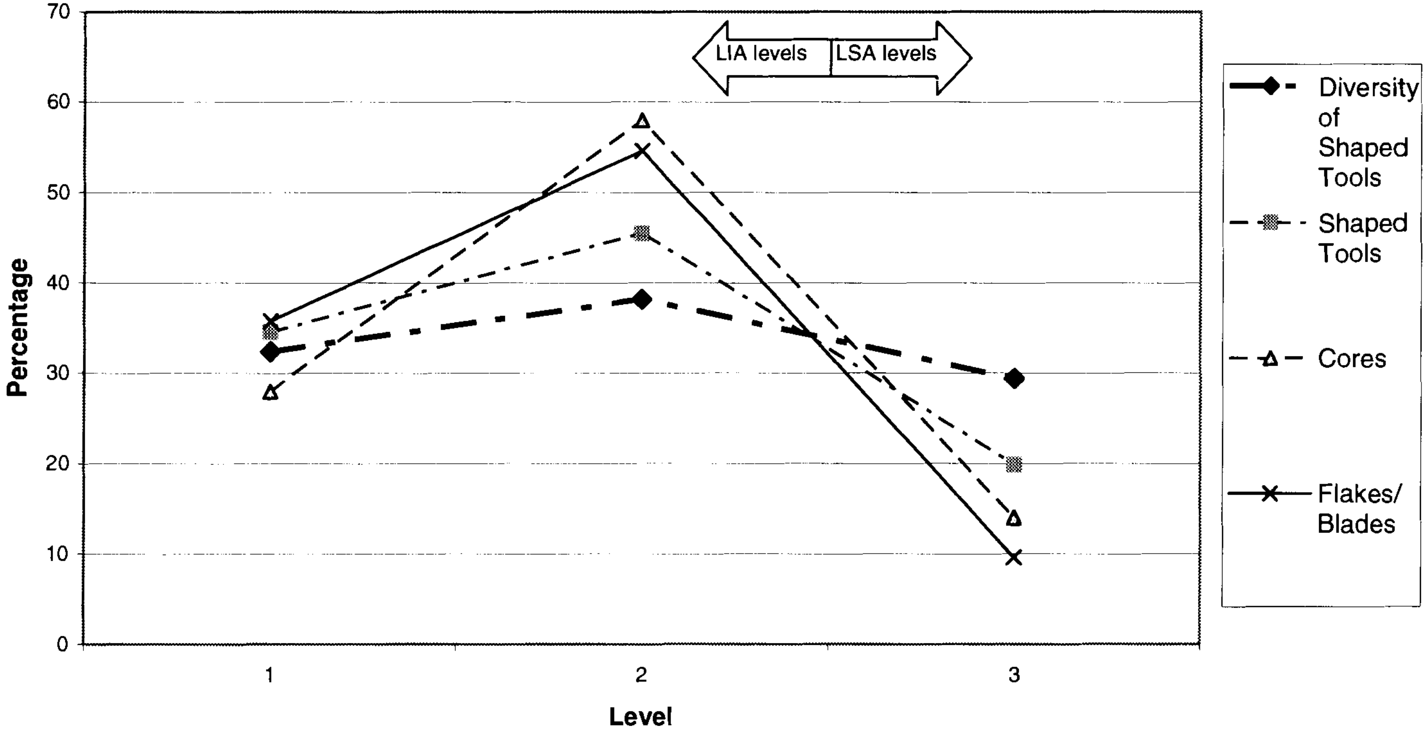


Figure 7.19. Markasi Lusangi 2: Unit 3 (Rock-shelter P1) - Stratigraphical frequency of shaped tools, cores and flakes/blades



These results indicate that lithic technology is not abruptly replaced during the LIA period. However despite the evidence for decreasing frequency in lithic artifact production, there is no evidence for change in lithic production technology. Several shaped tools continued to be produced albeit with an overall decrease in diversity through time (Figures 7.15 – 7.19). A decrease in diversity of shaped tools should not be interpreted as change in the technology of lithic production. As has been discussed earlier the tendency for lithic technology to continue unaltered for long periods of time after the introduction of pottery and iron-working is not peculiar to Pahi sites (see Masao 1979; Miller 1969; Musonda 1987; Phillipson 1976a). Evidence indicates that a decrease in shaped tool diversity corresponds more with a general decline in the number of lithic artifacts in upper and lower levels with minor differences. For example in most units producing low frequencies of lithic artifacts, shaped tool diversity was also lower, while levels with higher frequency of lithic artifacts also produced higher diversity of shaped tools (Figures 7.15 – 7.19).

Stratigraphical Distribution of the Major Shaped Tool Categories

The stratigraphical distribution of major shaped tools is illustrated in Figures 7.20 – 7.24. Burins and points are very rare in the Pahi assemblage and as a result they do not appear in most of the figures. As shown in Figures 7.20 -7.24, with the exception of Baura Unit 4 where *outil écaillés* are missing, scrapers, backed pieces and *outil écaillés* occur in most of the represented units. These tools are also fairly well represented in both

Figure 7.20. Baura 1: Unit 2 - Stratigraphical distribution of the major shaped tool categories

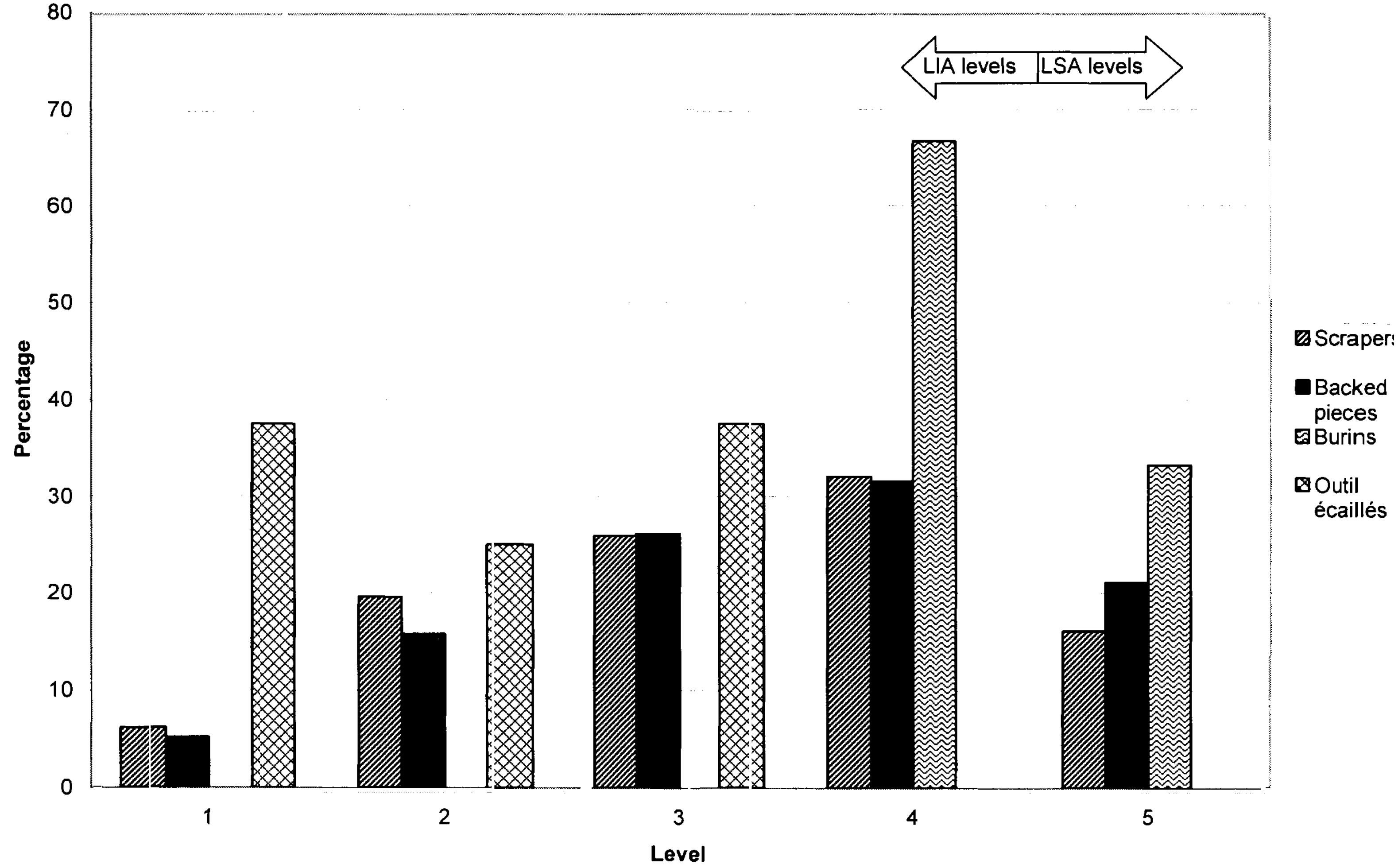


Figure 7.21. Baura 1: Unit 3 - Stratigraphical distribution of the major shaped tool categories

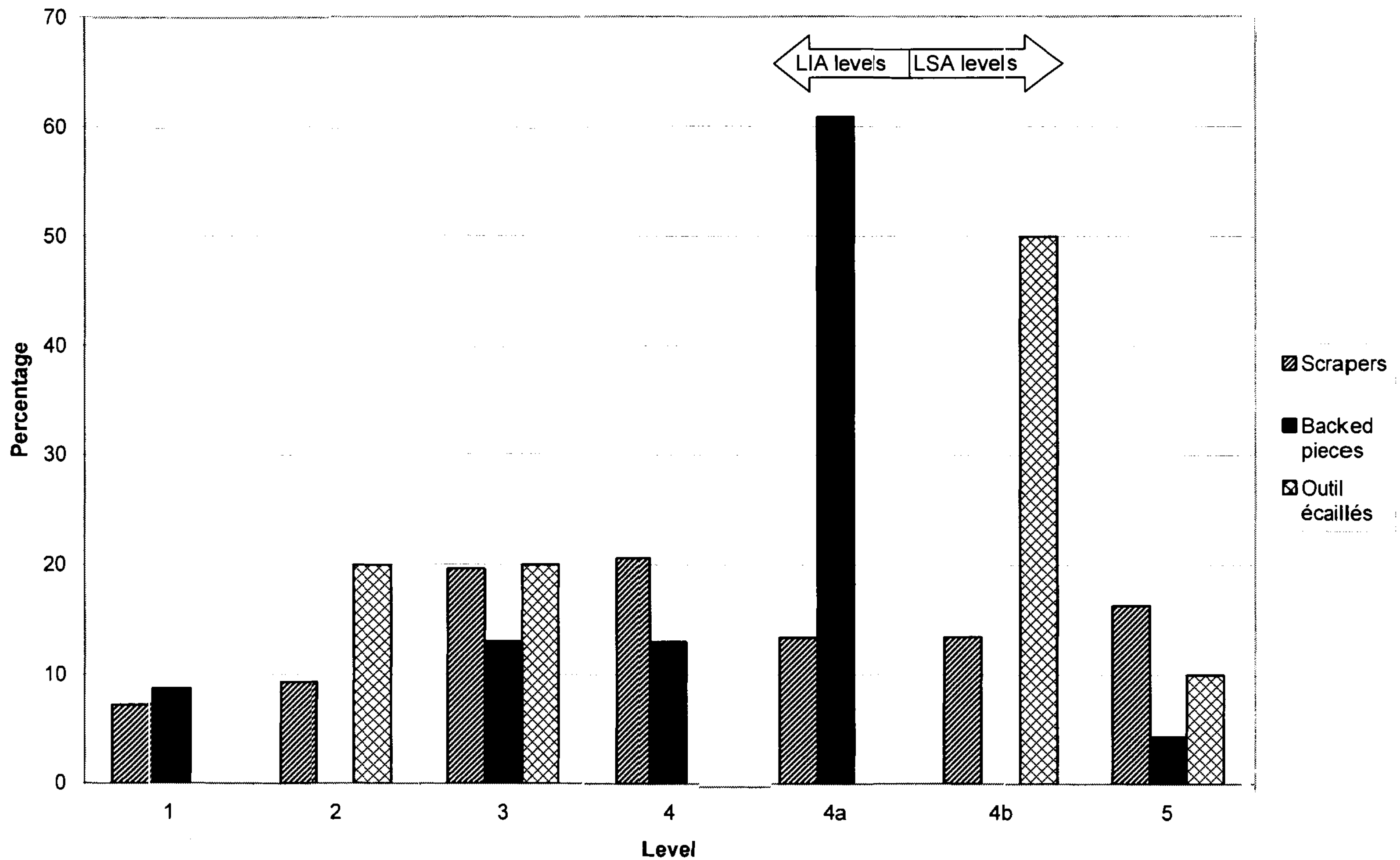


Figure 7.22. Baura 1: Unit 4 - Stratigraphical distribution of the major shaped tool categories

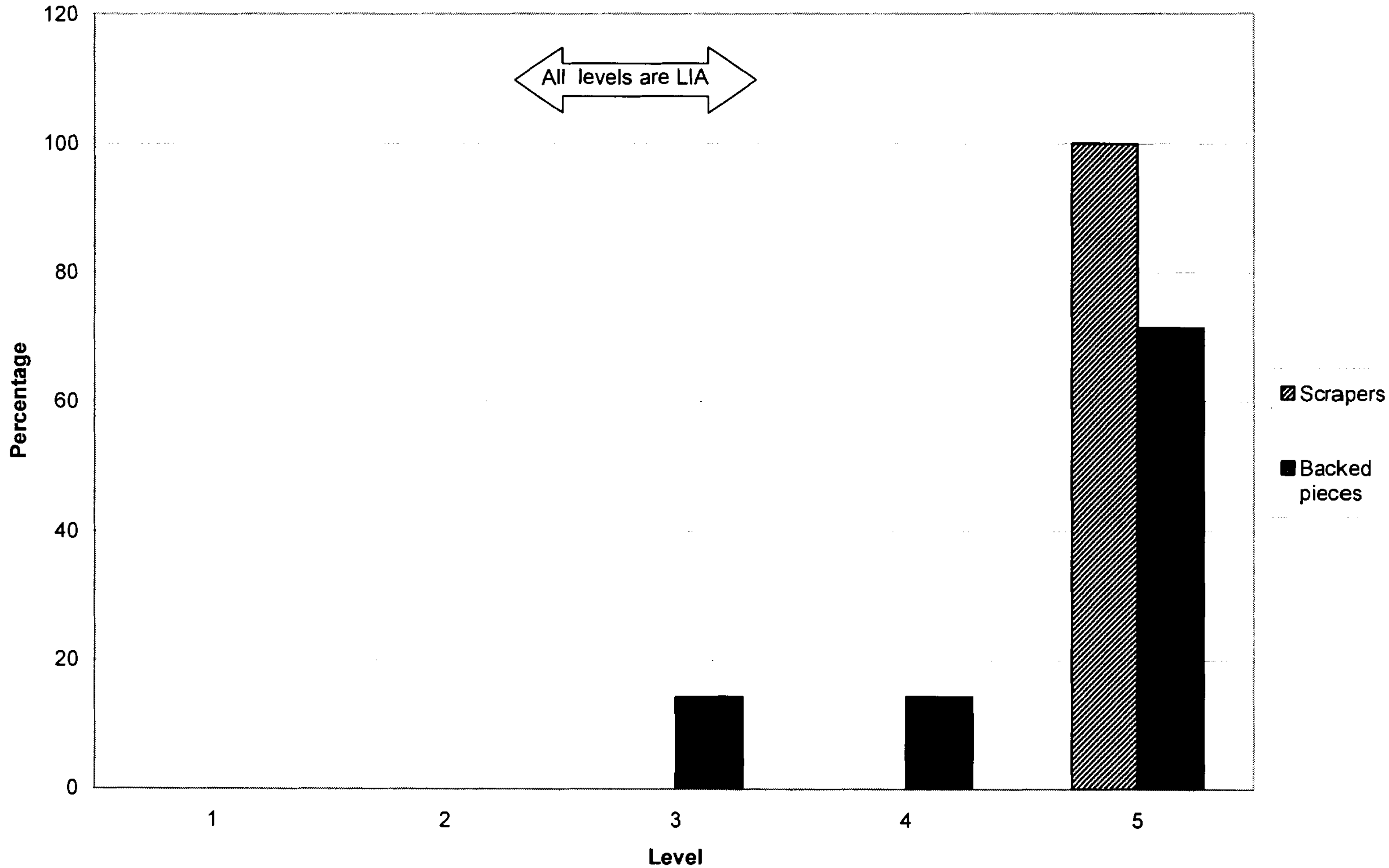


Figure 7.23. Lusangi 1: Unit 1 (Rock-shelter P44) - Stratigraphical distribution of the major shaped tool categories

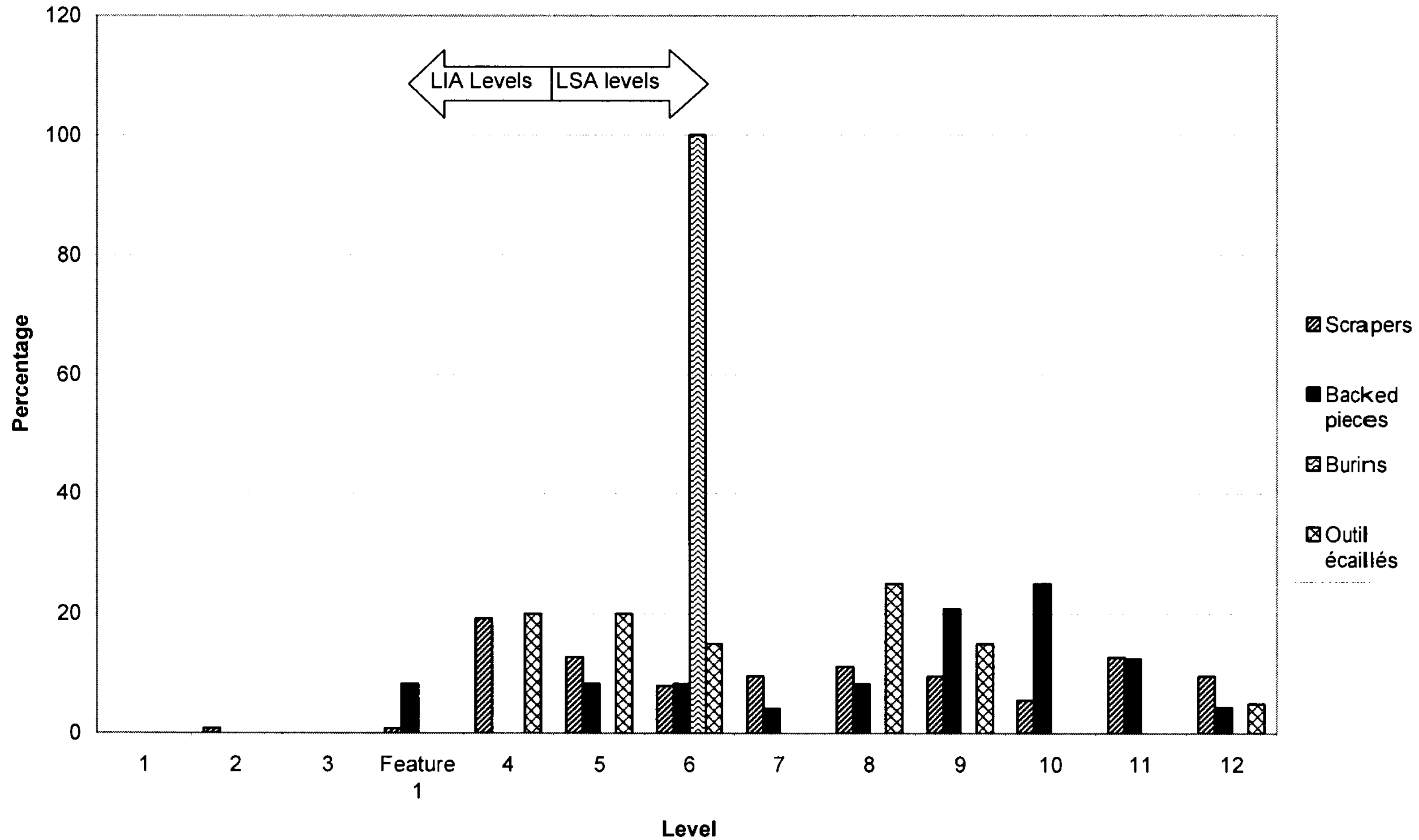
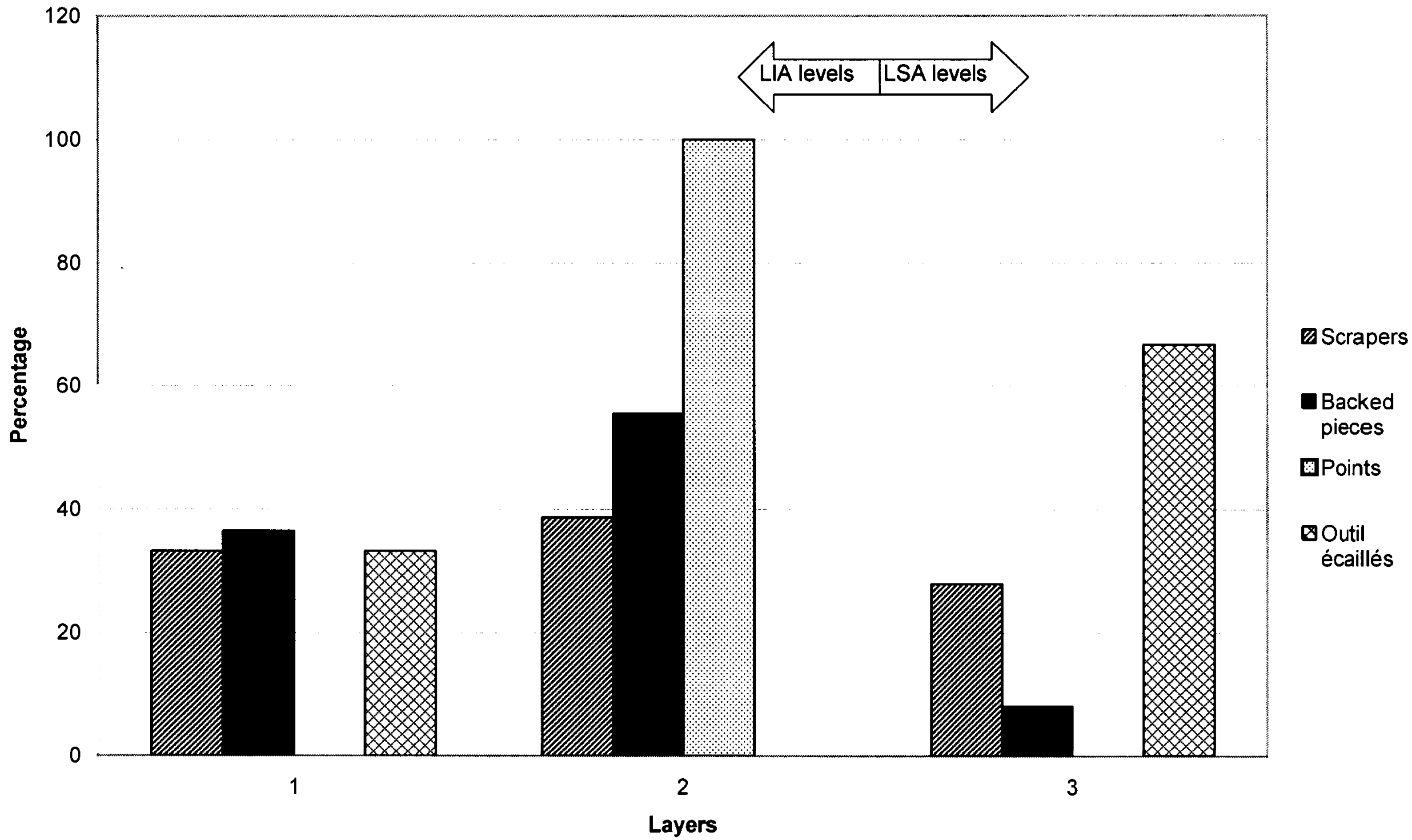


Figure 7.24. Markasi Lusangi 2: Unit 3 (Rock-shelter P1) - Stratigraphical distribution of the major shaped toool categories



LSA and LIA levels suggesting that there was little or no technological change between the two stages of cultural development.

Stratigraphical Distribution of Cores

Figures 7.25 – 7.29 represent the stratigraphical distribution of cores. Platform peripheral, pyramidal, part-peripheral, radial and all forms of core scrapers occur rarely in the Pahi assemblages so they are not used in the frequency comparison between the LSA and LIA components. Divers, opposed, adjacent, multiple, bipolar and amorphous cores occur in abundance in the represented units. These cores also occur in both LSA and LIA levels with the exception of amorphous cores that are represented only in the LIA. These results indicate similar core flaking patterns in both LSA and LIA.

7.3.2.3. Raw Materials

Over 99% of the raw materials used in Pahi lithic industries was quartz (see also Masao 1979: 40, 90-1). Only a few pieces of obsidian, basalt and chert were recovered from excavations. Both basalt and obsidian are not found in this part of central Tanzania and must have been obtained from adjacent regions. Obsidian trade or exchange is more likely to have been practiced rather than individual travel to the sources because of the distance involved. Obsidian sources in the Tanzanian Rift Valley are said to be poor and unsuitable for tool manufacture, consequently the occupants of the Nasera and Mumba Rock-shelter sites probably imported obsidian from either Lake Naivasha or Njorowa Gorge in Kenya about 320 km to the north. The use of obsidian from these sources dates

Figure 7.25. Baura 1: Unit 2 - Stratigraphical distribution of cores

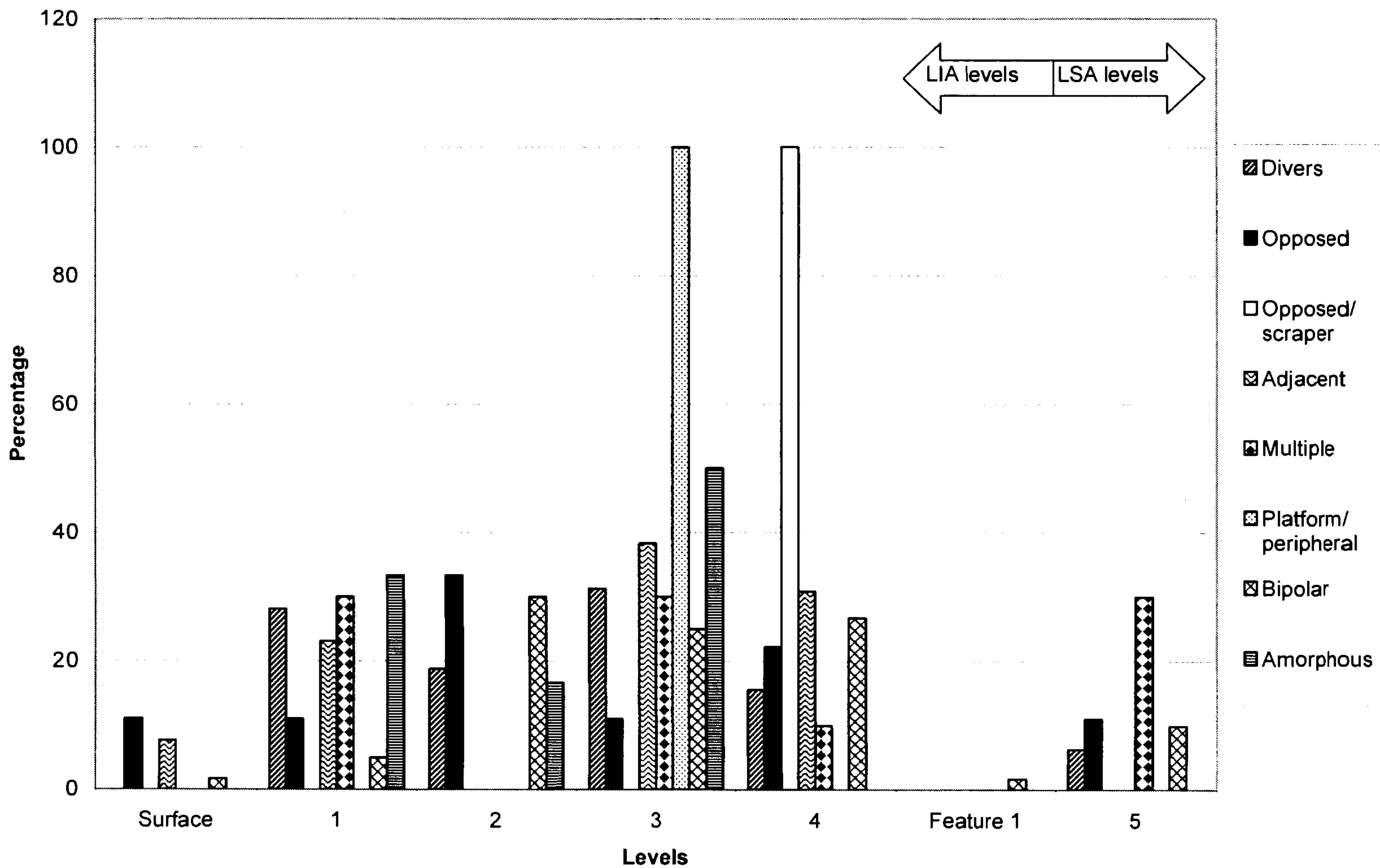


Figure 7.26. Baura 1: Unit 3 - Stratigraphical distribution of cores

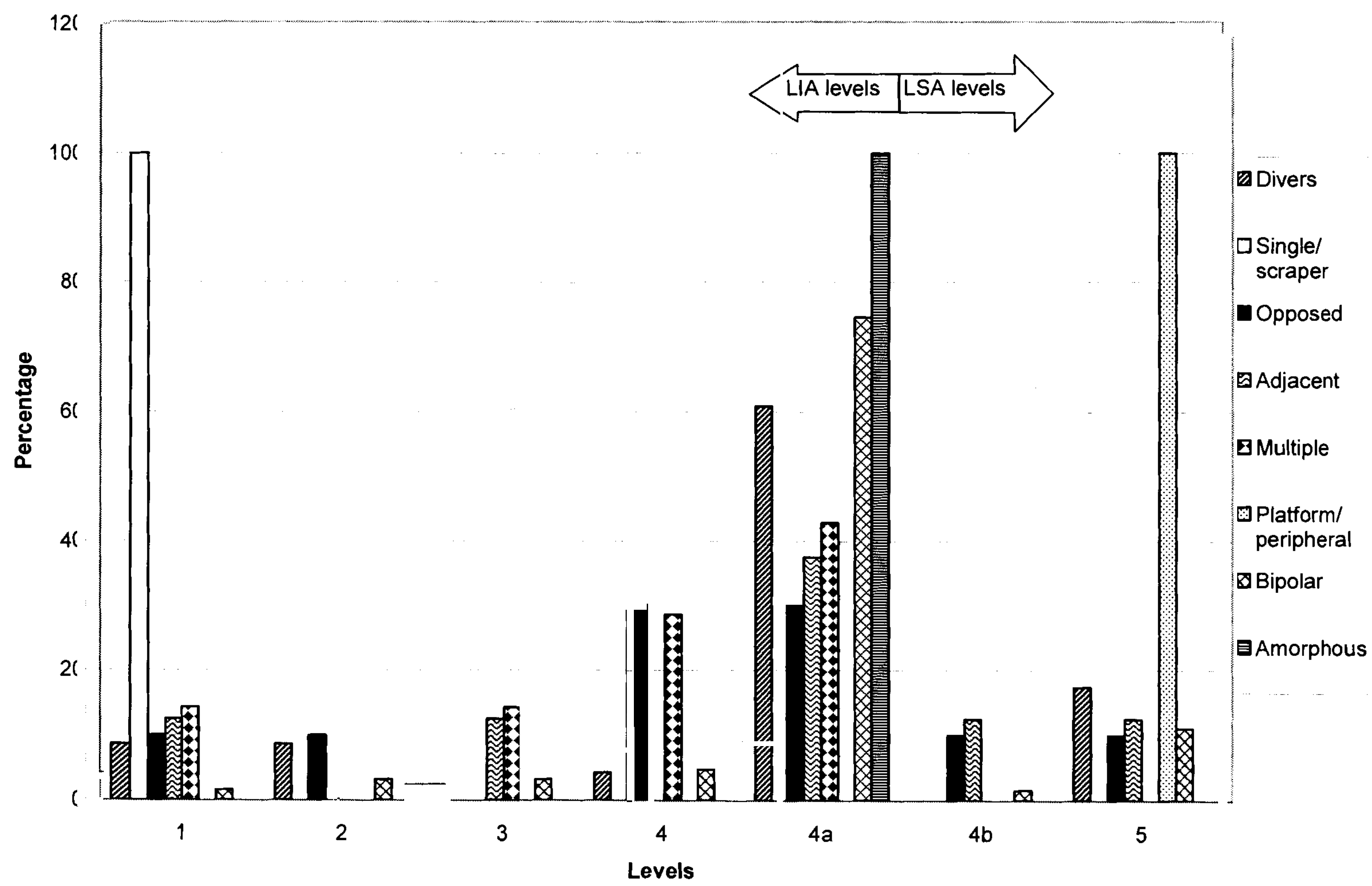
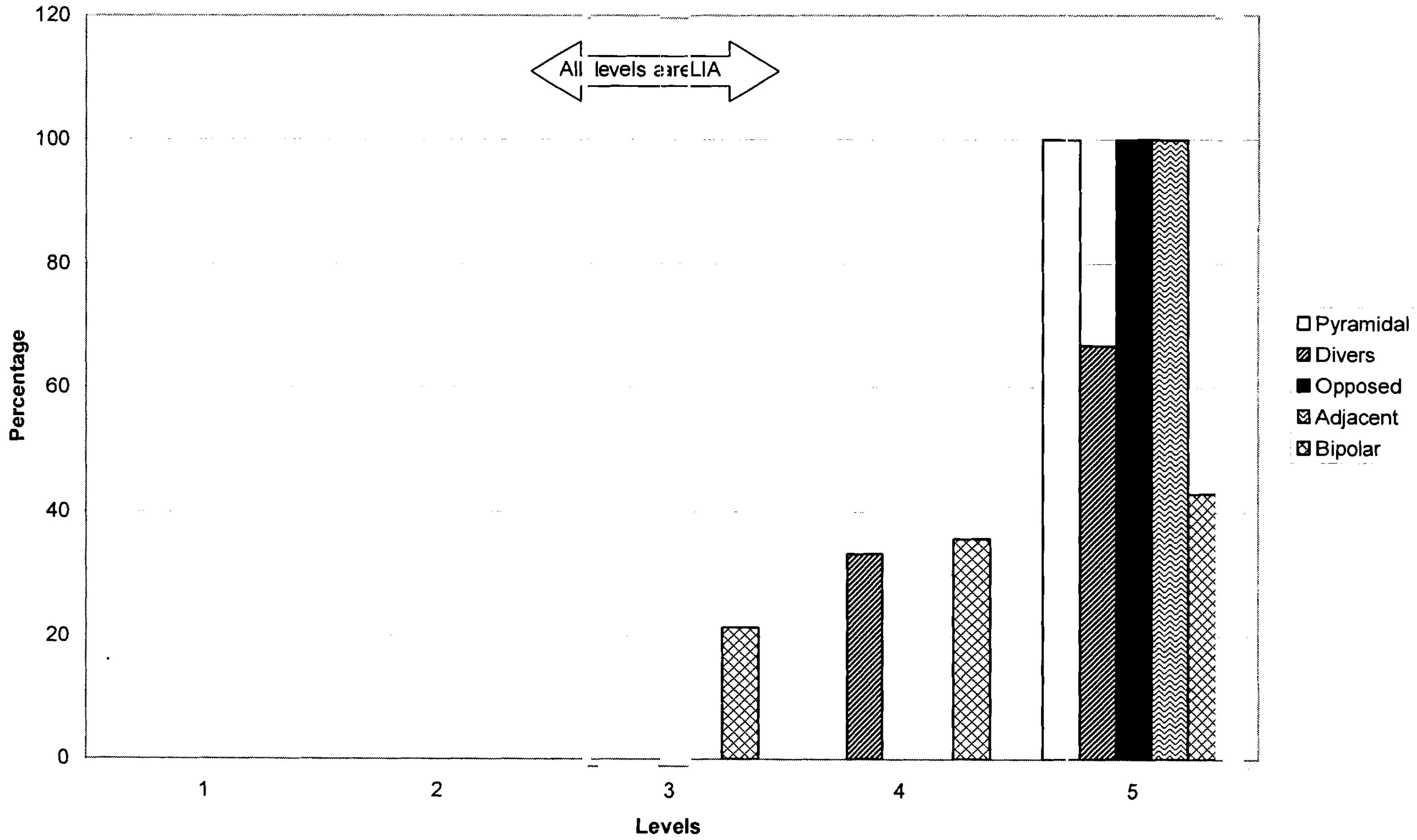


Figure 7.27. Baura 1: Unit 4 - Stratigraphical distribution of cores



Figre 7.28. Lusangi 1: Unit 1 (Rock-shelter P44) - Stratigraphical distribution of cores

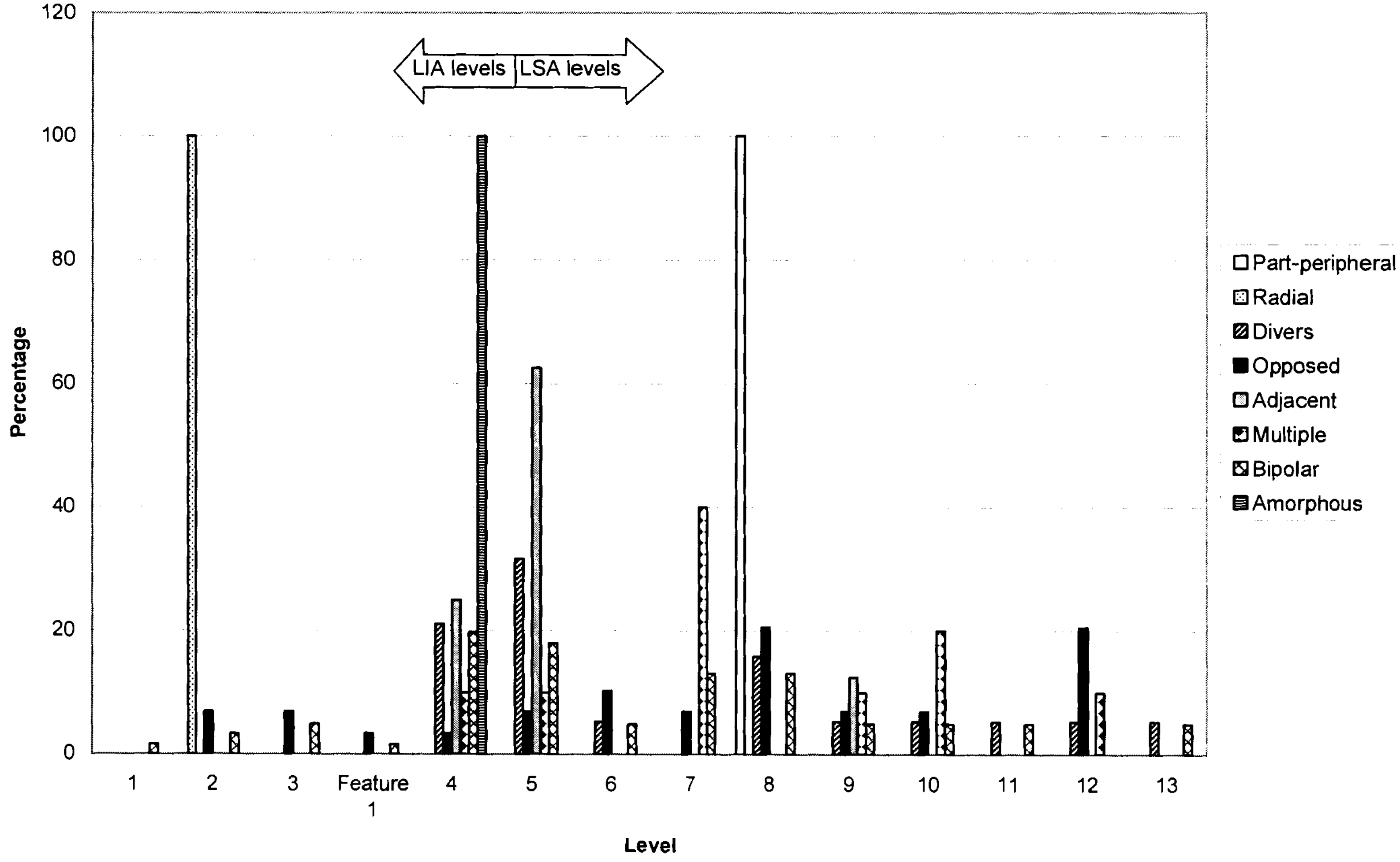
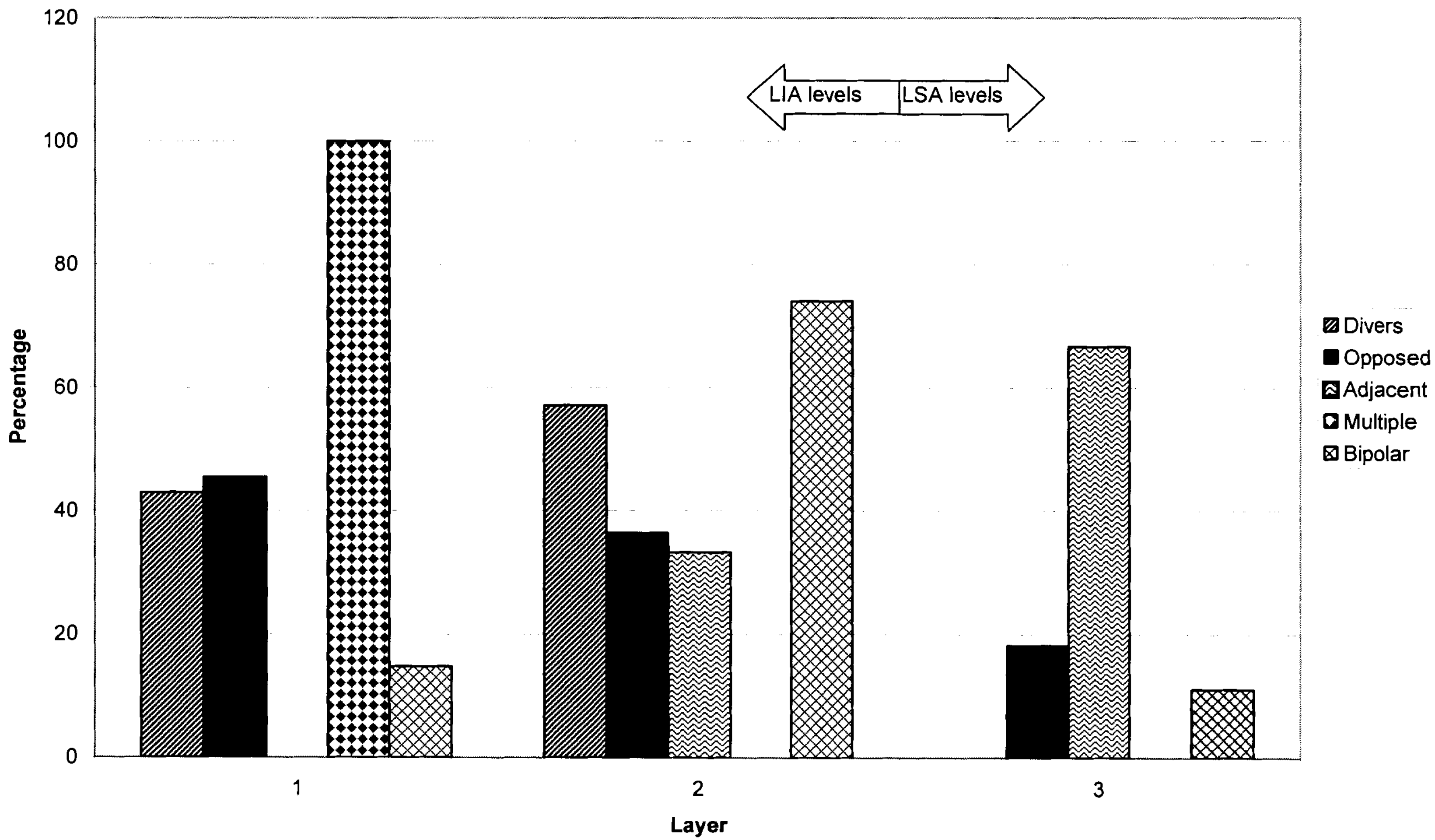


Figure 7.29. Markasi Lusangi 2: Unit 3 (Rock-shelter P1) - Stratigraphical distribution of cores



back to over 100,000 years (Mehlman 1989:197). Assuming that obsidian raw materials for the Pahi sites were obtained from the same sources this would mean a transport distance of about 560 km. The only two obsidian artifacts collected were from Markasi Lusangi 2 unit 3 Layer 2 and Baura 1 unit 2 Level 4 where both stratigraphic positions mark the beginning of the LIA period.

7.3.3. Pahi Iron Technology

In most respects the remains of iron-working at Pahi appear together with pottery suggesting that both elements were adopted at the same time. Since no furnace structures were discovered from Lusangi, it is difficult to make conclusive remarks on the technology employed in the area. However, based on the similarities of furnace structures at Baura 2 and 3 it is evident that a technology employing a bowl furnace was practiced at Baura (Figure 5.9 and 5.11). Bowl furnaces have been reported in several areas including Kordofan and central Sahara (Tylecote 1980:213), East Africa, the Congo Basin and Angola (van der Merwe 1980:489). The bowl furnaces at Baura sites differ from these examples to some degree. Among the more significant variations are the diameter and thickness of the furnace walls and the presence of a ritual pit at Baura 2. In addition, although all furnaces consist of clay-smeared pits dug into the ground, the Baura 3 furnace differs because its clay wall extends beyond the ground surface (see Chapter 5 and Figures 5.9 and 5.11). As has been pointed out the two furnaces are almost contemporary dating to 120 ±50 and 140 ±50 BP (Beta # 176192 and 176191). However the absence/presence of a ritual pit raises a question about contemporaneity. In several areas of Africa ritual pits are said to have been used as features for "special offerings that ensure a successful smelt and/or protect the smelt from those who would do it harm." (Schmidt 1997:224)

One important feature shared by Baura furnaces is their orientation in that all furnaces have slag openings facing westward (see Figures 5.9 and 5.11). This orientation is commonly found in southwestern Tanzania and has been associated with a symbolic representation (Barndon 1996; Mapunda 1995). In the Fipa tradition Mapunda (1995:166) notes the following:

> ... the western direction was selected both for location of smelting furnaces and the palinyina because of its cultural/symbolic significance to the Fipa and the strong relationship between iron smelting and human reproduction. The furnaces symbolized a woman in labor, "sitting" in the western (feminine) side of the termitary with the birth canal (palinyina) through which the newborn (bloom) would come also facing west.

Evidence suggests that there is some variation in iron technology between Baura and Lusangi. There is a significant difference between the quantity and sizes of slag between Baura 2 and 3 and Markasi Lusangi 2 Unit 4. The latter consisted of extensive remains of slag the majority of which were more massive than those at Baura. Slag weight from Markasi Lusangi 2 (61.9 kg) was 5.4 times that collected from Baura 2 and 3 combined (11.4 kg) (Chapter 5). It may be possible that a superstructure furnace was employed at Markasi Lusangi 2 rather than a small bowl furnace.

Ethnographic information collected through informal inquiries made of local people suggest that iron smelting was important until the beginning of the 20th century. It came to a halt due to abolishment by the colonial government as well as competition from cheap imported iron. Very little is known about the technological aspect of iron technology at the sites investigated in Pahi. It has been suggested that there were two types of specialists in iron working: smelters and blacksmiths. Blacksmiths, also worked with copper and bought pig-iron from iron smelters (Liesegang 1975:95). Iron ore was obtained after collecting sand from riverbeds and washing it in wooden basins. The ore was carried to the smelting site where it was placed in a furnace then mixed with charcoal and reduced. The smelting process was conducted with the help of six to eight cup (or bowl) bellows (Liesegang 1975:95).

7.3.4. Ochre and White Chalk Remains

Ochre and white chalks constituted raw materials used for producing paints for drawing rock art (Plate 7.1 and 7.2). Most of these materials were found in rock-shelter sediments at Lusangi 1 Unit 1 and Markasi Lusangi 2 Unit 3. Baura 1 Unit 2 is the only open-air site where pieces of red ochre were recovered. The association of painting materials with other cultural deposits suggests that they were brought to the rock-shelters for making paintings. However, these materials are also known to have been used for decorating skin, clothes, body, wooden tools and weapons (Leakey 1983:22; Rudner 1983). The stratigraphic distribution of red ochre and white chalks provides a relative chronology to the sequence of the rock art in Pahi. Red ochre remains consistently appear stratigraphically earlier than white chalk (Table 5.25 and 5.31). Interestingly, the introduction of white chalk does not seem to have replaced red ochre because both continue to appear in upper stratigraphic levels (Table 5.31). However, the role of red ochre in rock paintings in later times at Pahi remains uncertain because red rock art paints were replaced by white (see also Masao 1979:226-254; Phillipson 1976a:184-5). It is possible that the use of red ochre after the introduction of the white paints at Pahi was

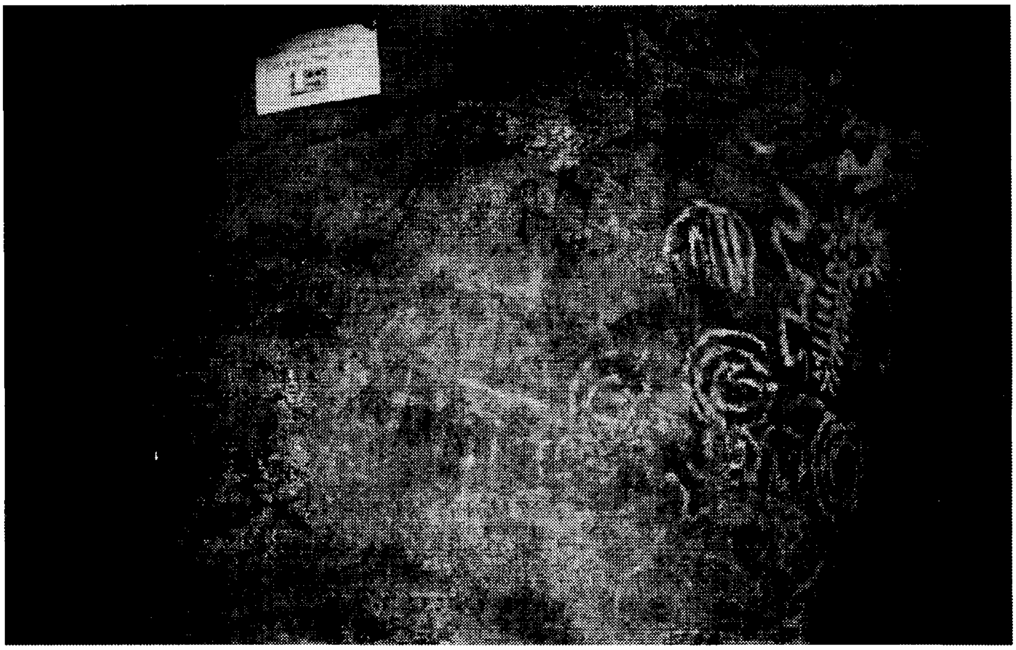


Plate 7.1. Red, yellow and white paintings from Rock-shelter P1. The red and yellow paints depict animals, humans and hands but are now faint. The long black outline below the paper is part of an eland (back) depicted in yellow wash (for details see Leakey 1983:48). The white paints are symbols and geometrics

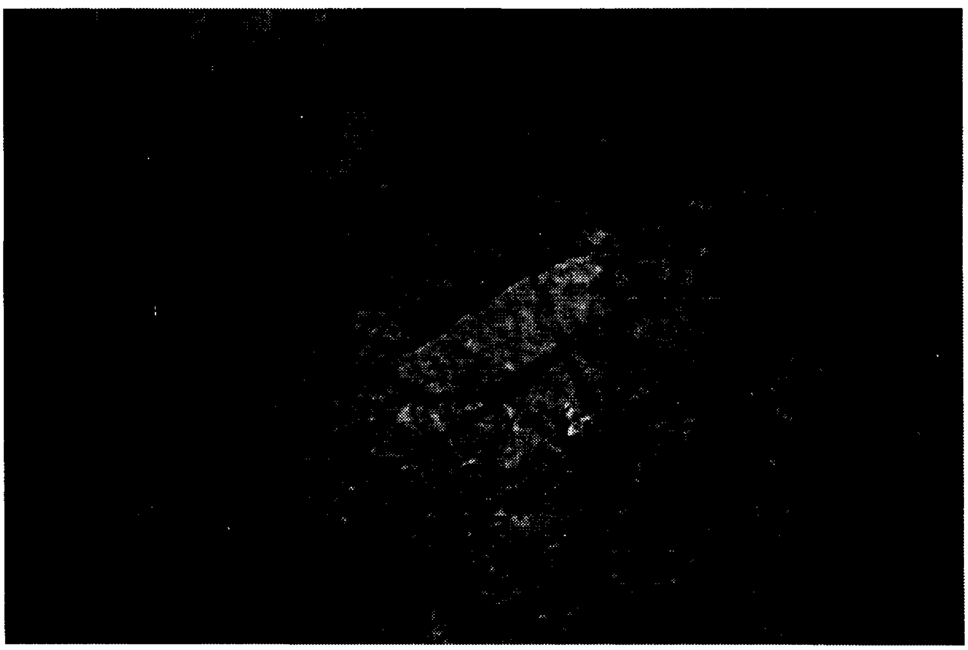


Plate 7.2. Red human figures in stylized representation from Rock-shelter Kolo 2 (see also Leakey 1983:42)

restricted to other activities such as decorating skin, clothes, body, wooden tools, weapons, *etc*. For example, red ochre is known to have been used by Khoisan for cosmetic purposes until recent times and is also found occasionally in burials (Masao 1979:68; Rudner 1983:18). The direct dating of central Tanzania rock art has not yet been possible partly due to lack of research and difficulties associated with dating rock art in general (Anati 1996:22-24; Masao 1979:269). However, there are suggestions that in central Tanzania rock art may date back to the Pleistocene and continued until 200 years ago (Anati 1996 22-24; Leakey 1983:22; Masao 1979:276-7; Odner 1971b:179). Studies of stylistic variation, superposition of rock art, and stratigraphic position of raw materials in Africa have provided some clues to the antiquity of red and white paintings as well as the people involved in the production of the art. In central Tanzania for example, several models based on stylistic variation and colour have been developed as an approach to understanding the chronology of rock art. An investigation by Leakey (1936:151-8, 1950) proposed that 17 styles were present in Kondoa. A study of six sites in southwest Kondoa led Fozzard (1959:94) to suggest a sequence of five styles. The Leakey and Fozzard models were later found to be rather restrictive and did not account for the range of styles that constitute central Tanzania rock art (Masao 1979:225-6; Odner 1971b:178). Reacting to this situation Anati (1996), Masao (1979) and Odner (1971b) developed new models which may be more applicable. Table 7.1 is a summary of rock art models established by Anati (1996), Masao (1979) and Odner (1971b) for central Tanzania, and by Phillipson (1976a) in Zambia.

Table 7.1. Summary of rock art models for central Tanzania and eastern Zambia after Anati (1996); Masao (1979); Odner (1971b) and Phillipson (1976a)

Author	Region	Group/ style	Subject matter	Colouring matter/ and or paint texture	Position in rock-shelter	Estimated age	Associated industry
Odner (1971b)	Central Tanzania	Group 1: realistic and near realistic images	Human, animals and symbols	Red (solid)	Outside walls	6th –1st millennium BC.	LSA
		Group 2: schematic	Human	Mostly white, but also red and yellow (crude)	Deep cave walls	1st millennium BC – 19th century AD.	LSA/IA
		Group 3: semi-realistic	Symbols, *e.g.*, hand prints, "suns" and comb-like representations	White and black	Outside walls	Later than previous and perhaps also coexisted	?
Masao (1979)	Central Tanzania	Group 1: stylized/ schematic	Human figures more common than wild animals	Red	Outside walls	3000 BP	LSA
		Group 2: naturalistic, semi-naturalistic	Wild animal figures more common than human	Mostly red, but brown and white	Outside walls	3000 BP?	?
		Group 3: semi-realistic silhouettes	Human and animal figures (including domesticates, *e.g.*, cattle, sheep and dogs)	White and in rare cases-black (thin wash and thick paste, some crudely done)	Often in deep cave walls than outside	IA, possibly latest and practiced until 200 BP	IA
		Group 4: abstract and geometric figures	Symbols/ geometrics, *e.g.*, lines, crosses, checkers ladders, U's circles and unintelligible forms	White, orange, brown, red and black (thin wash and thick paste, some crudely done)	Often in deep cave walls than outside	?	LSA?/IA

Table 7.1 continued ---

Author	Region	Group/ Style	Subject matter	Colouring matter/ and or paint texture	Position in rock-shelter	Estimated age	Associated industry
Anati 1996	Central Tanzania	Group 1: Naturalistic generalized	Animals and few human figures. Weapons and tools including spears, throwing sticks and boomerangs. Symbols and geometric figures *e.g.* dots and net-like patterns.	Dominantly dark reddish brown but also red, dirty white, yellow, orange, grey, blue grey, dark brown and black.	Vertical rock surfaces.	Pleistocene era.	Early Hunters.
		Group 2: Naturalistic realistic	Humans. Animals but few. Symbols, e.g., dots, zigzags and net patterns. Vegetal depictions, e.g. fruits, trees and branches.	Red, brown, dirty white, black and bichrome.	Rock surfaces (and caves?).	Intermediate between Early Hunters and Late Hunters around 10,000 BP.	Early gatherers.
		Group 3: Naturalistic realistic	Hunting scenes: Human figures with arrows and bow, wild animals (and a domestic dog?).	Red, orange, yellow, brown, violet, bichrome and polychrome.	Caves and walls of shelters.	Earlier but sometimes contemporary with Stone Bowl, Pastoral and IA.	Late Hunters.
		Group 4: ?	Wild animals.	Brown grey and grey.	Inside caves.	2nd – 1st millennium BC.	Stone Bowl Culture.
		Group 5: Realistic	Domestic cattle, tools and weapons *e.g.* spears and shields.	Brown, red, black grey and green grey.	Outside and inside caves, on vertical and oblique surfaces.	1st millennium BC.	Pastoral.

Table 7.1 continued ---

Author	Region	Group/ Style	Subject matter	Colouring matter/ and or paint texture	Position in rock-shelter	Estimated age	Associated industry
Anati 1996		Group 6: Schematic and abstract	Symbols/ geometrics, *e.g.*, lines, solar shapes and hand stencils. Humans. Animals: primarily domesticated but also wild. Weapons and tools *e.g.*, arrows, spears and hoes.	Predominantly White and dirty white. In few instances, red, yellow and black are also used.	Deep caves and outside roofs, floors, walls.	200 -2000 BP.	IA (Bantu)
Phillipson (1976a)	Eastern Zambia	Group 1: Naturalistic	Animals	Red	?	Earliest.	LSA
		Group 2: schematic	Symbols, *e.g.*, grids, rectangles, ladders, lines, concentric circles and finger- dots.	Red (some depictions crudely done).	?	?	IA
		Group 3: stylized and schematic	Symbols, *e.g.*, finger dots and grids.	Red, buff and white	?	Later than previous.	IA
		Group 4: stylized and semi-naturalistic	Hoes, axes, finger-dots, lines, grids motor cars.	Buff and white (thick).	?	Latest practiced up to 20th century.	IA

The four schemes share several similarities, the most obvious being the chronological sequence and stylistic changes of subject matter through time. For example, all four authors agree that group 1 can be assigned to LSA. However there are slight differences in terms of stylistic order and to some extent grouping of the subject matter. For example, Odner's group 2 and 1 falls into Masao group 1 and 2 respectively (Masao 1979:233-241). Also, while symbols are included in Odner's group 1 and 3, Masao places all symbols under group 4. Anati's (1996) scheme is more elaborate than those of Odner (1971b) and Masao (1979) with the inclusion of additional cultural groups in the production of the art such as Pastoral and Stone Bowl Culture. These groups have never before been proposed as contributors to central Tanzanian art production. Finally according to Anati (1996), the models are far from complete as the analysis of field data continues. Based on this argument the following discussion will concentrate more on the models of Masao (1979), Odner (1971) and Phillipson (1976a).

While Masao (1979:277) and Odner (1971b:178-80) attempted to provide an absolute chronology, Phillipson (1976a) relied on relative dating based on comparisons of stylistic changes through time and the relative superposition of the art itself. In general their conclusions indicate that red paints are the earlier form of art representation, while black and white were later. Evidence suggests that red painting was not replaced immediately at the onset of white but coexisted with it along with others such as brown, black, yellow, orange and buff. Eventually however, the red paints were replaced completely by white (see Masao 1979:226-254; Phillipson 1976a:184-5). Odner's groups 1 and 2 have been suggested to date to 6^{th} - 1^{st} millennium BC and 1^{st} millennium BC – 19^{th} century respectively. Depictions of motor cars, hoe, axes and oral traditions such as those associated with the Chewa people of Zambia suggests that white painting was practiced until recent times (Phillipson 1976a:184-7). Groups 2-4 of Phillipson's model are suggested to be the workmanship of IA industries (Phillipson (1976a:186). If this is feasible, then groups 2-4 date from the beginning of the Christian era and after because IA industries appeared in central Africa at that time. In terms of attributes and chronology Phillipson's (1976a) groups 2-4 and fall into Anati's (1996) group 6.

The conclusions reached in the three studies presented above correlate well with data collected from Pahi rock-shelters. At Lusangi 1 Unit 1 (Rock-shelter P44) one piece of red ochre was found at Level 10 while a piece of white chalk was found in Level 3 demonstrating the earlier use of red ochre (Table 5.25). Also at Markasi Lusangi 2 Unit 3 (Rock-shelter P1) only red ochre pieces were found at Layer 3 while at the upper layers contain both red ochre and white chalk (Table 5.31). It is also clear that only red ochre is associated with the LSA while both red ochre and white chalks are found in LIA contexts (see Tables 5.25 and 5.31). Evidence for the possible continuous use of red ochre at Pahi is also found at open-air sites. For example, at Baura 1 Unit 2 Level 2, two pieces of ochre were found in association with the LIA (see Table 5.20). The function of the ochre from Baura 1 unit 2 cannot be determined since there are no rock-shelters in the vicinity. However, it may have been brought to the site to be used in ritual activities or body decoration.

As stated in Chapter 5 Lusangi 1 Rock-shelter P44 and adjacent rock-shelters have white paintings, while Rock-shelter P1 consists of several drawings depicted in red and white outline and a few in a yellow wash (Plate 5.5 and 5.9, see also Leakey 1983:48, 60). The white and black paints at the two sites depict symbols and geometrics and can be categorized as belonging to groups 3 of Odner (1971b), 3 and 4 of Phillipson (1976a) and 4 of Masao (1979). The red and yellow paints in Rock-shelter P1 (Plate 5.9 and 7.1) depicts animals, a human, sun and human hands, and can be categorized as group 1 of Odner (1971b), 1 of Phillipson (1976a), and 2 of Masao (1979).

A question which invariably follows is who produced the rock art? A definitive answer to this question has yet to be achieved. One of the difficulties associated with the interpretation of rock art arises from dating (Masao 1979:269-77; Phillipson 1977a:268-

9). The antiquity and stylistic sequence of rock art have not been well established in most parts of sub-Saharan Africa. Furthermore, problems associated with the interpretation of subject matter has hindered attempts to associate the art with ancestors of contemporary groups primarily because rock painting is a forgotten art. Attempts have been made to identify cultures based on stylistic changes, variation in use of paint materials and their stratigraphical association although such suggestions are speculative (Anati 1996; Masao 1979; Phillipson 1976a:185-7; 1977a). For example based on style, colour and stratigraphic association, it is generally accepted that images in white paint are of later antiquity than those painted red (Table 7.1). Many have pointed out that in most cases white paints overlie the others. According to Masao (1979:254) white painted art is more widespread than any other painting style leading to a suggestion that they belong to a culture that also was more widely distributed. Although speculative, Masao (1979:276) suggests: "The Bantu, more than any other group, would be the most likely people to have painted the so called "late white and yellows" in which, ...domestic animals such as cattle, sheep and dogs begin to appear." In Zambia, Phillipson (1976a:186) is more confident about the artists of the different styles that appear in the rock art. He suggests that naturalistic and schematic traditions in eastern Zambia rock-paintings belong to distinct socio-economic groups. Earlier naturalistic representations were the work of the stone-tool-using peoples while schematic traditions belong to IA contemporaries and successors. Schematic traditions are suggested to have continued, in modified form, to very recent times (Phillipson 1976a:195).

Although the practice of using white paints could have been introduced by IA people/Bantu the question of why the schematic rock art styles replaced the naturalistic traditions remains unaddressed. The areas of central Tanzania and eastern Zambia where

Odner (1971b), Masao (1979) and Phillipson (1976a) worked share several common features. For instance the majority of the sites were rock shelters bearing paintings, IA and LSA artifacts. In most cases the sites yielded pottery and/or iron-working remains and lithic artifacts in their upper levels suggesting coexistence of IA and LSA industries (Masao 1979; Odner 1971b; Phillipson 1976a). In Zambia Phillipson (1976a:196) notes that:

> It is clear that the two populations maintained, to a large extent, their separate identities throughout the period of their co-existence. ... the Early Iron Age folk, an immigrant group, were the sole makers of this pottery, but that they did not make chipped stone artifacts. The indigenous population, ... continued to practice their mode 5 stone-working technology, and obtained pottery from their Early Iron Age neighbours, the identity of the sherds from the rock-shelters with those from the villages being such as to preclude the possibility that the indigenes adopted the art of pottery manufacture themselves.

Despite the commonly accepted view of the coexistence LSA and IA industries, most authorities have not addressed why this phenomena is not supported by later rock art traditions which demonstrate that only one ethnic group (IA peoples/Bantu) seem to have produced rock art in later periods. For example, Phillipson (1976a:187) insists that schematic traditions were the work of IA folk and that earlier naturalistic traditions were produced by LSA people, however he does not specify what form the art of LSA peoples took after the introduction of IA traditions. In other words Phillipson (1976a:195-6) assumes that despite the LSA and IA coexistence and maintenance of separate identities for eight centuries, the LSA peoples lost their art traditions immediately after contact with IA peoples, while the art tradition of the IA thrived. Why did the LSA discontinued producing art if they maintained separate identities from the IA peoples until recent times? Indeed a much more complex form of interaction between the LSA and IA people must have been involved than is traditionally suggested.

A possible answer to this problem can be deduced by examining the motivation behind the rock art. It is said that the art of any people, like any other aspect of culture, can be viewed as part of a body of habits, beliefs, practices and products passed on from one generation to another (Masao 1979:255). An ethnographic study among San hunter-gatherers of South Africa by Lewis Williams (1983, 2002a & b) suggests that some prehistoric art in the area was drawn by their ancestors to record shamanistic experiences during trances. He suggests that some rock art found in other areas of the world such as Europe could have been produced on the basis of a similar motivation. According to Lewis-Williams (2002a & b) this inference should not be taken to imply that rock art in prehistory did not change through time or that the meanings were the same in different regions. Although shamanism has received a wide acceptance as one of the motives for rock art practice "debate continues on just how much of the art is shamanic and in what sense it is shamanic, and, further, on the nature of other meanings that may be encoded in the art" (Lewis- Williams 2002a:194). Commenting on the motives behind the production of rock art, Klein (1989a:380) observes the following:

> ...like the art of historic hunter-gatherers it was not done for its own sake. Instead, it was probably deeply embedded in other aspects of culture and perhaps functioned variously to enhance hunting success, to ensure the bounty of nature, to illustrate sacred beliefs and traditions (perhaps on ritual occasions), or to mark territorial boundaries of an identity-conscious group. Conceivably, much of it symbolizes or encodes the social structure or worldview of its makers, ...

Although it may be difficult to perceive the actual meaning of rock art, some of the representations depicted indeed reflect the culture and environment that surrounded the inhabitants who produced the art. For example, a look at Table 7.1 indicates that group 5 of Anati (1996) (Pastoral) is associated with domesticated animals and shields which are not found in earlier LSA depictions. Likewise Phillipson's (1976a) group 4 which dates to the IA portrays farming equipment such as axes and hoes.

In Pahi the change from the red to white paints may reflect changes in lifestyle and subsistence from foraging to farming during the period of initial interaction between LSA and IA peoples. Red paint represents mainly wild fauna and hunting scenes (Leakey 1983; Masao 1979) which were depicted by LSA people when large tracts of land and wild game were abundant. Demographic pressure resulting from expanding farming communities was associated with a decline in hunting-gathering resources that ultimately led to the collapse of the foraging mode of subsistence. This may have forced LSA indigenes to supplement their subsistence with domesticated resources. In addition, contact between LSA and IA peoples no doubt led to intermarriage, influence of social, beliefs and ritual practices which enhanced friendship and cooperation among the two groups.

As the mode of subsistence, habits and beliefs among LSA indigenes were affected by incoming IA communities, so were their worldviews. Their art was possibly affected the same way because old practices were replaced by new social and economic systems. This new economy and world view is demonstrated by the fact that although wild animals continued to be executed in white paint, there were very few scenes of hunting, and instead for the first time domesticated animals are depicted (Masao 1979:244). The fact that wild animals are still illustrated in white paintings suggest their continued significance, though perhaps not as important as before. For example, the Sandawe who have recently abandoned hunting-gathering for settled farming have extended their rock art tradition to include new practices associated with a farming economy (Ten-Raa 1971). An ethnographic study by Ten-Raa (1971) suggests that some of the most important reasons for rock art depiction among the Sandawe are sympathetic magic for hunting and sacrifices. Sacrifice depictions are normally done to seek the cooperation of the spirits for health of the living and to bring rainfall (Ten-Raa 1971:45). There is no doubt that the rainfall aspect was included in Sandawe rock art recently after adopting agriculture because of the importance of predictable rainfall for farming. Rock art depictions associated with rainmaking are also known through ethnographic information studies of farmers in central and southern African farming communities (Phillipson 1976a; Prins 1990; Prins and Hall 1994). It is suggested here that similar attributes associated with a new economy and social order that were responsible for the change in the rock art traditions during the transition to farming by LSA people. In this context, a change in rock art subject matter does not necessarily imply different authorship or ethnic groups.

7.3.5. Zooarchaeological

Skeletal remains were rare in most areas excavated except at Markasi Lusangi 2 Unit 3 (Rock-shelter P1) which contributed over 93% of the total recovered bones in the Pahi samples. Most bones recovered from excavations were fragmentary, the majority of which were not identifiable to species level. Evidence from Markasi Lusangi 2 Unit 3 (Rock-shelter P1) suggests that some bones were broken into pieces for extraction of marrow and perhaps also for boiling. Unfortunately, all remains of identified animal species were from LIA contexts. These included domestic fowl (14) and cow (2); and wild species such as hyrax (2), ostrich (7), giraffe (1), warthog (4) and vervet monkey (2) (Table 6.23). Although LSA levels did not yield diagnostic species the general consensus among most African archaeologists is that LSA peoples did not herd animals (except the ancestors of the Khoi of Southern Africa) before the arrival of the PN or IA cultures, but instead depended on wild species (Mehlman 1989; Phillipson 1993a). Based on these grounds the Pahi results suggest a continuous exploitation of wild fauna from the LSA through the LIA.

The two bones of domestic cattle were recovered from Markasi Lusangi 2 Unit 2 (see Appendix E and Table 6.23). Further evidence for domestic cattle is present at the Pahi 39 Rock-shelter where in particular humped cattle are depicted (Leakey 1983:124-5). In comparison to other known sites, small quantities of domesticated cattle are also reported from the Kandaga A site, all of which were recovered in LIA levels (Masao 1979:49-50). Chicken bones were recovered at Baura 1, Lusangi site 3 and Markasi Lusangi 2. At Markasi Lusangi 2 unit 4, chicken bones were recovered in Level 3. A date of 760 ±60 BP (Beta 176193, Table 5.26) was secured from Level 2 of Unit 4. Therefore the chicken remains are most likely older than 760 ±60 BP. Investigation of the Machaga cave in Zanzibar suggests chicken to have been brought to East Africa by the first millennium BC (Chami 2001a & d). The chicken bones from Markasi Lusangi 2 Unit 4 were associated with slag. This suggests that the bird was brought to the site for sacrifice.

As stated in Chapter 6 if all remains of bird species from Pahi sites are ignored and one takes into account the mammals such as cow, hyrax, giraffe, vervet monkey and warthog the results indicate that wild species outnumber those of domestic mammals in LIA contexts. These results suggest that as far as faunal remains are concerned, the Pahi sites are different from those of the PN in northeastern Tanzania (Nasera, Ishimijega rock-shelters and Jangwani 1) where domesticated animal remains outnumber those of wild species (Mehlman 1989:510-514). This observation suggest that the PN industry predominant in northeastern Tanzania for over the past 2000 years (Mehlman 1989:510-513) had little influence on the Pahi area despite being in close proximity. Owing to the small quantity of domesticated cattle in Pahi sites, it is not possible to conclude whether the animals were herded by LSA indigenes or obtained through exchange with herding/farming communities. Leakey (1983:124-5) has raised doubts as to whether the Kondoa Irangi environment would have favoured cattle given the presence of tsetse fly that inhabited the forest before being cleared by the British administration at the turn of the 20th century. Apart from mammals and birds, gastropods also may have been sought for food. At Mumba Rock-shelter for example, large land snail (*Burtoa nilotica*) was collected by LSA peoples (Mehlman 1989:315-6). Evidence from Kalemba Rock-shelter similarly suggests a land snail of the *Achatina* species to have been used for food (Phillipson 1976a:163).

None of the bones or shell collected seems to have been processed to make tools or ornaments. Bone implements have been reported from various LSA sites among them Lululampembele Rock-shelter (Odner 1971b:192), Kwa Mwango Rock-shelter (Masao 1979:172-3) and Mumba Rock-shelter (Mehlman 1989:430-1). Shell beads particularly those of ostrich eggshell are also common in LSA sites (Masao 1979:172-3; Mehlman 1989:430-1).

7.4. The Pahi Results in Light of Other Studies

7.4.1. Sequence and Association of Finds

The association of LSA and IA artifacts is not unique to the Baura and Lusangi sites, but has been reported from other localities in Africa. However such associations have received varying interpretations. For example, the rock-shelters of Kandaga A9, Kwa Mwango and Kirumi Isumbirira yielded a mixture of LSA and IA remains in upper levels (Masao 1979). Masao (1979:91) suggests that LSA technology was not replaced after the introduction of IA technology but both technologies coexisted and supplemented each other.

At Chole Rock-shelter in Mwanza, Tanzania pottery of LIA (roulette pottery) and slag were found in association with lithic artifacts and Kansyore ware (Soper and Golden 1969:30-35). The people who produced Kansyore ware are thought to have practiced hunting and gathering using stone tools while those who used roulette pottery possessed iron technology and presumably practiced cultivation crop and animal herding supplemented by hunting. No detailed explanation is given for the association of LSA and IA at Chole Rock-shelter apart from possible disturbance which led to mixing of cultural materials (Soper and Golden (1969:37-8). However research in areas adjacent to Chole's Rock-shelter suggest that the makers of LSA Kansyore ware may have been assimilated or displaced by EIA peoples during the first half of the first millennium AD while in some areas they survived well into recent times (Soper and Golden 1969:38, 53).

In Central Africa, Miller (1969) reports several sites in the Muchinga Escarpment (Nachikufu Rock-shelter, Bimbwe wa Mpalambwe and Nsalu Hill cave) and northern plateau (Mwela Rock-shelter) of Zambia where LSA lithics are associated with EIA artifacts. Other sites with similar associations include Makwe and Thandwe rock-shelters of eastern Zambia (Phillipson 1976a) and Lunsemfwa Drainage Basin (Musonda 1987). At the Nachikufu shelter for example IA remains consisting of pottery, slag and furnaces are found in association with lithic artifacts overlying stratigraphical contexts containing LSA artifacts dating to AD 890 (Miller 1969:83). Lithic materials are present in IA deposits for several levels although they decrease in quantity moving upward in the sequence. Unfortunately the first appearance of pottery and smelting was not dated, although a level immediately above these materials was dated to 1750 AD. Evidence from Nachikufu Rock-shelter suggests that subsistence activities did not change despite the introduction of iron and pottery technology. According to Miller (1969:83) hunting remained a mainstay in the economy, with groups still depending on lithic technology even after the introduction of iron. Preservation of the old hunting traditions during the IA is supported by the continued use of microliths such as arrow barbs. The Nachikufu Cave located adjacent to Nachikufu shelter has a similar association of slag, pottery and lithic artifacts dated to 1650 A.D.

At Makwe Rock-shelter the lower horizons (I-2ii) are comprised of solely LSA artifacts, while upper levels from Horizon 3i to the surface yielded a mixture of LSA and IA remains (Phillipson 1976a). The IA cultural remains include EIA and LIA pottery with EIA ceramics appearing in lower levels (Horizon 3i). Other IA elements included slag (Horizon 5), metal objects from Horizon 4ii to the surface and remains of domesticated animals including cattle, goats and dog from Horizon 4i to the surface. The EIA ceramic and domestic animal remains at Makwe date to at least the third century AD (Phillipson 1976a:66-118). At the site of Thandwe Rock-shelter iron-working remains including tuyeres, haematite, slag, and worked iron are found in association with lithic artifacts from Layer 4 to the surface. Evidence for EIA pottery below these levels dates to 1060 AD (Phillipson 1976a:51-59).

In an overall analysis, Miller (1969) has presented two sets of interpretations relating to the association of IA and LSA artifacts. First, Miller suggests that in some instances the mixture of LSA and IA artifacts resulted from trading activities between the two groups. Miller (1969:86) supports this idea by citing an example of oral tradition from the Vamari of Zimbabwe (Rhodesia) which asserts that the original agricultural people known as the Ngoa, exchanged their agricultural products with hunter-gatherers who occupied adjacent regions. Miller also cites Turnbull's observation that the Ituri forest Pygmies exchange their products with those of neighbouring agriculturalists. According to Miller (1969:87) there is no evidence to suggest that interaction between LSA hunter-gatherers and IA agriculturalists was accompanied in the early stages by violence although rock art depictions in Zimbabwe suggest that occasionally small-scale skirmishes might have occurred. Secondly, Miller contends that in some instances hunter-gatherers adopted iron technology and manufactured iron objects for themselves. For example the association of iron slag, furnace and lithic artifacts at the Nachikufu Rock-shelter suggests that hunter-gatherers who retained their traditional lithic technology learned how to work iron (Miller 1969:87). Iron-working by hunter-gatherers is reported in many parts of northeastern Zambia, Congo and Malawi. According to Miller (1969) oral traditions of Bantu agriculturalists narrate the existence of non-Bantu iron-workers known as Akafula and Abatwa who had no knowledge of agriculture but disappeared a few generations ago. Similar accounts are given by Bantu agriculturalists of southwestern Tanzania (Mapunda 1995: 332-335). Miller's (1969) proposition that the Nachikufu Rock-shelter hunter-gatherers adopted some IA technology is also supported by

Denbow's (1984:177-79) observation that in the last 1000 years some Botswana Khoisan speaking hunter-gatherers switched from foraging to food production while others adopted agropastoralism at an early date and became "indistinguishable, both genetically and culturally, from their Bantu-speaking neighbours".

Phillipson (1976a) and Musonda (1987) reject Miller's (1969) suggestion that the association of iron-working remains with LSA materials meant the adoption of iron technology by LSA hunter-gatherers. Phillipson (1976a:196-7) concludes that the makers of the Makwe LSA industry continued to exist until the 17th century AD, in other words several centuries after the initial presence of EIA people in the region. He suggests that the makers of the Makwe and the Thandwe LSA industries maintained separate cultural identities throughout their coexistence with IA populations. Phillipson reached this conclusion after noting that in an adjacent region, specifically at the site of Kamnama, contemporary sites have no lithic remains but exclusively EIA artifacts suggesting that EIA people did not make lithic tools. Furthermore, the chipped stone tools of the Makwe LSA do not show changes in style or composition throughout its coexistence with IA cultures (see also Musonda 1987:153). Phillipson (1976a:196-7, 1977a:248-250) suggests that IA pottery in the rock-shelters was probably acquired by hunter–gatherers through exchange with the farmers. His argument is based on the finding that EIA pottery from the rock-shelters closely resembles that found in EIA sites. The association of iron-working remains such as tuyere and slag in the rock-shelters are interpreted as evidence for the use of the rock-shelters by IA people and not LSA groups (Phillipson 1976a:196).

In summing up Phillipson suggests that the most satisfactory interpretation of the Makwe LSA industry and IA interaction is that of a temporary client relationship. Similar conclusions were made by Walker (1983:90) working at Bambata cave in Zimbabwe where IA Bambata pottery is found in LSA contexts. Walker attributed the Bambata pottery to food producers rather than hunter-gatherers because its appearance in LSA contexts does not seem to have affected the life-styles of hunter-gatherers. The Bambata cave sequence demonstrates continuity in lithic technology, exploitation of wild animals and exchange of pottery and domestic stock. The exchange relationship proposed by Phillipson has recently been challenged by Musonda (1987:155) who suggests that pottery found in LSA contexts was obtained by hunter-gatherers collecting vessel fragments left behind at sites inhabited by farmers. Support to this argument is demonstrated by a tendency of LSA people to possess EIA pottery several centuries after EIA people have discontinued the tradition (Musonda 1987:155).

Assuming that original LSA hunter-gatherers in sub Saharan Africa were related to Khoisan speakers and incoming IA people were Bantu agropastoralists as has been claimed by many authors (Clark 1970:122; Chittick 1975; Ehret 1998; Olderogge 1981:277-81; Phillipson 1993a:7) a question arises as to how one could identify the physical characteristics of each group. These types of studies have been problematic in the sub-Saharan region because of a lack of preserved skeletal remains. Instead researchers have used language to identify original LSA inhabitants but this has also proved difficult because Bantu languages have almost entirely replaced the others. Despite this lack of evidence Miller (1969) suggests two options. One possibility is that slowly, over time individual cultures sharing a territory became assimilated leading to the fusion and disappearance of language and physical features that previously distinguished them. A second possibility is that LSA hunter-gatherer groups may have been acculturated while retaining their physical identity (Miller 1969:87). Physical attributes in skeletal remains from Zambia and Zimbabwe suggest combined morphological features of both Bantu and Khoisan (Fagan 1967:667). However, tribal legends assert that hunter-gatherers remained culturally distinct and maintained their traditional way of life while adopting few elements from agropastoralists. At some point they were driven to retreat or became extinct (Miller 1969:89; Musonda 1987:153).

When compared to the evidence presented above (Masao 1979; Miller 1969; Phillipson 1976a), the Pahi research has produced similar conclusions but, with some important differences. In most excavated sites of Pahi the stratigraphic contexts of various materials indicate that lower levels consist of LSA artifacts while the upper stratigraphic sequences consist of IA materials mixed with lithics. This has been observed not only in rock-shelters but also in open-air sites. Combined results of survey and excavation demonstrate clearly that sites have been continuously occupied by the indigenous LSA peoples who through contacts with IA people added new elements to their culture. There are several sources of evidence that support this conclusion. First, the lithic tradition continued to be practiced during the LSA and LIA periods until recent times. Secondly as is the case for the Makwe Rock-shelter, the lithic industry at both Baura and Lusangi does not show any change in style or composition through-out its coexistence with the IA culture. Thirdly, there are no breaks in the archaeological record to indicate any form of interruption of cultural continuity in any of the excavated units. Fourthly, survey results indicate a similar continuous settlement pattern throughout the LSA and LIA periods. This trend was demonstrated at both Baura, Lusangi and Markasi Lusangi. The general evidence also shows all investigated rock-shelters were occupied continuously by people with both LSA and LIA material culture.

Evidence for iron-working is widely distributed throughout the study area and is both found in both open and rock-shelter sites. As discussed earlier evidence for iron-smelting and pottery at Markasi Lusangi dates to 1030 ±40 BP with iron-working practiced on a substantial scale by 760 ±60 BP. In several areas the introduction of iron-working seems to have gone hand in hand with the introduction of pottery. This evidence is demonstrated at Baura 1, Lusangi 1, and Markasi Lusangi 2. A similar development was observed by Masao (1979) at Kandaga A9 Rock-shelter. The survival of iron and stone technology from 1030 ±40 BP until recent times raises many questions as to why stone technology did not change significantly despite their coexistence. However, as stated above there is a slight reduction in lithic production after the introduction of pottery and iron technology. It is quite possible that stone tool use continued to be practiced in Pahi along with iron as a matter of preference for certain activities or for convenience when iron tools were not readily available. The ubiquity of stone raw materials on the landscape and less effort demanded by stone tool making relative to iron may have made stone more preferred in certain circumstances hence prolonging the use of lithic technology which is cheaper.

Ethnographic studies among the Gurage, Arussi-Galla and Sidamo in central Ethiopia has indicated a preference in the use of obsidian tools in skin scraping despite the availability of iron tools (Gallagher 1977). This preference is not related to the ubiquity of raw materials but its efficacy in carrying out hide scraping (see Clark and Kurashina 1981:305). This is demonstrated by the fact that raw materials are located up to a half-day's walk from villages. People who reside far from obsidian mines could also obtain it through trade (Clark and Kurashina 1981:7; Gallagher 1977). In this area, equipment such as iron tipped digging sticks are used to mine obsidian, while narrow, flat iron bars are used as hammers in the process of knapping flakes from cores or retouching flakes to make tools. Processing a tool from a flake takes no more than five minutes (Gallagher 1977:410).

This ethnographic information has some limitations for its use in interpreting the Pahi data. For example, among the Gurage, Arussi-Galla and Sidamo only scrapers are made to be used exclusively in scraping animal hides, while sharp flakes can be used for shaving and nail cutting. Also Gallagher (1977:412) observed that the ethnographic tool products of Gurage, Arussi-Galla and Sidamo did not bear technological and typological resemblance to the local prehistoric materials. However a combined effort in ethnographic and archaeological studies in later research by Clark and Kurashina (1981:319) among the Chawa (neighbours to Gurage) suggests similarities between prehistoric chert scraping tools found in the vicinity of the fortified town of Mole in the Chercher Mountains dated to 1450 AD and modern obsidian scrapers. Other sites with similar scrapers include Gobedra Rock-shelter dated to 1000 BC (Phillipson 1977b:81) and Lake Besaka and Metahara dated to 1500 BC (Clark and Kurashina 1981:319). An account similar to the Pahi findings comes from the site of Aksum in Ethiopia where throughout the Aksumite period people continued to produce and use lithic artifacts despite the possession of complex and sophisticated metal-working technology (Phillipson 2000:473-4, Phillipson, Laurel 2000). Several sites in England have also yielded evidence of continual production of lithic artifacts through the Bronze to Iron Ages (Young and Humphrey 1999).

The archaeology of subsistence activities at Pahi remains largely unknown. With the exception of one seed of Solanaceae *cf. Solanum* from Lusangi Pahi 2 (Rock-shelter P1) and two unidentifiable seed fragments recovered from Markasi Lusangi 2 and Lusangi 1 (Rock-shelter P 44), archaeobotanical remains were rare and there is no floral data to indicate the pattern of plant use through time at Pahi. Also, the faunal data collected from the sites was very limited for both analytical and for inter-site comparative purposes.

7.4.2. Forager-Farmer Studies

While it is most likely that Pahi people acquired iron-working and pottery through contacts with iron-working farmers, an intriguing question is how were relations between the IA farmers and LSA people established at the initial period of contact? The main question addressed here is competition over resources between IA farmers and LSA hunter-gatherers. Interestingly, the Baura and Lusangi areas include excellent farmland and hunting-gathering locales that could have encouraged competition between LSA foragers and IA farmers. As far as farming is concerned, the Lusangi and Baura areas are located in the Irangi Hills where today rainfall for agricultural activities is more reliable than neighbouring areas. The flat-lying areas of the Irangi Hills provide fertile land for agricultural production and animal husbandry. In terms of hunting-gathering this region is suggested to have quantities of game comparable to modern East African game reserves (Masao 1979:15). From these perspectives we must ask whether there were conflicts between IA farmers and LSA hunter-gatherers in the Lusangi and Baura areas. Historical, archaeological and anthropological evidence of farmer and hunter-gatherer interactions from several areas of the world and the nature of the archaeological evidence in this work are instructive in dealing with this issue particularly the areas where agriculture was introduced (rather than developed indigenously) such as Europe, East, Central and southern Africa.

Contacts and interactions between farmers and hunter-gatherers have taken various forms, and several factors can influence the nature of the relationship. For example, in the homogeneous forest regions of the southern Zambian plateau, relationships between EIA and the LSA folk were less friendly and may have included intentional avoidance because of direct competition for resources (Bisson 1990; Clark and Kleindienst 1974; Miller 1969). In other areas the presence of diverse resources created buffer zones that minimized conflicts between hunter-gatherers and farmers. In the Lunsemfwa Drainage Basin of central Zambia for example, the location of agricultural and hunter-gatherer sites has exhibited a pattern of differential settlement that could have resulted in exploitation patterns that avoided conflicts arising between Iron and Stone Age communities (Musonda 1987:149-56). Evidence indicates that LSA sites were located in rocky areas while those of EIA were established in the vicinity of fertile land. This varied land potential allowed hunter-gatherers to continue their mode of subsistence with little change until the 19th century when a sudden increase in population pressure forced them to adopt food production (Musonda 1987:153). Musonda's argument is in support of an earlier suggestion made by Miller (1969:82) that the southern plateau of Zambia near Lusaka was occupied at an earlier date (AD 212) than other areas by EIA farmers owing to its suitability for agriculture. In this case LSA peoples were soon assimilated by incoming farmers or forced into less desirable territories. Miller's (1969:82) suggestion is further supported by evidence that contacts between LSA and EIA were brief with minimal or no cultural exchange. For example, at the Lusu site, LSA horizons dating to 400 –75 B.C. lack pottery and other EIA elements, while immediately above are levels with EIA cultural elements containing sherds of Situmpa Ware. Other evidence indicating displacement of LSA people is found at Leopard's Hill Cave where a purely LSA deposit underlies EIA levels dated to AD 535. According to Miller (1969:83) "long-term retreat area for hunter-gatherers lay in the more densely wooded, less fertile regions of northern Zambia which were relatively unfavorable for agriculture. The Muchinga Escarpment provided an ideal refuge of this sort". At the Nachikufu Rock-shelter on the Muchinga Escarpment LSA assemblages were found without EIA influence up to 890 A.D. The upper levels of the Nachikufu Shelter consists of a mixture of IA remains and lithic artifacts bearing some similarities to sites at Pahi.

In Europe the earliest farming communities first settled in areas which were poor in resources for hunting-gatherers but rich for farmers (Zvelebil 1986). These include the plains of Thessaly, the Tavoliere, the loess areas of Central Europe, and the broad basins of large rivers, such as the Danube, Rhine or the Seine. After this, farming was established in areas with habitats that were favorable for both foragers and farmers such as river valleys and broad coastal plains. Regions that were highly productive for foragers but relatively unproductive for farming such as steep littoral zones, estuarine habitats, river gorges and lacustrine habitats were the last areas where farming was adopted (Zvelebil 1986b:179-180).

A situation similar to that of Europe has been documented in Africa. Denbow (1990:141) argues that in the ecologically differentiated environments of central West Africa hunter-gatherers lived side by side with the farmers and developed symbiotic relationships. In an ecologically homogeneous environments the situation seems to have been different. Rapid assimilation or displacement of hunter-gatherers was the social outcome of interaction (Denbow 1990:170-2).

Studies on anthropological and oral traditions from various areas in Tanzania suggest that conflicts between farmer and hunter-gatherers did not necessarily take place.

This was so because of long established relationships that existed between the two societies from the outset. An example of such a relationship is illustrated by the Sandawe and their neighbors the Turu, Tatoga, Gogo and Barabaig. The Sandawe reside to the southwest of Kondoa town and are believed to represent descendants of indigenous peoples who lived there before the coming of the Bantu and non-Bantu agropastoral peoples (Ten Raa 1970:127). Traditions from the Sandawe and their neighbors such as Turu and Gogo indicate that the Sandawe were hunters-gatherers until recently (Bagshawe 1925b; Newman 1970:25-26; Ten Raa 1986; Trevor 1947:62). According to the traditions, the Sandawe may have come into contact with Turu and Tatoga people more than 500 years ago (Trevor 1947:62). It is reported that until the 1920s it was possible to find Sandawe who subsided exclusively on bush game, fruits and honey (Kimmanade 1936, as quoted by Newman 1970:27, see also Ten Raa 1986). It is suggested that ecological catastrophes especially famine and environmental resource imbalance as well as social relationships between Sandawe and their agropastoral neighbors caused Sandawe to become farmers and herders (Newman 1970:47-56). In East Africa pastoralists/farmers are said to have developed close ties with hunter-gatherers in certain circumstances for survival. For example in good years local foraging groups could offer labour while in bad years they would have provided knowledge for exploitable wild foods to pastoralist/farmers (Gifford-Gonzalez 1998).

Many accounts of famine are known for central Tanzania (Brooke 1967:20-22; Ten Raa 1968:36-9; Trevor 1947:62). Although these accounts are relatively recent they can possibly account for similar experiences in the past. That this may have been the case is demonstrated by archaeological, historical and geological data from East and Central Africa that indicate many environmental instabilities that may have resulted over famine for the past 1000 years (Nicholson (1998). Sources in central Tanzania include documents by German and British colonial governments (Koponen 1995:590-1) and oral traditions that predate colonial rule (Trevor 1947:62). Colonial records from the 1850s to 1963, as well as Gogo and Sandawe calendars indicate that there were 24 incidents of famine in Dodoma (Brooke 1967:20-22; Ten Raa 1968:36-39). Famine was caused by drought, excessive rainfall, invasion of birds and insects such as locust and army worms that killed cattle and caused crop failure (Brooke 1967:20-22; Ten Raa 1968:36-39). During famines farmers lost most of their cattle and crops. Oral traditions indicate that agropastoralists and hunter-gatherers altered their movements and wandered over the landscape in search of food (Newman 1970:48). Such events led to intensified interaction between agropastoralists and Sandawe hunter-gatherers, resulting in marriage and other social activities which enhanced the relationship between the two societies (Newman 1970:48). At the end of the famine some people returned to their original occupation while other agropastoralists switched to hunting-gathering and some Sandawe hunter-gatherers resorted to farming. Although major changes did not occur in Sandawe communities some impacts did occur. As described by Newman (1970:56) "After perhaps an initial stimulus from severe famine, it was accomplished primarily through a gradual process of infiltration and assimilation, not sudden invasion, and consequently the Sandawe were able to maintain their separate identity."

During times of ecological stability the Sandawe exploited forest products such as hides, meat and honey which they exchanged with their neighbors for grain and iron tools (Newman 1970:25). This form of interaction undoubtly removed social barriers between the Sandawe and their neighbors. Resource imbalance such as a decline in wild game was probably the last factor that destroyed the hunting-gathering mode of subsistence that forced the Sandawe to adopt herding and cultivation (Newman 1970). The resource imbalance is suggested to have been caused by population growth due to immigration (Bagshawe 1925b:220; Newman 1970:48, 56). Oral traditions of the Barabaig, Laalu, Alagwa and Tatoga maintain that cattle were initially unknown to the Sandawe. They recall how the Sandawe regarded cattle as game for hunting when they first encountered them and this became a point of humor for both cultures (Ten Raa 1969:93, 1986). The Sandawe term for cattle is borrowed from the Barabaig, Gogo and Alagwa and this supports the oral traditions (Newman 1970:53-4; Ten Raa 1969:93, 1986). In addition, the Turu claim to have been the first to introduce cattle and domesticated crops to the Sandawe. Ethnographic studies by Newman suggests that of all groups the Turu were the most influential in transmitting crop and animal husbandry practices to the Sandawe (Newman 1970:55-56). There are also stories that the Sandawe acquired cattle through exchange of their women for cattle from the Tatoga and Turu (Trevor 1947:62). An important aspect that we learn from the Sandawe is that they have no history of being displaced from their original territory by agropastoralists. Apart from occasional cattle raids (Bagshawe 1925b), there also does not appear to be a tradition of conflict or land disputes between neighbours. Overall, the Sandawe have maintained their language, culture and autonomy despite extended contacts with farmers and agropastoralists. This aspect is a challenge to views maintained by many archaeologists that original hunter-gatherers of sub-Saharan Africa were either absorbed, displaced or conquered by migrating Bantu peoples (Chittick 1975; Denbow 1990:141; Phillipson 1993a:7, 203).

A similar relationship is apparent between Hadzabe hunter-gatherers and neighbouring Isanzu farmers. However in contrast to the Sandawe region, the environment occupied by the Hadzabe is unpredictable and prone to drought, making the area less suitable to agriculture (Ndagala 1988:65; Marlowe 2002:268). Also, before the eradication of tsetse flies by the colonial government in the 1940s and 1950s the Hadzabe region was badly infested with tsetse flies making it unsuitable for pastoralism (Marlowe 2002:268). Finally, the recent proclamation of national parks such as Ngorongoro, Serengeti, Maswa and Lake Manyara (by colonial and independent governments) which are close to the Hadzabe region have allowed game to persist (some game from the parks migrate to Hadzabe territory) making hunting-gathering continuously reliable (Marlowe 2002:268). These factors may have caused some Hadzabe to be reluctant to adopt agriculture even after long contacts with farming and herding communities. Hadza are said to have had strong ties with their neighbours such as the Isanzu through intermarriage. In European accounts of the 1890s such interactions are said to have encouraged some Hadza to adopt agriculture (Woodburn 1968a:49). For example, at the beginning of the 20th century a major famine caused the Isanzu to take refuge in the bush with the Hadza in search of food. At the end of the famine they returned to cultivation (Woodburn 1968a). During that drought some Hadza intermarried with Isanzu (Woodburn 1968a:49, 54). The resulting mixed population that included some Hadza settled close to Isanzu communities and began to cultivate regularly (Woodburn 1962:270). Increasing population pressure from Hadza neighbours such as the Iraqw, Sukuma and the Isanzu led to further encroachment on the Hadza land hence escalating the interaction process (Woodburn 1962).

The ethnographic accounts from the Sandawe and Hadza support the idea that past cyclical ecological catastrophes such as famine in the Kondoa region are among the factors that promoted cooperation and relationship between IA agropastoralists and LSA hunter-gatherers during the transition from hunting-gathering to agropastoralism. That a series of environmental problems could have fostered interaction between LSA and IA populations is supported by paleoenvironmental data (Gasse 2001; Nicholson 1998; Verschuren 2000:297, see also Chapter 1). The Medieval Warm Period (MWP) AD 1000-1300 for example is suggested to have been drier than today (Verschuren (2000:297). This period coincides well with the period of transition from LSA to LIA in Pahi circa 1030 ±40 BP and could have possibly accelerated interaction between LSA and IA populations. Also this period is associated with increased soil erosion at Haubi-Kondoa around 900 BP which has been suggested by Lane *et al.* (2001) (see also Eriksson 1998:20-21) to have possibly caused by enhanced farming and iron-working activities (see Chapter 1). The Little Ice Age Period (LIAG) AD 1300-1850 which followed the MWP, though wetter was also interrupted by many short episodes of climatic instability accompanied by droughts and famine in East and Central Africa (Nicholson 1998).

In the final analysis it can be concluded that anthropological and oral history data on interactions between the Sandawe and Hadzabe hunter-gatherers and neighbouring agropastoralists are useful in modelling and interpreting the Pahi survey/excavation results. The indistinguishable distribution patterns of LSA and IA sites over the landscape and the subsequent stratigraphic sequence of the cultural materials at Baura and Lusangi suggest a continuous occupation by original LSA inhabitants who slowly absorbed new cultural elements through contact with IA cultures. During the early contact period LSA hunter-gatherers continued to exploit the habitats in ways similar to their predecessors while introducing new IA cultural elements. This resulted in no observed differences in the distribution of LSA and IA sites over the landscape. It is unlikely that new and different people such as IA, with their totally unique technology and subsistence system, would have produced land use patterns similar to LSA predecessors. Based on these findings displacement of the LSA by IA people in the Pahi region appears unlikely. That some autochthonous LSA hunter-gatherers in central Tanzania might have remained in their ancestral land without displacement is demonstrated in ethnographic and oral traditions that recall localities, including rock-shelters, that were used until recent times. In Pahi for example, rock-shelters are currently used for ritual activities, an aspect that suggests some connection between ancient site use and recent populations. One such use was observed at Mungumi wa Kolo Rock-shelter (about 7 km southwest of Lusangi) where we found beer sprinkled on the rock paintings. Local people practice this custom regularly at this place to consult their ancestors. Moreover, oral traditions from Kwa Mwango in Singida region indicate that rock-shelters and caves were used as sanctuaries for various ritualistic practices as well as hideouts from hostile tribes such as the Maasai (Masao 1979:63; Odner 1971b:157, 180).

7.5. Chapter Summary

The observed variation in lithic assemblages at the sites of Baura, Lusangi and Markasi Lusangi can be attributed to local activities carried out at the respective sites. The potential for strategic activities seems to be one factor affecting the nature and distribution of lithic artifacts. For example, the use of Baura Pahi 1 for both habitation and hunting activities may reflect the diverse nature of shaped tools as well as the homogeneity of lithic artifacts distribution/frequencies compared to rock-shelter sites. The higher concentration of lithic artifacts in rock-shelters indicates that they were more preferred as workshops for lithic knapping than adjacent open-air sites.

Overall, the dominance of scrapers and backed pieces in lithic assemblages (shaped tools) in the Pahi sites is comparable to that of other East African sites (Mabulla

1996: 332-390; Masao 1979:197; Mehlman 1989:369-438). As is the case for other central Tanzanian sites, burins and points are rare compared to sites further north (Masao 1979:211; Nelson and Posnansky 1970:135-6). The rarity of Levallois and radial cores and the ubiquity of bipolar cores indicate that bipolar reduction characterizes LSA artifact production in central Tanzania (Masao 1979:211-2). A significant decrease in the quantity of lithic artifact production is associated with the introduction of iron-working and pottery technologies followed by a decrease in diversity of shaped tools. However no significant changes in stone working technology took place until recent times when lithic technology was abandoned altogether.

It is unfortunate that pottery with sufficiently discrete features were not obtained from Pahi excavations. This has limited any attempt to construct the developmental sequence of pottery types. To this end it can be said that a full picture of Baura and Lusangi pottery remains incomplete and relationships with other pottery types can be established when adequate diagnostic sherds are found in stratigraphic contexts. However, it can be tentatively concluded that based on a date of 1030 ±40 BP from Markasi Lusangi 2 and morphological attributes, the pottery under study was introduced to Baura and Lusangi at the early phase of the LIA.

White chalk appears at the onset of LIA in the study area and supports the general proposition that white paintings were executed during the IA (Leakey 1983; Masao 1979; Odner 1971b; Phillipson 1976a). The introduction of white paints does not seem to have replaced the use of red ochre as both coexist in upper archaeological sequences at Pahi. However the role of red ochre use in later paintings is unknown since no red paints are known to overlay other paints (Masao 1979:253-4; Phillipson 1976a:184). While the use of red ochre for rock art after the introduction of the LIA remains uncertain, its continuous association throughout the archaeological sequences manifest its significance to both LSA and LIA peoples. As pointed out earlier red ochre is known not only for its significance in rock art paintings but also for cosmetics and burial rituals (Masao 1979:68; Rudner 1983:18).

Exploitation of wild animals seems to have been significant during both the LSA and LIA. Although remains of domestic cattle appear at both Kandaga A9 (Masao 1979) and Markasi Lusangi 2 their role to the economy of the LIA remains poorly understood owing to rarity of preserved bone in the Pahi archaeological sequences.

The overall cultural sequences obtained from both survey and excavation suggests a slow transition accompanied by the conservation of lithic technology after the introduction of iron-working and pottery. LSA peoples practiced hunting and gathering and were also responsible for various forms of early art depicted in rock-shelters. Long distance trade is demonstrated by a limited number of exotic materials of obsidian and basalt. By 1030 ±40 BP or earlier LSA groups, either through contact or diffusion, acquired metal and pottery technology. Despite the availability of iron, stone tools remained stylistically and technologically unchanged until recent times. Since both iron-working and pottery technologies were adopted approximately at the same time, LSA peoples must have acquired these technologies from IA groups who were already present in East Africa during the first millennium BC. The continuous association of iron working and lithic remains in upper stratigraphic sequences to recent times, suggests that LSA hunter-gatherers were not displaced or assimilated by incoming IA groups, but continued to maintain some form of self autonomy for several hundred years.

As stated earlier the Irangi Hills offered both good hunting-gathering and farming territories, an aspect that may have encouraged competition between the two cultures.

Despite this attribute the indigenous LSA peoples were not displaced by IA farmers. There is little doubt that LSA people managed to retain their land because of a harmonious relationship that existed between them and IA people. The initial economic and social relationship may have been stimulated through exchange of trade goods and intermarriage. Incidents such as famine associated with environmental instability would have forced extensive mobility as people moved over the landscape in search of resources. This would have stimulated interactions that brought about exchanges of cultural materials and innovations. Such processes have been documented in studies of Hadzabe and Sandawe where contacts with neighbouring agropastoralists led to exchange of material culture and marriage causing some members to change their subsistence economy (Newman 1970; Woodburn 1962, 1968a). It is suggested that similar incidents stimulated cooperation or at least tolerance between Pahi LSA and IA communities. Increases in farming population through time would have placed increasing pressure on hunter-gatherer's lands, resulting in depletion of the resources. Eventually foragers had to adopt farming as the only means for survival. The hunter-gatherer population might have represented a smaller group and this may explain why their language was replaced by that of the IA Bantu.

CHAPTER 8: CONCLUSION

This work has attempted to elucidate LSA and IA cultural patterns in the Pahi study area. Both survey and excavation results support a succession of original LSA autochthones throughout the transition period from a sole dependence on LSA lithic technology to the introduction and adoption of IA elements. There are several lines of evidence to support this. First, the survey results indicate that both LSA and IA remains were homogeneously distributed over the landscape suggesting continuous succession and exploitation of the landscape. Traditionally East African IA peoples are believed to have practiced farming and had permanent settlements while LSA groups (with the exception of the PN) were hunter-gatherers with no permanent settlements. If such different modes of subsistence did coexist in Pahi one might expect site distributions to reflect this pattern. However the settlement data do not support such a conclusion. For example, with the exception of lower sequences which consist of exclusively LSA lithic artifacts, upper sequences as well as the settlement distributions at Pahi do not reflect separate identities for LSA and IA peoples because the artifact assemblages appear mixed. This indicates that both LSA lithics and IA artifacts were produced by the same group of people practicing a similar mode of subsistence. Secondly, all excavated areas demonstrate continuous cultural development with no breaks in stratigraphical sequences from the LSA to IA. Thirdly, in most investigated areas lithic technology was not abandoned abruptly after the introduction of iron-working. This implies that LSA people continued to exist in their traditional territory practicing some of their old traditions and at the same time adopting new elements from IA neighbours.

Despite continuous production of lithic artifacts throughout the stratigraphic sequences, two distinct terminologies are used here to define the Pahi cultural developments. The term LSA is used to refer to cultural deposits with exclusively LSA remains often found in the lower stratigraphic sequences while IA refers to cultural deposits with a mixture of LSA and IA remains which form the upper stratigraphic sequences. As mentioned in Chapter 7 although upper stratigraphic deposits consist of a mixture of LSA and IA remains the term IA is preferred because the inclusion of IA elements into the LSA is considered to have brought major cultural changes to the Pahi people. This implies that although lithic technology was not abandoned completely the Pahi LSA people accepted new technologies such as food and metal production.

A date of 18,190 BP from Kisese Rock-shelter (Deacon 1966:38; Inskeep 1962) marks the LSA transitional industry in Kondoa, and by 3500-1000 BP the LSA proper was widespread in central Tanzania (Masao 1979:210). Associated with the transition from LSA to IA was a change in rock art styles and subject matter suggesting a modification in their ideology. The transition from LSA to IA in Pahi seems to have commenced around 1030 ±40 BP and may have begun much earlier as demonstrated by dates from Lusangi 1 Unit 1. This process took place gradually accompanied by the conservation of lithic technology until recent times despite the introduction of iron-working and ceramics at the onset of the IA. Cases for continuous production of lithic artifacts after the introduction of complex metal-working technology are not peculiar to Pahi sites and are reported elsewhere in Africa (Phillipson 2000:473-4; Phillipson, Laurel 2000) and Europe (Young and Humphrey 1999). The reasons for a slow replacement of lithic by iron-working technology at Pahi are not known but research demonstrates a decrease in production of stone tools after the introduction of iron-working. As discussed in the last chapter, continuous use of lithic artifacts side by side with iron may be related to several factors such as production costs or preference to use certain tools for specific activities.

The EIA culture reported at the Lelesu site in southwestern Kondoa (Sutton 1968) did not apparently influence the Lusangi and Baura hunter-gatherers despite the proximity of the two areas. Similarly, influence of the ceramic LSA (associated with Kansyore ware - 5400 BP) and the PN industries (2200 BP) of the Nasera Rock-shelter (Mehlman 1989:45, 556-61) located about 244 km to the north did not reach Pahi. Whether this is an indication of resistance to acculturation by LSA hunter-gatherers at this early period remains unknown. The spread of livestock to East Africa from northeastern Africa was met with several difficulties that included new diseases (Marshall and Hildebrand 2002:115-6). Tsetse fly would have affected cattle survival in Kondoa (Leakey 1983:124-5) therefore limiting the spread of the PN industry. However this may not be the only explanation for the absence of PN industry in Pahi because other elements of this industry, such as pottery and stone bowls, could have spread through diffusion. Therefore a lack of significant contact between the LSA and PN peoples or resistance by LSA people to accommodate these cultural elements is the most likely explanation. It is worth noting however that if we accept that obsidian artifacts collected in the Pahi excavations were obtained from Kenyan sources as suggested in the last chapter, it is most likely they passed through the Rift Valley region where PN industries thrived at the time. If this interpretation is correct then contacts between the Pahi LSA populations and the people residing along the Rift Valley may have been restricted to a few trade items such as obsidian, or involved peoples who did not practice PN lifeways.

The LSA and IA cultural elements of Pahi are in most respects comparable to others in East Africa with minor variations. Iron smelting was carried out in bowl furnaces although evidence from Markasi Lusangi 2 suggests that superstructures may have been used. Orientation of the slag tapping mouth and the associated furnace ritual pit are evidence of symbolic characteristic and features shared by most iron working industries especially Bantu speakers in sub-Saharan Africa, and in East Africa (Mapunda 1995; Schmidt 1997:224). Observable attributes in Pahi pottery suggest no close relationship to other sites in Tanzania. However based on morphological attributes and chronology, the Pahi pottery can be categorized as belonging to the LIA. Hunting of wild fauna played an important role in the subsistence of both LSA and IA. The role of domesticated animals and plants in IA subsistence is less understood owing to the scarcity of preserved remains. The rarity of domesticated remains in comparison to wild faunal remains in IA deposits may suggest that pastoral activities played a minimal role. The single cattle bone from Markasi Lusangi 2 Unit 2 suggests that domestic cattle were present after 1030 ±40 BP, while a date just prior to 760 ±60 BP is suggested for the presence of chicken at Markasi Lusangi 2 Unit 4. Although the remains of domesticates are not present in sufficient quantities to provide a full picture of subsistence, farmers could supplement protein needs by hunting wild animals before large domesticates herds were adequately developed (Phillipson 1977a:77-8; Van Neer 2002:363-4).

It may be useful to review some approaches used in African archaeology as key interpretive models in hunter-gatherer and farmer interactions. While ethnographic and oral tradition has been used widely by archaeologists (Musonda 1987; Phillipson 1976a, 1993a), historians, and linguistic anthropologists (Vansina 1990, 1994-5, 1995), the available literature on the subject matter calls for scrutiny of these data in developing archaeological interpretive frameworks. First, modern day hunter-gatherers (San, Pygmy and Hadzabe) live in areas that are marginal to agricultural production (Denbow 1984:176, 1990:141; Ndagala 1988:65), and as such their lifeways may not adequately reflect the broad range of conditions that may have existed in the past. In effect they may provide only a glimpse of a wide range of human behaviour present in prehistory. Nevertheless ethnography can provide some clues as to how to improve archaeological interpretation especially on processes that are not observable in the archaeological record. For example, while the interactions between Pygmy hunter-gatherers (Turnbull 1961, 1965; Woodburn 1988:55) and Hukwe (Phillipson 1976a:196) and farmers is that of a temporary client relationship, the Hadzabe hunter-gatherers avoid such commitments in any circumstance and only engage in minimal exchanges with neighbour farmers (Woodburn 1988:50-53).

Secondly, the use of generalized models to explain interactions between IA agropastoralists and hunter-gatherers may obscure our knowledge about the true picture of past contacts. It is important to take into account the varying forms they may have taken in time and space before generalizing (see Mitchell 2002:297-99). For example, it is unclear what may have caused the Khoikhoi to acquire herding. It is unlikely that models employed in archaeology such as population pressure from farming communities (Phillipson 1993a:203) was responsible for the Khoikhoi shift from hunting-gathering to herding in the third century BC (Mitchell 2002:232). It is worth noting that the Situmpa and Salumano (where the Khoikhoi are supposedly thought to have acquired cattle from the Chifumbaze) are the only earliest recorded Chifumbaze sites southern Africa and this tradition is unknown beyond southeastern Africa until the beginning of the first millennium AD (see Mitchell 2002:227-37; Phillipson 1993:187-194, 206-7). At this juncture there are no known factors which could have triggered population pressure in the vicinity of Situmpa and Salumano because IA farming communities were not widely spread in southern Africa at that time. While population pressure seems an unlikely factor in the Khoikhoi adoption of farming, authors such as Mitchell (2002:161-93, 235) have suggested that intensive exploitation of terrestrial and aquatic resources in response to deteriorating environmental conditions in the last few millennia BC may have allowed Khoikhoi hunter-gatherers to become more sedentary. This could have encouraged other changes in social and economic organization such as adoption of herding from IA peoples. Although this proposal is worthy of consideration a lack of basic field data hampers its certainty (Mitchell 2002:232-7).

Studies indicate that interactions between hunter-gatherers and farmers took place in varying forms and the degree or rapidity of acculturation differed from one place to another (see for example, Zvelebil *et al.* 1986). It is suggested that hunter-gatherers who resided in areas that were more conducive for agricultural production in Africa and Europe were acculturated sooner than those who occupied areas less suitable for farming (Miller 1969: 82-3; Zvelebil 1986b:179-180). Clearly any inquiry into hunter-gatherer contacts with farmers should focus on a thorough examination of local attributes that affected the interaction processes.

The Pahi survey and excavation results suggest that commonly held views that LSA hunter-gatherers were displaced or assimilated by incoming IA farming groups (Clark 1970:210; Denbow 1990:141, 170; Phillipson 1993a:7, 203; van der Merwe 1980: 480-82) are not supported as a universal explanation for the development of settled communities in sub-Saharan Africa. Instead Pahi research results support an acculturation model (Vansina 1994-5, 1995). This implies that acculturation as a possible outcome of interaction between LSA hunter-gatherers and IA agropastoralists in sub Saharan Africa should not be ignored but given equal weight along with other models (*i.e.* assimilation and displacement) in the course of describing the consequence of contacts between the two groups. It is suggested here that original Pahi LSA folk developed autonomously while acquiring elements of IA farming groups through diffusion or borrowing. However the borrowing process between the LSA and IA groups was not necessarily one of a receiver/donor or superior/inferior culture (*cf.*, Vansina 1994-5:16-7, 1995:190-1). It was a selective borrowing process based on several factors. The old view that elements of agropastoralism were adopted by hunter-gatherers because the culture of agropastoralists was dominant has received criticism (Kent 2002). It is emphasized here that complete acculturation of LSA peoples did not necessarily take place because the recipient was inferior, but because the subsistence practices of LSA peoples were no longer supported by the environment. The social and economic relationship between LSA and IA groups may resemble that observed in modern interactions between hunter-gatherers and neighbouring farm communities. To this end it can be concluded that autochthonous LSA peoples of Pahi contributed as an active group in later formation of settled societies in central Tanzania. In other words persistence of LSA cultural elements such as lithic technology among Pahi autochthones along with those of IA for more than nine centuries, is an indication that the LSA people were not dominated by IA groups after contact.

It is not surprising that new archaeological and linguistic research now questions the universal applicability of the assimilation and displacement models. For example, Vansina (1994-5, 1995) suggests that the use of Bantu migration as an explanation for the rapid spread of language, food production and iron-working to sub-equatorial Africa probably did not take place (Phillipson 1977a:210-30; 1993a:198-205; van der Merwe

1980:80-82). According to Vansina (1994-5:16-17, 1995:190-1) the technologies did not necessarily diffuse together and there was no overwhelming superiority over earlier settlers or a single massive wave of migration. Instead, he suggests the dispersal of Bantu language and culture occurred in the form of several successive waves brought about by diffusion and borrowing of useful elements at different times without the need for migration in all areas (Vansina 1995:186-195, 1994-5:19). Furthermore the long held theory that iron-working spread from West to East Africa is now being reconsidered in light of new early evidence of iron-working from East and central Africa (Clist 1995; Grunderbeek 1992; Peyrot and Oslisly 1987). An intriguing question that arises from these findings is whether the two areas represent independent sources for iron-working.

The concept that IA cultural elements did not necessarily spread as a package is supported by possession of domesticated sheep and possibly cattle in the Cape of Good Hope by LSA hunter-gatherers during the first century AD when metal technology was unknown (Denbow 1990:159-60). Further evidence for the adoption of domestic animals before iron-working is attested at the Lotshitshi site on the southern edge of Okavango Delta where cattle remains date to AD 290 (Denbow and Wilmsen 1986:1509-10), Bambata cave in Zimbabwe where remains of sheep and ceramics date to 190 AD (Walker 1983), and Enkapune Ya Muto Rock-shelter in Kenya where Eburran hunter-gatherers acquired pottery by the fifth millennium BP and added livestock to their economy after 900 years. Hunting-gathering continued as an important source of subsistence in the Eburran industry until about 3000 BP when pastoralism played a major role in the economy (Marean 1992: 65, 110). As in the case of Pahi, the Eburran lithic industry showed no major technological or stylistic change from preceding hunter-gatherers. This supports the conclusion that it was the autochthonous hunter-gatherers who made the transition to livestock keeping (Marean 1992:123). Similar accounts have been reported by Chami (2001a); Chami and Chami (2001) and Chami and Kwekason (2003) at Tendaguru and Zanzibar where LSA people acquired pottery and domesticates long before the introduction of iron-working. The early adoption of domesticates in southern Africa has been attributed to LSA Khoisan-speakers (Khoikhoi) and at the time of contact with Bantu-speakers they were already well-established herders (Ehret 1984:34, 1998:216-29). The source of domesticates at such an early date in southern Africa is uncertain. While Phillipson (1993a:207) suggests that they derive from the Chifumbaze complex (EIA Bantu Speakers) during the last few centuries BC, linguistic studies point to Eastern Sahelian speakers as the main source of domestic livestock (Ehret 1989:217-8, 1984:35). These emerging data suggest that if Bantu speakers were at all responsible for the spread of food production they must have arrived in East Africa before the IA (Chami 2001c:649; Chami and Kwekason 2003).

The Kondoa Irangi people are now Bantu speakers. It is assumed that before the spread of Bantu languages, LSA hunter-gatherers south of the Sahara spoke languages related to the Khoisan language group. Assuming that the people of Pahi developed autonomously from LSA predecessors while adopting pottery, iron-working and farming through interaction and diffusion with neighbouring Bantu speakers, an intriguing question is what happened to their indigenous language? The answer to this question is a difficult one as there is some disagreement between archaeologists (Phillipson 1977a, 1993a) and linguists (Vansina 1995, Ehret 1998). While Phillipson (1993a:198-205) proposes that the displacement and assimilation models brought about by the Bantu migration explains the disappearance of Khoisan languages, Vansina (1995) contends that diffusion is the more appropriate explanation. According to Vansina (1995:191) it is unlikely that the spread of Bantu cultures was associated with a single large-scale migration. He envisions the current distribution of Bantu languages to have resulted from complex historical dynamics which involved successive dispersals as well as reversals of individual languages over a time span of millennia (Vansina 1995:195). Diffusion was the main form of dispersal of the Bantu language, supplemented by small-scale migration as original populations grew to form new settlements. The stimuli for the spread of the Bantu language may be related to the prestige associated with sedentary life, its complexity of social organization, demographic advantage, but not to its technological superiority. Large settlements associated with sedentary life would have become centres of trade and social activities attracting people from outlying areas leading to the exchange of languages. In this circumstance the autochthonous populations may have first become bilingual and then over several generations lost their original language (Vansina 1995:191-5).

There are several cases of language transfer without displacement or assimilation of autochthones as proposed by Vansina. The Pygmies of the Congo rainforest are said to have interacted with Bantu farmers for centuries, ultimately loosing their indigenous language (Vansina 1990:56-7). Most Pygmies are involved in a client relationship with Bantu farmers and it is through such activities that language transfer took place. As discussed earlier, Pygmies have also adopted certain customs from the Bantu such as male circumcision (Coon 1971:322). In addition, the Philippine Negritos lost their language after intensive interaction with Austronesians sometime between 3000-1000 BP (Headland and Reid 1989:46-7). Despite this interaction and adoption of the Austronesian language, Negritos continued to practice hunting and gathering until modern times.

Another example is the Swahili language which spread along the entire coast of East Africa through trade interactions between different communities (Nurse and Spear 1985). The establishment of caravan routes to the African interior at the beginning of the 19^{th} century extended this language to areas where it was not previously spoken (Whiteley 1969). The Oromo-speaking Waata (Brenzinger *et al.* 1991:31, 1992:296), Sandawe (Brenzinger 1992:293) and Khoikhoi present cases in sub-Saharan Africa where ethnic groups interacted with farmers and adopted their culture without completely losing their indigenous languages. At the period of transition, these groups added only important terminologies associated with the newly acquired economy along with those of relevant techniques from the donor culture. According to Brenzinger *et al.* (1991:31) and Brenzinger (1992:301) change of one aspect of culture such as economy does not necessarily induce language shift and language death. For such a language shift to occur a variety of factors must be present.

Study on the recent interaction between Yaaku and Laikipiak Maasai by Brenzinger (1992:300-2) in Kenya present a good example of factors that may lead to language shift. According to traditions, the Yaaku (eastern Cushitic speakers) who reside in the Mukogodo Mountains practiced hunting-gathering until 1925 (Brenzinger 1992:297-99). The shift from Yaku language to Maasai occurred with the change of Yaaku economy. The Laikipiak Maasai are said to have arrived at the Mukogodo in the later part of the 19^{th} century and since then lived side by side with the Yaaku. The Maasai speakers, as intruders to the Yaaku land, were pastoralists with no land rights but had cattle wealth and a larger population than the Yaaku. Contacts between the Laikipiak Maasai and Yaaku led to many social and economic interactions which are the basis for language and economic shifts. For example, Yaaku people received cattle as bridewealth when their girls were married to Laikipiak Maasai pastoralists, not only beehives as was the Yaaku custom. This custom influenced the Yaaku people so much that they began to demand cattle as bridewealth from their own men. This aspect made it necessary for young unmarried Yaaku to acquire cattle and after a prolonged period of acculturation some Yaaku gave up their subsistence practices and assumed a pastoralist life. Ultimately, increasing economic and social contacts with neighbouring Maasai speakers led to a decline in use of the Yaaku Language. After the Yaaku adopted the value system of the pastoralists, Maasai lifestyle and language was considered to have higher prestige. Eventually, the Yaaku language was lost among the younger generation, and was only spoken by the elders. The Yaaku discouraged the use of their language because its semantic emphasis on hunting was considered unfit for a cattle-breeding society. This had detrimental effects because as the older generation died out so did the Yaaku language. Brenzinger (1992:301) notes that the decision to give up the Yaaku language should not be seen as resulting from one reason or motive but as a response to changing conditions in the entire environment surrounding contacts and interactions between the Yaaku community and the Maasai.

The means and causes for language shift between autochthonous LSA hunter-gatherers of Pahi and their neighbour Bantu IA farmers may never be completely understood. One has recourse to evidence of language shifts from other regions in order to propose a possible explanation. In Africa, most cases suggest that multiple factors are involved (Brenzinger 1992; Brenzinger *et al.* 1991) including economic/social interactions and number of speakers between the groups in contact (Phillipson 1993a:202-3; Vansina 1995:192). There is no doubt that at the beginning of the transition period in Pahi, population growth among Bantu farmers would have been accelerated since they were more sedentary than indigenous LSA. Ultimately LSA people would have found themselves confronted by Bantu speakers from every side eventually leading to the loss of their language (Vansina 1995:192). Increase in social interaction such as trade and intermarriage between the two groups would have further accelerated the language shift. In general the causes for language shifts are multiple and interrelated and no cause can be singled out as a general explanation for loss of an ethnic tongue (Mackey 1980:39).

Contact and interaction between LSA hunter-gatherers and IA farmers in Pahi should not be considered to have led to an immediate acculturation without some form of resistance at the initial period of contact. That some form of hesitation might have taken place is suggested by the presence of PN and EIA cultures in neighbouring areas of Pahi for over a millennium, but without any apparent influence on Pahi LSA hunter-gatherers. As noted above ceramic LSA pottery (Kansyore ware), PN and EIA industries were already present at Nasera and Mumba rock-shelters at 5400, 2200 and 1800 BP respectively (Mehlman 1989:556-560), while EIA Lelesu pottery was introduced to the southwest of Kondoa possibly by 1800 BP (Sutton 1968, see Soper 1971a & b and Mehlman 1989:523 for chronology of the Lelesu pottery). It would be unreasonable to assume that LSA inhabitants of Pahi were totally unaware of these cultures while they had access to obsidian raw materials located almost 560 km further north.

If a date of 1030 ±40 BP is accepted for the commencement of the LSA to IA transition in Pahi, it may have significant implications for social, technological and political transformations that took place in East and Central Africa at the end of the first and beginning of the second millennium AD. In the first instance as observed in Chapter 1 and 7 this date falls within the Medieval Warm Period AD 1000 - 1300 that was associated with a relatively more drier climate than today (Verschuren 2001:297).

Ethnographic and colonial records in central Tanzania indicate that drier climates were often associated with drought and famine (Chapter 7). Assuming that such conditions prevailed in central Tanzania during the MWP, interaction between LSA hunter-gatherers and IA farmers would have increased as population moved about in search of better opportunities for wild food, pasture and arable lands for raising crops. This situation would promote acculturation and encourage interdependence between LSA and IA peoples in order to survive. Such a scenario could account for the initial transition of the LSA to IA in 1030 ±40 BP. This period is also associated with the establishment of the LIA in sub-Saharan Africa as a whole (Huffman 1989; Phillipson 1976a:212-4; Vansina 1994-5:25) and is characterized by increases in cattle herding and changes in pottery styles (Phillipson 1976a:212-4, 1993a:225-6). Also of great significance is the emergence of larger-scale political organizations and the establishment of cities such as Kilwa and Manda on the east coast, Mapungumbwe in southern Africa and elaborate earthworks in Bigo in Uganda (Chittick 1974, 1984; Phillipson 1993a; Vansina 1994-5:25). Assuming that this period was also associated with significant population growth as has been claimed in several areas of east and central Africa (Phillipson 1988:663; Reid 1994-5:309; van der Merwe, 1980:482; Vansina 1995:25), one of its immediate effects could have been an increase in interaction between neighbouring communities. There is a close correlation between the onset of population growth in East and Central Africa and the emergence of the IA in Pahi. This supports the initial assumption of this thesis that the transition from nomadic foraging to settled and farming communities was brought about by population growth and other factors. Interestingly, recent research by Shishira and Pyton (1996), Eriksson (1998) and Lane *et al.* (2001) have suggested that although land degradation in Kondoa has a long history going as back as 14,500-11,400 BP it has accelerated in the past 900 years. This date coincides well with the beginning of the IA in Kondoa. The increase in land degradation in the past 900 years may indicate the beginning of extensive farming and iron-working activities in Kondoa stimulated by growth in population. That growth in population might have influenced change from hunting-gathering to farming at Pahi is demonstrated by a significant increase in production of lithic artifacts immediately before the appearance of iron-working and pottery or during the initial stage of LSA/LIA transition (see Figure 7.15 – 7.19 & Table 5.20, 5.21, 5.22, 5.25 and 5.31). However the coincidental rise in population and the prevailing MWP drier climate raises some questions and remains to be verified. Besides population growth, it is also highly possible that other factors contributed to an increase in the number of lithic artifacts during LSA/LIA transition. Settled people would likely have produced more lithic artifact deposits at a given time than nomadic hunter-gatherers whose residence is temporary. Evidence for the beginning of settled life at Pahi is also supported by the appearance of daubs at Baura 1, Markasi Lusangi 2 and Lusangi 3. Note that the earliest dates for the transition period at Baura 1 (460 ±40 BP) (Table 5.19) and Markasi Lusangi 2 (1030 ±40 BP) (Table 5.26) are associated with daubs.

Experience from Pahi investigation indicates that excavating isolated villages or rock-shelter sites as has been done by many archaeologists (Miller 1969; Musonda 1987; Phillipson 1976a) is inadequate for understanding the broader context in which hunter-gatherer and farmer interactions took place. Vansina (1994-5:20, foot notes) and Kent (2002:83-4) call for a need to excavate fully and carefully more foraging settlements along with contemporary farming settlements to gain insights into interactions between the two groups. Investigations should aim at full coverage of prospective areas to evaluate the nature of the landscape use patterns of the interacting cultures. This method may prove to be useful especially in regions where hunter-gatherers coexisted with farmers and used the same landscape as is the case in eastern Zambia (Phillipson 1976a).

Lastly, it should be remembered that an agricultural way of life is fraught with many instabilities such as drought, flooding, diseases and pests. This is demonstrated in oral traditions and written documents in central and northeast Tanzania where agropastoralists were forced to hunt and gather wild food after successive crop failures. Groups that relied exclusively on one system of farming appear to have been more drastically affected. For example, the Maasai pastoralists and Kikuyu cultivators occasionally seek refuge with Dorobo hunter-gatherers after loosing their cattle and crops through disease, drought and war (Bagshawe 1924-25a:129; Spencer 1973). The insecurity associated with agropastoralism would suggest that only under restrictive conditions would LSA hunter-gatherers have resorted to agriculture full-time.

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APPENDICES

Appendix A: Data Collection Forms

Form A1. Site survey

Site name: ____________________________________Site no._________________

Region _______________District____________________ Ward________________

Map reference___________________________________ UTM________________

Lat./ Long._____________________________________ Elev._________________

Distance to, direction description, of nearest (in km.): town______________________

Fresh water: (source/distance to)____

Contemporary site/s____

Topographic setting ____

Vegetation/cultivation____

Directions to site____

Owner and address____

Other contacts____

Site type/description/visible features____________________________________

Site dimension (m or ha)____

Depth/thickness of deposits (m)_______________________________________

1/

Site survey continues---

Deposit description____
____

Condition of deposits____
____

Artifacts observed____
____

Artifact collected____
____

Prior collection____

Est. chronology____

Published references____
____
____

Bag/catalog nos. ____

Further work____

Comments____
____

Work done: surface coll.__________ STP exca._________ Auger___________________

Survey___________ Photo_____________(ref._______) Map/plan_________________

Appended: site map__________________Other _________________________________

Page ___ of_____/Recorder ________________Date__________ Other Crew__________

2/

Form A2. STP (Shovel Test Pit)

Site name: ___________________________ Site # ____________ STP. # ____________
Region: ________________ District: ____________________ Ward: ________________
Map reference ____ UTM: ______________
Lat./Long. ____ Elev. ______________

Resources/sources/distance to (*e.g.*, water, lithic quarry, iron ore, etc.)

____

____

____

1. Survey around STP (200 X 200m): Cultural materials observed _________________

____

Artifact collected ____

____ Bag # ____________

Estimated chronology (e.g., LSA, IA) ____

2. Size of STP __________________________ Mesh size _____________________ mm.

Method/tools: ____

Level	Munsell	Soil description	Nature of deposition	Features	Cultural materials	Chron. estimates	Bag #

Page ___ of _____ /Recorder ___________________ Date ________ Other Crew ________

Form A3. Trench excavation

Site name: ____Site no.________________

Unit ______________________________________Bag #________________________

Coordinates______________________________ Dimensions ____________________m

Sub datum corner and
coordinates____

Surface elevation________________________. Elevation reference ________________

Layer designation________ Depth: top and bottom DBSD* cm. __________________
(Sketch unit twice w/measurements:
L X W and Depth: 4 corners and centre)

Method and tools: ____
____

Dry screen mesh size ____________mm. Munsell ________Desc. ________________

Soil characteristics ____

Inclusion ______________________Disturbance _______________________________

Deposition ____

Features____

Cultural materials____

Chron. estimates (compare to other units/layers) _______________________________
____

Samples (Soil? _____) ____
Comments/sketches

Date______________________ Weather____
Append: Photo_________ Plan __________ Profile _____________ STP____________
Other____
* DBSD = Depth below sub datum

Page ___ of_____/Recorder _____________________Date______ Other Crew ______

Form A4. Feature excavation

Site name: ____Site no.______________

Site________________ Unit_____________ Layer___________ Bag#_________

Feature#____ Date_____________

Description ____

____

____

Loc. w/in site/unit ____

Excavated? _______ Exc. method/tools ____________________________________

____

Mesh ______ mm wet/dry fill _______________________ Munsell_____________

Stratig. context/rel. to other features.____

____

____

Cultural material/s____

____

____

Material collected (Soil sample? _______)____________________________________

____

____

Disturbances ____

Contents/prelim. analysis ____

____

____

____

____

Attached: Plan____ Photo ___ Profiles ______Other___________________________

Page __of__/Recorder _____________________Date______ Other Crew_________

Form A5. Carbon sample collection

Bag #	Sample #	Date	Unit	Feature	Layer/ Level	Coordinate	Depth	Description and type of matrix. Suspect to contamination?

Recorder ______________________ Other Crew ____
Page ___ of_____/

Form A6. Soil sample collection

Site name: ____Site no________________

Bag #	Sample #	Date	Unit	Layer/ Level	Feature #	Coordinate	Depth	Munsell/ Description

Recorder__________________________ Other Crew ______________________________
Bag _____ of ________/

Form A7. Bag control log

Site name: ____ Site no________________

Bag#	Date	Unit	Layer etc.	Depth	Description

Recorder __________________ Other Crew ______________________________________

Page ___ of_____/

Form A8. Photograph log

Site name:______________________________________ Site no.____________________

Roll #_________ Camera____________ Film__________ Date______________________

Frame	Date	Direction	Time	Light	F-Stop	Shutter	Lens	Distance
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								

Recorder ____________________ Other Crew ____________________________________

Page ___ of_____

Appendix B: Breakdown of the Pahi Lithic Assemblages by Unit

Table B1. Baura 1 Unit 1: shaped tool frequency

	Level						
Tool type	1	2	3	4	5	**Total**	%
Convex end scraper					2	**2**	2.7
Convex double end scraper					2	**2**	2.7
Convex end and side scraper					12	**12**	16.0
Convex side scraper					10	**10**	13.3
Convex double side scraper					10	**10**	13.3
Sundry side scraper	1					**1**	1.3
Concave scraper					5	**5**	6.7
Scraper fragment					1	**1**	1.3
Crescent					8	**8**	10.7
Triangle					1	**1**	1.3
Curve backed piece					1	**1**	1.3
Straight-backed piece					3	**3**	4.0
Divers backed piece					2	**2**	2.7
Concave backed piece					2	**2**	2.7
Unifacial point					3	**3**	4.0
Angle burin					1	**1**	1.3
Outil écaillés					11	**11**	14.7
Total	**1**				**74**	**75**	**100.0**
%	1.3				98.7	**100.0**	

Table B2. Baura 1 Unit 1: frequency of major shaped tool categories

	Level						
Tool type	1	2	3	4	5	**Total**	%
Scraper	1				42	**43**	57.3
Backed piece					15	**17**	22.7
Point					3	**3**	4.0
Burin					1	**1**	1.3
Outil écaillés					11	**11**	14.7
Total	**1**				**74**	**75**	**100.0**

Table B3. Baura 1 Unit 1: core frequency

	Level						
Type of core	1	2	3	4	5	**Total**	%
Disc core			1			**1**	0.2
Levallois core					1	**1**	0.2
Divers single platform core		3			93	**96**	18.5
Opposed double platform core	1	2	1		36	**40**	7.7
Adjacent double platform core					45	**45**	8.7
Adjacent double platform core scraper		1			2	**3**	0.6
Multiple platform core	1				22	**23**	4.4
Platform peripheral core					6	**6**	1.2
Bipolar core	2	3	1	2	246	**254**	48.9
Bipolar core fragment					7	**7**	1.3
Amorphous core					43	**43**	8.3
Total	**4**	**9**	**3**	**2**	**501**	**519**	**100.0**
%	0.8	1.7	0.6	0.4	96.5	**100.0**	

Table B4. Baura 1 Unit 1: debitage frequency

Debitage type							
Classified flakes/blades	Level						
(100%)	1	2	3	4	5	**Total**	%
Whole Flake	4	8	4	2	1002	**1020**	87.3
Trimmed/Utilized Flake					11	**11**	0.9
Flake Talon Fragment	4	1	3	1	24	**33**	2.8
Whole Blade		2	1		102	**105**	9.0
Subtotal	**8**	**11**	**8**	**3**	**1139**	**1169**	**100.0**
%	0.7	0.9	0.7	0.3	97.4	**100.0**	
+ **Unclassified Debitage**							
Angular Fragment (100%) **Subtotal**					(518.5) **1580**	(518.5) **1580**	
Total	**8**	**11**	**8**	**3**	**2719**	**2749**	
%	0.3	0.4	0.3	0.1	98.9	**100.0**	

*numbers in parenthesis are weight in grams

Table B5. Baura 1 Unit 2: shaped tool frequency

	Level								
Tool type	Surface	1	2	3	4	Feature 1	5	**Total**	%
Small convex scraper			2	3				**5**	3.5
Convex end scraper			4	5	4		4	**17**	12.0
Convex end and side scraper		2	3	6	7		4	**22**	15.5
Circular scraper					1			**1**	0.7
Nosed end scraper					1			**1**	0.7
Convex side scraper		3	8	12	6		6	**35**	24.7
Convex double side scraper		2	5					**7**	4.9
Sundry end scraper					1			**1**	0.7
Sundry side scraper				1	6			**7**	4.9
Sundry double side scraper				1				**1**	0.7
Concave scraper				1	10		2	**13**	9.2
Concavity							2	**2**	1.4
Crescent				3	2		1	**6**	4.2
Curve backed piece		1					1	**2**	1.4
Angle backed piece							1	**1**	0.7
Backed *percoir*			2	2	3		1	**8**	5.6
Concave backed piece			1		1			**2**	1.4
Angle burin					2		1	**3**	2.1
Outil écaillés		3	2	3				**8**	5.6
Total		**11**	**27**	**37**	**44**		**23**	**142**	**~ 100.0**
%		7.8	19.0	26.0	31.0		16.2	**100.0**	

Table B6. Baura 1 Unit 2: frequency of major shaped tool categories

	Level								
Tool type	Surface	1	2	3	4	Feature 1	5	**Total**	%
Scraper		7	22	29	36		18	**112**	78.9
Backed piece		1	3	5	6		4	**19**	13.4
Burin					2		1	**3**	2.1
Outil écaillés		3	2	3				**8**	5.6
Total		**11**	**27**	**37**	**44**		**23**	**142**	**100.0**

Table B7. Baura 1 Unit 2: core frequency

Core type	Level								
Classified cores (~25%)	Surface	1	2	3	4	Feature 1	5	**Total**	%
Divers single platform core		9	6	10	5		2	**32**	24.2
Opposed double platform core	1	1	3	1	2		1	**9**	6.8
Opposed double platform core scraper					1			**1**	0.8
Adjacent double platform core	1	3		5	4			**13**	9.8
Multiple platform core		3		3	1		3	**10**	7.6
Platform peripheral core				1				**1**	0.8
Bipolar core	1	3	18	15	16	1	6	**60**	45.5
Amorphous core		2	1	3				**6**	4.5
Subtotal	**3**	**21**	**28**	**38**	**29**	**1**	**12**	**132**	**100.0**
%	2.3	15.9	21.2	28.8	21.9	0.8	9.1	**100.0**	
+									
Unclassified cores (~75%) (Subtotal)	**7**	**44**	**80**	**115**	**90**	**3**	**38**	**377**	
Grand total	**10**	**65**	**108**	**153**	**119**	**4**	**50**	**509**	
%	2.0	13.0	21.0	30.0	23.0	1.0	10.0	**100.0**	

Table B8. Baura 1 Unit 2: debitage frequency

Debitage type									
Classified flakes/blades (~25%)	Level								
	Surface	1	2	3	4	Feature 1	5	**Total**	%
Whole flake		31	37	53	64		16	**201**	93.0
Trimmed/ utilized flake					1		1	**2**	0.9
Flake talon fragment				1				**1**	0.5
Whole blade			2	4	4		1	**11**	5.1
Trimmed/ utilized blade	1							**1**	0.5
Subtotal	**1**	**31**	**39**	**58**	**69**		**18**	**216**	**100.0**
%	0.5	14.3	18.1	26.8	32.0		8.3	**100.0**	
+ **Unclassified debitage**									
Flake/ blade (~75%) **Subtotal**	**4**	**96**	**120**	**172**	**206**		**57**	**655**	
Angular fragment (100%) **Subtotal**		(98) **430**	(66) **251**	(372) **1348**	(286) **1249**	(0.5) **4**	(37) **181**	(859.5) **3463**	
Grand total	**5**	**557**	**410**	**1578**	**1524**	**4**	**256**	**4334**	
%	0.1	12.8	9.5	36.4	35.2	0.1	5.9	**100.0**	

*numbers in parenthesis are weight in grams

Table B9. Baura 1 Unit 3: shaped tool frequency

	Level									
Tool type	1	2	3	4	4a	4b	Feature 3	5	**Total**	%
Small convex scraper				2					**2**	1.5
Convex end scraper	3	4	3	3	1	4		2	**20**	15.4
Convex double end scraper	1								**1**	0.8
Convex end and side scraper		3	2	4		4		3	**16**	12.3
Convex side scraper		2	1	1	3			2	**9**	6.9
Convex double side scraper				4		4		5	**13**	10.0
Sundry end scraper			1	1					**2**	1.5
Sundry end and side scraper				1					**1**	0.8
Sundry side scraper			3		2				**5**	3.9
Sundry double side scraper	2								**2**	1.5
Concave scraper			7	2	1	1		4	**15**	11.5
Concavity			2	1	6				**9**	6.9
Notch	1								**1**	0.8
Sundry combination scraper				1					**1**	0.8
Crescent					7			1	**8**	6.1
Curve backed piece				1					**1**	0.8
Straight-backed piece				1					**1**	0.8
Oblique truncation	1								**1**	0.8
Backed *percoir*	1		3		2				**6**	4.6
Concave backed piece				1	5				**6**	4.6
Outil écaillés		2	2			5		1	**10**	7.7
Total	**9**	**11**	**24**	**23**	**27**	**18**		**18**	**130**	**100.0**
%	6.9	8.5	18.5	17.7	20.8	13.8		13.8	**100.0**	

Table B10. Baura 1 Unit 3: frequency of major shaped tool categories

	Level									
Tool type	1	2	3	4	4a	4b	Feature 3	5	**Total**	%
Scraper	7	9	19	20	13	13		16	**97**	74.6
Backed piece	2		3	3	14			1	**23**	17.7
Outil ècaillès		2	2			5		1	**10**	7.7
Total	**9**	**11**	**24**	**23**	**27**	**18**		**18**	**130**	**100.0**

Table B11. Baura 1 Unit 3: core frequency

Core type	Level									
Classified Cores (~25%)	1	2	3	4	4a	4b	Feature 3	5	**Total**	%
Divers single platform core	2	2		1	14			4	**23**	20.0
Single platform core scraper	1								**1**	0.9
Opposed double platform core	1	1		3	3	1		1	**10**	8.7
Adjacent double platform core	1		1		3	1		2	**8**	6.9
Multiple platform core	1		1	2	3				**7**	6.1
Platform peripheral core								1	**1**	0.9
Bipolar core	1	2	2	3	47	1		7	**63**	54.8
Amorphous core					2				**2**	1.7
Subtotal	**7**	**5**	**4**	**9**	**72**	**3**		**15**	**115**	**100.0**
%	6.1	4.4	3.5	7.8	62.6	2.6		13.0	**100.0**	
+										
Unclassified cores (~75%) (Subtotal)	**22**	**14**	**12**	**28**	**215**	**9**		**43**	**343**	
Grand total	**29**	**19**	**16**	**37**	**287**	**12**		**58**	**458**	
%	6.0	4.0	3.0	8.0	63.0	3.0		13.0	**100.0**	

Table B12. Baura 1 Unit 3: debitage frequency

Debitage type	Level									
Classified flakes/blades (~25%)	1	2	3	4	4a	4b	Feature 3	5	**Total**	%
Whole flake	12	16	9	24	88	11	1	26	**187**	87.0
Trimmed/utilized flake		1	3	1	6	5		2	**18**	8.4
Flake talon fragment								1	**1**	0.4
Whole blade	1	2	2	2	2				**9**	4.2
Subtotal	**13**	**19**	**14**	**27**	**96**	**16**	**1**	**29**	**215**	**100.0**
%	6.0	8.8	6.5	12.6	44.7	7.4	0.5	13.5	**100.0**	
+ **Unclassified debitage**										
Flake/blade (~75%) **(Subtotal)**	**41**	**55**	**43**	**80**	**291**	**49**	**1**	**87**	**647**	
Angular fragment (100%) **(Subtotal)**	(89) **326**	(185) **647**	(76) **318**	(57) **203**	(847) **1886**	(27) **105**	(3) **11**	(55) **216**	(1339) **3712**	
Grand total	**380**	**721**	**375**	**310**	**2273**	**170**	**13**	**332**	**4574**	
%	8.3	15.8	8.2	6.8	49.7	3.7	0.3	7.2	**100.0**	

*numbers in parenthesis are weight in grams

Table B13. Baura 1 Unit 4: shaped tool frequency

	Level						
Tool type	1	2	3	4	5	**Total**	%
Concave scraper					1	**1**	11.1
Convex side and concave combination scraper					1	**1**	11.1
Trapeze					1	**1**	11.1
Straight-backed piece			1			**1**	11.1
Oblique truncation				1	1	**2**	22.2
Unifacial point					3	**3**	33.3
Total			**1**	**1**	**7**	**9**	**100.0**
%			11.1	11.1	77.8	**100.0**	

Table B14. Baura 1 Unit 4: frequency of major shaped tool categories

	Level						
Tool type	1	2	3	4	5	**Total**	%
Scraper					2	**2**	22.2
Backed piece			1	1	2	**4**	44.4
Point					3	**3**	33.3
Total			**1**	**1**	**7**	**9**	**100.0**

Table B15. Baura 1 Unit 4: core frequency

Core type							
Classified cores	Level						
(~25%)	1	2	3	4	5	**Total**	%
Pyramidal single platform core					1	**1**	4.4
Divers single platform core				1	2	**3**	13.0
Opposed double platform core					4	**4**	17.4
Adjacent double platform core					1	**1**	4.4
Bipolar core			3	5	6	**14**	60.8
Subtotal			**3**	**6**	**14**	**23**	**100.0**
%			13.0	26.1	60.9	**100.0**	
+							
Unclassified cores (~75%) (Subtotal)			**9**	**16**	**41**	**66**	
Grand total			**12**	**22**	**55**	**89**	
%			13.5	24.7	61.7	**100.0**	

Table B16. Baura 1 Unit 4: debitage frequency

Debitage type	Level						
Classified flakes/blades (~25%)	1	2	3	4	5	**Total**	%
Whole flake			6	9	22	**37**	86.0
Trimmed/utilized flake				2		**2**	4.7
Whole blade			1	1	2	**4**	9.3
Subtotal			**7**	**12**	**24**	**43**	**100.0**
%			16.3	27.9	55.8	**100.0**	
+ **Unclassified debitage**							
Flake/ blade (~75%) **(Subtotal)**			21	36	69	**126**	
Angular fragment (100%) **(Subtotal)**			(6) **19**	(12) **53**	(50) **220**	(68) **292**	
Grand total			**47**	**101**	**313**	**461**	
%			10.2	21.9	67.7	**100.0**	

*numbers in parenthesis are weight in grams

Table B17. Lusangi 1 Unit 1: shaped tool frequency

	Level																
Tool type	Surface	1	2	3	F. 1	4	5	6	7	8	9	10	11	12	13	**Total**	%
Small convex scraper						3	3		4			2				**12**	7.1
Convex end scraper			1			4		3					3	3		**14**	8.2
Convex double end scraper						3	2			3	2		4	4		**18**	10.6
Convex end and side scraper						1	5		3	5	6	3	3			**26**	15.3
Convex side scraper					1	7	6	3	2		4					**23**	13.5
Convex double side scraper						5		4	3	6		2	5	5		**30**	17.6
Sundry side scraper													1			**1**	0.6
Concave scraper						1										**1**	0.6
Crescent							1	2	1	2	5	6	3	1		**21**	12.3
Straight-backed piece					1											**1**	0.6
Backed *percoir*					1		1									**2**	1.2
Angle burin								1								**1**	0.6
Outil ecailles						4	4	3		5	3			1		**20**	11.8
Total			**1**		**3**	**28**	**22**	**16**	**13**	**21**	**20**	**13**	**19**	**14**		**170**	**100.0**
%			0.6		1.8	16.5	12.9	9.4	7.6	12.4	11.8	7.6	11.2	8.2		**100.0**	

Abbreviations: F.1 = Feature 1

Table B18. Lusangi 1 Unit 1: frequency of major shaped tool categories

Tool type	Level																
	Surface	1	2	3	F. 1	4	5	6	7	8	9	10	11	12	13	**Total**	%
Scraper			1		1	24	16	10	12	14	12	7	16	12		**125**	73.5
Backed piece					2		2	2	1	2	5	6	3	1		**24**	14.1
Burin								1								**1**	0.6
Outil écaillés						4	4	3		5	3			1		**20**	11.8
Total			**1**		**3**	**28**	**22**	**16**	**13**	**21**	**20**	**13**	**19**	**14**		**170**	**100.0**

Abbreviations: F.1 = Feature 1

Table B19. Lusangi 1 Unit 1: core frequency

Core type																	
Classified	Level																
cores (~25%)	Surface	1	2	3	F. 1	4	5	6	7	8	9	10	11	12	13	**Total**	%
Part peripheral core										1						**1**	0.8
Radial core			1													**1**	0.8
Divers single platform core						4	6	1		3	1	1	1	1	1	**19**	14.5
Opposed double platform core			2	2	1	1	2	3	2	6	2	2		6		**29**	22.1
Adjacent double platform core						2	5				1					**8**	6.1
Multiple platform core						1	1		4		1	2		1		**10**	7.6
Bipolar core		1	2	3	1	12	11	3	8	8	3	3	3		3	**61**	46.6
Amorphous core						2										**2**	1.5
Subtotal		**1**	**5**	**5**	**2**	**22**	**25**	**7**	**14**	**18**	**8**	**8**	**4**	**8**	**4**	**131**	**100.0**
%		0.8	3.8	3.8	1.5	16.8	19.1	5.3	10.7	13.7	6.1	6.1	3.1	6.1	3.1	**100.0**	
+																	
Unclassified cores (~75%) (Subtotal)		**4**	**15**	**14**	**6**	**65**	**76**	**19**	**42**	**59**	**22**	**24**	**11**	**23**	**12**	**392**	
Grand total		**5**	**20**	**19**	**8**	**87**	**101**	**26**	**56**	**77**	**30**	**32**	**15**	**31**	**16**	**523**	
%		1.0	3.8	3.6	1.5	16.6	19.3	5.0	10.7	14.7	5.7	6.1	2.9	5.9	3.1	**100.0**	

Abbreviations: F.1 = Feature 1

Table B20. Lusangi 1 Unit 1: debitage frequency

Debitage type	Level															
Classified flakes/ blades (~25%)	Surface	1	2	3	F. 1	4	5	6	7	8	9	10	11	12	13	**Total**	%
Whole flake	1	1	3	4	1	16	27	19	45	45	40	52	26	35	21	**336**	84.6
Trimmed/ utilized flake							2			2	2					**6**	1.5
Flake talon fragment				1												**1**	0.3
Whole blade			1	1		6	1	2	6	4	4	6	11	8	4	**54**	13.6
Subtotal	**1**	**1**	**4**	**6**	**1**	**22**	**30**	**21**	**51**	**51**	**46**	**58**	**37**	**43**	**25**	**397**	**100.0**
%	0.3	0.3	1.0	1.5	0.3	5.5	7.6	5.3	12.8	12.8	11.6	14.6	9.3	10.8	6.3	**100.0**	
+ **Unclassified debitage**																	
Flake/ Blade (~75%) **Subtotal**		**3**	**11**	**19**	**1**	**67**	**88**	**62**	**154**	**156**	**139**	**171**	**112**	**132**	**75**	**1190**	
Angular fragment (100%) **(Subtotal)**	(2) **5**	(3) **12**	(15) **69**	(5) **25**	(1) **6**	(23) **101**	(13) **57**	(17) **88**	(49) **207**	(50) **220**	(42) **156**	(42) **170**	(25) **98**	(67) **281**	(10) **44**	**(464) 1539**	
Grand total	**6**	**16**	**84**	**50**	**8**	**190**	**175**	**171**	**412**	**427**	**341**	**399**	**247**	**456**	**144**	**3126**	
%	0.2	0.5	2.7	1.6	0.2	6.1	5.6	5.5	13.2	13.6	10.9	12.8	7.9	14.6	4.6	**100.0**	

*numbers in parenthesis are weight in grams.   Abbreviations: F.1 = Feature 1

Table B21. Lusangi 1 Unit 2: core frequency

Core type	Level 1	2	3	4	5	6	Total	%
Pyramidal single platform core				1			**1**	7.1
Bipolar core			1	5	2		**8**	57.1
Opposed double platform core				1	1		**2**	14.3
Adjacent double platform core					2		**2**	14.3
Multiple platform core				1			**1**	7.1
Total			**1**	**8**	**5**		**14**	**~ 100.0**
%			7.0	57.0	36.0		**100.0**	

Table B22. Lusangi 1 Unit 2: debitage frequency

Debitage type **Classified flakes/blades (100%)**	Level 1	2	3	4	5	6	Total	%
Whole flake	2	2	1	7	5		**17**	94.4
Whole blade					1		**1**	5.6
Subtotal	**2**	**2**	**1**	**7**	**6**		**18**	**100.0**
%	11.0	11.0	5.6	38.9	33.3		**100.0**	
+ **Unclassified debitage**								
Angular fragment (100%) **(Subtotal)**					(2) **8**		(2) **8**	
Grand total	**2**	**2**	**1**	**7**	**14**		**26**	
%	7.7	7.7	3.8	26.9	53.8		**~ 100.0**	

*numbers in parenthesis are weight in grams

Table B23. Lusangi 1 Unit 3: core frequency

Core type	Level 1	2	3	4	5	Total	%
Bipolar core	3	6				**9**	81.8
Opposed double platform core	1	1				**2**	18.2
Total	**4**	**7**				**11**	**100.0**
%	36.4	63.6				**100.0**	

Table B24. Lusangi 1 Unit 3: debitage frequency

Debitage type **Classified flakes/blades (100%)**	Level 1	2	3	4	5	Total	%
Whole flake	2	2	6	1	1	**12**	92.3
Whole blade		1				**1**	7.7
Subtotal	**2**	**3**	**6**	**1**	**1**	**13**	**100.0**
%	15.4	23.1	46.1	7.7	7.7	**100.0**	
+ **Unclassified debitage**							
Angular fragment (100%) **(Subtotal)**	(3.5) **10**	(1.3) **10**			(1) **1**	(5.8) **21**	**61.8**
Grand total	**12**	**13**	**6**	**1**	**2**	**34**	**100.0**
%	35.3	38.2	17.7	2.9	5.9	**100.0**	

*numbers in parenthesis are weight in grams

Table B25. Markasi Lusangi 2 Unit 1: core frequency

	Level											
Core type	Surface	1	2	3	4	5	6	7	8	9	**Total**	%
Radial core					1						**1**	5.6
Bipolar core	1		3		2	1		1	2		**10**	55.5
Opposed double platform core			2		1			1	1		**5**	27.7
Adjacent double platform core									1		**1**	5.6
Adjacent double platform core scraper			1								**1**	5.6
Total	**1**		**6**		**4**	**1**		**2**	**4**		**18**	**100.0**
%	5.6		33.3		22.2	5.6		11.1	22.2		**100.0**	

Table B26. Markasi Lusangi 2 Unit 1: debitage frequency

Debitage Type												
Classified flakes/ blades (100%)	Level											
	Surface	1	2	3	4	5	6	7	8	9	**Total**	%
Whole flake		3	7	9	13	3	1	8	7	1	**52**	81.2
Whole blade			1	2	7	1		1			**12**	18.8
Subtotal		**3**	**8**	**11**	**20**	**4**	**1**	**9**	**7**	**1**	**64**	**100.0**
%		4.7	12.5	17.2	31.2	6.2	1.6	14.1	10.9	1.6	**100.0**	
+ **Unclassified debitage**												
Angular fragment (100%) (**Subtotal**)			(2) **5**	(3) **16**	(1) **6**			(1) **4**	(0.3) **3**		(7.3) **34**	
Grand total		**3**	**13**	**27**	**26**	**4**	**1**	**13**	**10**	**1**	**98**	
%		3.1	13.3	27.5	26.5	4.1	1.0	13.3	10.2	1.0	**100.0**	

*numbers in parenthesis are weight in grams

Table B27. Markasi Lusangi 2 Unit 2: core frequency

	Level													
Core type	1	2	3	4	5	6	7	8	9	10	11	12	**Total**	%
Divers single platform core		1		1					1		1		**4**	11.4
Opposed double platform core				1					2		1	1	**5**	14.3
Adjacent double platform core										1			**1**	2.8
Multiple platform core											1		**1**	2.8
Bipolar core	2	1		2			1	4	5	1	5	3	**24**	68.6
Total	**2**	**2**		**4**			**1**	**4**	**8**	**2**	**8**	**4**	**35**	**~ 100.0**
%	5.7	5.7		11.4			2.9	11.4	22.9	5.7	22.9	11.4	**100.0**	

Table B28. Markasi Lusangi 2 Unit 2: debitage frequency

Debitage type	Level													
Classified flakes/blades (100%)	1	2	3	4	5	6	7	8	9	10	11	12	**Total**	%
Whole flake	3	7	2	23	11	7	3	14	25	1	4	12	**112**	91.8
Flake talon fragment		2											**2**	1.6
Whole blade				3	1			2	1	1			**8**	6.6
Subtotal	**3**	**9**	**2**	**26**	**12**	**7**	**3**	**16**	**26**	**2**	**4**	**12**	**122**	**100.0**
%	2.5	7.4	1.6	21.3	9.8	5.7	2.5	13.1	21.3	1.6	3.3	9.8	**100.0**	
+ **Unclassified debitage**														
Angular fragment (100%) **(Subtotal)**				(3) **16**	(0.1) **2**	(0.5) **5**	(0.7) **4**	(1.1) **4**	(1.5) **7**	(1) **8**	(1) **7**	(1.8) **11**	**(10.7) 64**	
Total	**3**	**9**	**2**	**42**	**14**	**12**	**7**	**20**	**33**	**10**	**11**	**23**	**186**	
%	1.6	4.8	1.1	22.6	7.5	6.4	3.8	10.8	17.7	5.4	5.9	12.4	**100.0**	

*numbers in parenthesis are weight in grams

Table B29. Markasi Lusangi 2 Unit 3 (Rock Shelter P1): shaped tool frequency

	Layer				
Tool type	1	2	3	**Total**	%
Small convex scraper		3	2	**5**	3.2
Convex end scraper	6	4	3	**13**	8.3
Convex double end scraper	4	6	3	**13**	8.3
Convex end and side scraper	7	4		**11**	7.1
Convex side scraper	4	5	7	**16**	10.3
Convex double side scraper	3	7	6	**16**	10.3
Sundry end scraper	1			**1**	0.6
Crescent	16	30	3	**49**	31.4
Curve backed piece	9	5	1	**15**	9.6
Straight-backed piece		2		**2**	1.3
Oblique truncation		1	1	**2**	1.3
Backed *percoir*	1	2	1	**4**	2.6
Concave backed piece		1		**1**	0.6
Divers backed piece	1			**1**	0.6
Unifacial point		1		**1**	0.6
Outil écaillés	2		4	**6**	3.9
Total	**54**	**71**	**31**	**156**	**100.0**
%	34.6	45.5	19.9	**100.0**	

Table B30. Markasi Lusangi 2 Unit 3 (Rock Shelter P1):
frequency of major shaped tool categories

	Layer				
Tool type	1	2	3	**Total**	%
Scraper	25	29	21	**75**	48.1
Backed piece	27	41	6	**74**	47.4
Point		1		**1**	0.6
Outil écaillés	2		4	**6**	3.9
Total	**54**	**71**	**31**	**156**	**100.0**

Table B31. Markasi Lusangi 2 Unit 3 (Rock shelter): core frequency

Core type					
	Layer				
Classified cores (~10%)	1	2	3	**Total**	%
Divers single platform core	3	4		**7**	14.0
Opposed double platform core	5	4	2	**11**	22.0
Adjacent double platform core		1	2	**3**	6.0
Multiple platform core	2			**2**	4.0
Bipolar core	4	20	3	**27**	54.0
Subtotal	**14**	**29**	**7**	**50**	**100.0**
%	28.0	58.0	14.0	**100.0**	
+					
Unclassified cores (~90%) **(Subtotal)**	**123**	**270**	**60**	**453**	
Grand total	**137**	**299**	**67**	**503**	
%	27.2	59.4	13.3	**~ 100.0**	

Table B32. Markasi Lusangi 2 Unit 3 (Rock shelter): debitage frequency

Debitage type					
	Layer				
Classified flakes/blades (~10%)	1	2	3	**Total**	%
Whole flake	153	236	41	**430**	82.7
Trimmed/utilized flake	6	13	6	**25**	4.8
Whole blade	27	35	3	**65**	12.5
Total	**186**	**284**	**50**	**520**	**100.0**
%	35.8	54.6	9.6	**100.0**	
+ **Unclassified debitage**					
Flake/Blade (~90%) **(Subtotal)**	**1682**	**2556**	**456**	**4694**	
Angular fragment (100%) **(Subtotal)**	(351) **1575**	(608) **3132**	(65) **316**	(1024) **5023**	
Grand total	**3443**	**5972**	**822**	**10,237**	
%	33.63	58.34	8.03	**100.0**	

*numbers in parenthesis are weight in grams

Table B33. Markasi Lusangi 2 Unit 4: core frequency

Core type	Level							
	1	2	3	4	5	6	**Total**	%
Divers single platform core		1	2				**3**	9.4
Opposed double platform core			7	4			**11**	34.4
Adjacent double platform core				1	1		**2**	6.2
Multiple platform core			1				**1**	3.1
Bipolar core		2	6	5	2		**15**	46.9
Total		**3**	**16**	**10**	**3**		**32**	**100.0**
%		9.4	50.0	31.2	9.4		**100.0**	

Table B34. Markasi Lusangi 2 Unit 4: debitage frequency

Debitage type								
Classified flakes/blades (100%)	Level							
	1	2	3	4	5	6	**Total**	%
Whole flake		10	45	76	10	8	**149**	89.8
Whole blade		3	4	10			**17**	10.2
Subtotal		**13**	**49**	**86**	**10**	**8**	**166**	**100.0**
%		7.8	29.5	51.8	6.0	4.8	**100.0**	
+ **Unclassified debitage**								
Angular fragment (100%) **(Subtotal)**			(13) **60**	(16) **60**	(2) **7**	(1) **3**	(32) **130**	
Grand total		**13**	**109**	**146**	**17**	**11**	**296**	
%		4.4	36.8	49.3	5.7	3.7	**~ 100.0**	

* numbers in parenthesis are weight in grams

Table B35. Lusangi 3 Unit 1: core frequency

	Level											
Core type	1	2	3	4	5	6	7	8	9	10	**Total**	%
Bipolar core	2			4	1	1	1				**9**	60.0
Opposed double platform core				1	1				2		**4**	26.7
Multiple platform core					1	1					**2**	13.3
Total	**2**			**5**	**3**	**2**	**1**		**2**		**15**	**100.0**
%	13.3			33.3	20.0	13.3	6.7		13.3		**100.0**	

Table B36. Lusangi 3 Unit 1: debitage frequency

Debitage type	Level											
Classified Flakes/ Blades (100%)	1	2	3	4	5	6	7	8	9	10	**Total**	%
Whole flake	2	1	1	18	15	17	11	3	11	6	**85**	85.9
Flake talon fragment						3	1				**4**	4.0
Whole blade			1	4		1			1	3	**10**	10.1
Subtotal	**2**	**1**	**2**	**22**	**15**	**21**	**12**	**3**	**12**	**9**	**99**	**100.0**
%	2.0	1.0	2.0	22.2	15.2	21.2	12.2	3.0	12.1	9.1	**100.0**	
+ **Unclassified debitage**												
Angular fragment (100%) (**Subtotal**)			(0.4) **2**	(0.4) **4**	(1.4) **13**	(3.2) **23**	(0.4) **4**	(0.8) **7**	(1.4) **12**		(8.0) **65**	
Grand total	**2**	**1**	**4**	**26**	**28**	**44**	**16**	**10**	**24**	**9**	**164**	
%	1.2	0.6	2.4	15.9	17.1	26.8	9.8	6.1	14.6	5.5	**100.0**	

*numbers in parenthesis are weight in grams

Appendix C: Mean Dimensions in mm, Standard Deviations and Form Ratios of Lithic Artifacts From Pahi Sites

Table C1. Mean dimensions in mm, standard deviations and form ratios of scrapers from Baura 1 LSA/IA Levels (Unit 2 Levels 1-4, Unit 3 Levels 1- 4a, Unit 4 Levels 3-5)

Scraper type	#	Length	Range	Breadth	Range	Thickness	Range	B/L Ratio
Small convex	7	16.8±3.7	9-20	12.3±3.6	5-14	6.0±3.3	2-12	.73
Convex end	27	25.2±6.3	21-49	16.4±8.3	6-47	5.8±4.3	3-23	.65
Convex double end	1	23.0	-	16.0	-	4.0	-	.70
Convex end and side	27	27.5±3.6	22-33	16.8±32	13-26	6.3±1.4	3-8	.61
Circular	1	9.0	-	7.0	-	2.0	-	.78
Nosed end	1	18.0	-	17.0	-	8.0	-	.94
Convex side	36	25.8±3.6	22-30	13.3±6.1	7-27	4.6±1.9	2-9	.52
Convex double side	11	23.0±4.4	21-34	12.5±4.1	8-22	6.1±2.1	4-10	.54
Sundry end	3	32.0±5.5	27-38	15.5±1.5	14-17	6.3±1.5	5-8	.48
Sundry end and side	1	22.0	-	20.0	-	8.0	-	.91
Sundry side	12	24.5±7.7	16-41	18.2±6.6	10-34	7.8±2.6	5-13	.74
Sundry double side	3	15.7±4	12-20	12.7±3.2	9-15	4.0±1	3-5	.81
Concave	22	21.1±7.9	10-40	16.9±6.2	6-34	7.1±2.6	4-13	.80
Concavity	9	22.2±5.2	14-30	16.6±6.2	8-27	7.6±2.1	4-10	.75
Notch	1	13.0	-	12.0	-	3.0	-	.92
Sundry Combination	1	32.0	-	25.0	-	7.0	-	.78
Convex side and concave combination	1	33.0	-	44.0	-	14.0	-	1.33

Table C2. Mean dimensions in mm, standard deviations and form ratios of scrapers from Baura 1 LSA Levels (Unit 1 Levels 1-5, Unit 2 Level 5 and Unit 3 Levels 4b - 5)

Scraper type	#	Length	Range	Breadth	Range	Thickness	Range	B/L Ratio
Convex end	12	27.5±2.8	24-33	14.0±2.5	11-17	4.2±2.1	2-6	.51
Convex double end	2	25.0±4.2	22-28	20.5±13.4	11-30	6.0±4.2	3-9	.82
Convex end and side	23	24.1±7.5	21-39	14.2±4.2	9-23	5.4±1.4	4-8	.58
Convex side	18	23.9±2.6	21-28	12.3±3.2	9-20	6.0±1.8	3-9	.51
Convex double side	19	25.1±1.9	22-28	19.7±9.6	10-39	6.5±2.4	4-11	.78
Sundry side	1	25.0	-	23.0	-	4.0	-	.92
Concave	12	21.0±6.8	10-36	16.4±9.5	7-42	6.75±3.6	2-14	.78
Concavity	2	19.5±0.7	19-20	17.0±1.4	16-18	7.5±3.5	5-10	.87

Table C3. Mean dimensions in mm, standard deviations and form ratios of scrapers from Lusangi 1 LSA/IA Levels (Unit 1 Levels 1-4)

Scraper type	#	Length	Range	Breadth	Range	Thickness	Range	B/L Ratio
Small convex	3	17.0±2	15-19	9.3±3.2	7-13	4.0±1	3-5	.55
Convex end	5	29.4±4	26-36	16.2±5.9	11-25	7.4±4.4	4-15	.55
Convex double end	3	25±2.6	22-27	20.3±4.2	17-25	7.7±0.6	7-8	.81
Convex end and side	1	22.0	-	12.0	-	3.0	-	54
Convex side	8	25.0±4	21-31	13.3±3.2	7-17	5.4±1.1	4-7	.53
Convex double side	5	29.0±7.1	22-38	12.6±2.3	9-15	4.6±2.1	2-7	.43
Concave	1	12.0	-	14.0	-	5.0	-	1.2

Table C4. Mean dimensions in mm, standard deviations and form ratios of scrapers from Lusangi 1 LSA Levels (Unit 1 Levels 5 - 13)

Scraper type	#	Length	Range	Breadth	Range	Thickness	Range	B/L Ratio
Small convex	9	15.9±2.8	11-20	12.0±1.8	9-15	5.6±0.9	4-7	.75
Convex end	9	34.8±7.3	23-45	25.0±5	21-33	13.7±4.5	10-25	.72
Convex double end	15	22.4±1.6	21-31	17.0±1.5	12-22	7.4±1.7	4-9	.76
Convex end and side	25	27.8±2.3	22-34	19.2±1.9	17-22	7.3±1.6	5-9	.69
Convex side	15	23.8±3.7	21-35	17.0±2.4	13-21	8.2±1.7	6-12	.74
Convex double side	25	23.9±3.5	21-36	17.5±2.3	12-22	10.3±2.8	6-15	.73
Sundry side	1	29.0	-	20.0	-	11.0	-	68

Table C5. Mean dimensions in mm, standard deviations and form ratios of scrapers from Markasi Lusangi 2 LSA/IA Levels (Unit 3 Layer 1-2)

Scraper type	#	Length	Range	Breadth	Range	Thickness	Range	B/L Ratio
Small convex	3	18.3±1.5	17-20	15.0±1	14-16	6.7±2.1	5-9	.82
Convex end	10	22.2±1.1	21-24	16.5±2.3	12-19	6.3±1.3	5-9	.74
Convex double end	10	23.6±3.9	21-34	16.9±2.9	12-21	8.7±3.6	4-16	.72
Convex end and side	11	22.9±3.3	21-32	17.7±2.8	14-23	8.1±1.9	5-12	.77
Convex side	9	24.8±4.5	21-35	15.2±5	9-22	6.3±2.7	3-11	.61
Convex double side	10	24.1±2.4	22-28	17.8±2	15-21	7.3±1.8	5-10	.74
Sundry end	1	18.0	-	10.0	-	3.0	-	.56

Table C6. Mean dimensions in mm, standard deviations and form ratios of scrapers from Markasi Lusangi 2 LSA Levels (Unit 3 Layer 3)

Scraper type	#	Length	Range	Breadth	Range	Thickness	Range	B/L Ratio
Small convex	2	17.5±2.1	16-19	17.0±1.4	16-18	5.5±0.7	5-6	.97
Convex end	3	23.0±2	21-25	17.0±2	15-19	8.0±2.6	5-10	.74
Convex double end	3	24.3±3.2	22-28	16.3±1.2	15-17	9.0±3	6-12	.67
Convex side	7	23.6±2	21-26	18.1±1.3	16-20	7.4±1.3	5-9	.77
Convex double side	6	23.1±1.9	22-27	17.8±2.1	14-20	7.3±2.1	5-10	.77

Table C7. Mean dimensions in mm, standard deviations and form ratios of backed pieces from Baura 1 LSA/IA Levels (Unit 2 Levels 1-4, Unit 3 Levels 1- 4a, Unit 4 Levels 3-5)

Type of backed piece	#	Length	Range	Breadth	Range	Thickness	Range	B/L Ratio
Crescent	12	19.2±2.4	16-24	12.1±1.5	10-14	5.3±1.8	3-9	.63
Trapeze	1	17.0	-	15.0	-	8.0	-	.88
Curved	2	19.5±0.7	19-20	19.5±12	11-28	5.5±3.5	3-8	1.0
Straight	2	18.0±1.4	17-19	13.5±3.5	11-16	5.0±0.0	0.0	.75
Oblique truncation	3	26.3±8.5	20-36	16.7±1.2	16-18	7.7±1.2	7-9	.63
Awl/drill/*percoir*	13	18.8±8.3	12-43	11.9±7.1	4-28	5.3±2.1	3-10	.63
Concave	8	19.6±5.8	12-28	14.0±2.8	10-18	6.5±1.7	4-9	.71

Table C8. Mean dimensions in mm, standard deviations and form ratios of backed pieces from Baura 1 LSA Levels (Unit 1 Levels 1- 5, Unit 2 Level 5, Unit 3 Levels 4b - 5)

Type of backed piece	#	Length	Range	Breadth	Range	Thickness	Range	B/L Ratio
Crescent	10	18.5±6.8	13-34	9.3±3.1	6-17	4.3±1.8	3-9	.50
Triangle	1	14.0	-	11.0	-	3.0	-	.79
Curved	2	22±2.8	20-24	14.5±7.8	9-20	5.0±2.8	3-7	.66
Straight	3	17.7±6.7	12-25	13.3±2.3	12-16	5.3±1.5	4-7	.75
Angle	1	28.0	-	18.0	-	9.0	-	.64
Divers	2	22.5±4.9	19-26	11.0±4.2	8-14	6.5±0.7	6-7	.49
Awl/drill/*percoir*	1	25.0	-	17.0	-	8.0	-	.68
Concave	2	21.5±3.5	19-24	16.5±4.2	13-19	6.5±0.7	6-7	.77

Table C9. Mean dimensions in mm, standard deviations and form ratios of backed pieces from Lusangi 1 LSA/IA Levels (Unit 1 Levels 1-4)

Type of backed piece	#	Length	Range	Breadth	Range	Thickness	Range	B/L Ratio
Straight	1	13	-	7	-	6	-	.54
Awl/drill/*percoir*	1	13	-	6	-	6	-	.46

Table C10. Mean dimensions in mm, standard deviations and form ratios of backed pieces from Lusangi 1 LSA Levels (Unit 1 Levels 5-13)

Type of backed piece	#	Length	Range	Breadth	Range	Thickness	Range	B/L Ratio
Crescent	21	21.2±4.2	14-27	12.3±3.1	8-18	4.8±1.8	2-3	.58
Awl/drill/*percoir*	1	14.0	-	8.0	-	6.0	-	.57

Table C11. Mean dimensions in mm, standard deviations and form ratios of backed pieces from Markasi Lusangi 2 LSA/IA Levels (Unit 3 Layers 1-2)

Type of backed piece	#	Length	Range	Breadth	Range	Thickness	Range	B/L Ratio
Crescent	46	16.3±3.3	11-24	9.9±2.3	6-16	3.9±1.3	2-8	.61
Curved	14	20.4±4.3	14-27	14.5±3.2	9-20	5.8±2.5	3-11	.71
Straight	2	17.0±1.4	16-18	11.5±4.9	8-15	4.0±1.4	3-5	.68
Oblique truncation	1	19.0	-	11.0	-	4.0	-	.58
Divers	1	29.0	-	25.0	-	10.0	-	.86
Awl/drill/*percoir*	3	19.0±2	17-21	9.3±1.5	8-11	4.7±2.1	3-7	.49
Concave	1	23.0	-	16.0	-	4.0	-	.70

Table C12. Mean dimensions in mm, standard deviations and form ratios of backed pieces from Markasi Lusangi 2 LSA Levels (Unit 3 Layer 3)

Type of backed piece	#	Length	Range	Breadth	Range	Thickness	Range	B/L Ratio
Crescent	3	16.3±2.5	14-19	9.7±1.2	9-11	3.0±0.0	0.0	.60
Curved	1	19.0	-	13.0	-	4.0	-	.68
Oblique truncation	1	19.0	-	9.0	-	3.0	-	.47
Awl/drill/*percoir*	1	21.0	-	17.0	-	9.0	-	.81

Table C13. Mean dimensions in mm, Standard deviations and form Ratios of *outil écaillés* from Baura 1, Lusangi 1 and Markasi Lusangi 2

Site and component affiliation	#	Length	Range	Breadth	Range	B/L Ratio
Baura 1 LSA/IA Levels	12	20.6±.3.6	14-26	15.8±1.3	14-18	.77
Baura 1 LSA Levels	17	21.6±6.7	15-38	17.3±3.1	13-24	.80
Lusangi 1 LSA/IA Levels	4	21.5±6.8	15-31	18.8±4.9	14-25	.87
Lusangi 1 LSA Levels	16	24.7±6.9	16-40	19.9±4.9	17-30	.81
Markasi Lusangi 2 LSA/IA Levels	2	18.0±1.4	17-19	16.0±1.4	15-17	.89
Markasi Lusangi 2 LSA Levels	4	28.8±6.8	21-35	23.5±7.0	16-30	.82

Table C14. Mean dimensions in mm, standard deviations and form ratios of cores from Baura 1 and 3 LSA/IA Levels (Baura 1: Unit 2 Levels 1-4, Unit 3 Levels 1- 4a, Unit 4 Levels 3-5; Baura 3: Unit 1 Level 1-3)

Core type	#	Length	Range	Breadth	Range	B/L Ratio
Pyramidal single platform	1	23.0	-	18.0	-	.78
Divers single platform	55	28.2±7.2	17-49	23.1±4.2	15-33	.82
Single platform/scraper	1	34.0	-	26.0	-	.76
Opposed double platform	21	25.2±8.3	15-52	17.7±4.5	11-34	70
Opposed double platform/scraper	1	29.0	-	20.0	-	.69
Adjacent double platform	19	32.7±5.3	18-45	27.4±3.6	13-32	.84
Multiple platform	14	32.1±4.7	20-51	25.1±3.4	15-38	.78
Platform/peripheral	1	28.0	-	21.0	-	.75
Bipolar	123	27.1±9.4	19-63	17.6±4.4	11-34	.76

Table C15. Mean dimensions in mm, standard deviations and form ratios of cores from Baura 1 LSA Levels (Unit 1 Levels 1-5, Unit 2 Level 5, Unit 3 Levels 4b-5)

Core type	#	Length	Range	Breadth	Range	B/L Ratio
Disc	1	29.0	-	20.0	-	.69
LeVallois	1	31.0	-	28.0	-	.90
Divers single platform	102	28.9±12.1	14-60	19.6±5.9	10-36	.68
Opposed double platform	43	24.4±6.7	15-54	17.8±4	11-31	.73
Adjacent double platform	48	28.9±5.3	20-50	24.5±4.7	16-39	.85
Adjacent double platform/scraper	3	37.3±6.7	33-45	25.0±2	25-27	.67
Multiple platform	26	32.6±75	19-49	23.3±3.4	18-32	.71
Platform/peripheral	7	32.4±9.1	25-52	24.9±6.8	18-36	.77
Bipolar	268	34.3±8.2	23-67	24.6±4.7	19-45	.72

Table C16. Mean dimensions in mm, standard deviations and form ratios of cores from Lusangi 1 and 3 LSA/IA Levels (Lusangi 1: Unit 1 Levels 1-4, Unit 2 Levels 1-6, Unit 3 Levels 1-3; Lusangi 3: Unit 1 Levels 1-4)

Core type	#	Length	Range	Breadth	Range	B/L Ratio
Radial/biconical	1	37.0	-	24.0	-	.65
Pyramidal single platform	1	25.0	-	17.0	-	.68
Divers single platform	4	27.0±1.8	25-29	21.8±1.7	20-24	.81
Opposed double platform	11	28.8±4.1	25-39	23.0±2.6	20-28	.80
Adjacent double platform	4	26.5±1.7	25-29	21.5±1	20-22	.81
Multiple platform	2	35.0±5.7	31-39	26.5±2.1	25-28	.76
Bipolar	42	30.4±6.9	24-49	24.0±4.1	19-35	.79

Table C17. Mean dimensions in mm, standard deviations and form ratios of cores from Lusangi 1, 3 and 4 LSA Levels (Lusangi 1: Unit 1 Levels 5-13; Lusangi 3: Unit 1 Levels 5-10, Lusangi 4: Unit 1 Level 3)

Core type	#	Length	Range	Breadth	Range	B/L Ratio
Part-peripheral	1	44.0	-	34.0	-	.77
Divers single platform	15	31.7±6.9	21-48	26.0±5.1	18-35	.82
Opposed double platform	26	29.0±6.2	22-47	24.7±5.6	16-36	.85
Adjacent double platform	6	28.0±6	22-40	27.0±6.5	18-35	.96
Multiple platform	11	26.0±3.5	21-34	21.1±36	16-28	.81
Bipolar	48	30.0±5	23-41	25.1±4.6	17-33	.84

Table C18. Mean dimensions in mm, standard deviations and form ratios of cores from Markasi Lusangi 2 LSA/IA Levels (Unit 1 Levels 1-3, Unit 2 Levels 1-4, Unit 3 Layers 1 and 2, Unit 4 Levels 1-4)

Core type	#	Length	Range	Breadth	Range	B/L Ratio
Divers single platform	12	28.3±7.7	18-44	23.4±5.5	16-31	.83
Opposed double platform	23	31.8±8.3	19-47	26.3±6.9	18-39	.83
Adjacent double platform	2	42.0±22.6	26-58	33.5±12	25-42	.80
Adjacent double platform/scraper	1	35.0	-	30.0	-	.86
Multiple platform	3	27.7±1.2	26-29	21.7±1.5	20-23	.78
Bipolar	46	30.6±8.2	18-51	25.8±6.7	17-43	.84

Table C19. Mean dimensions in mm, standard deviations and form ratios of cores from Markasi Lusangi 2 LSA Levels (Unit 1 Levels 4-9, Unit 2 Levels 5-12, Unit 3 Layer 3, Unit 4 Levels 5-6)

Core type	#	Length	Range	Breadth	Range	B/L Ratio
Radial/biconical	1	33.0	-	26.0	-	.79
Divers single platform	2	28.0±9.9	21-35	25.5±9.2	19-32	.91
Opposed double platform	9	31.2±7.7	23-46	26.0±6.2	19-38	.83
Adjacent double platform	5	26.2±4	22-33	21.6±2.7	19-26	.82
Multiple platform	1	29.0	-	25.0	-	.86
Bipolar	30	30.9±6.2	23-48	25.4±7.2	19-39	.82

Table C20. Mean dimensions in mm, standard deviations and form ratios of flakes/blades from Baura 1, 2 and 3 LSA/IA Levels (Baura 1: Unit 2 Levels 1-4, Unit 3 Levels 1- 4a, Unit 4 Levels 3-5; Baura 2 Unit 1 Level 5; Baura 3: Unit 1 Level 1-3)

Flake/Blade type	#	Length	Range	Breadth	Range	Thickness	Range	W/L Ratio
Whole flake	373	18.4±8.6	6-56	15.3±7.9	4-53	6.2±2.8	2-16	.83
Trimmed/utilized flake	14	19.6±4.3	13-27	19.6±5.5	11-29	6.9±2.1	4-10	1.0
Whole blade	24	20±6.3	12-39	9.1±2.9	6-19	4.9±1.3	2-7	.46
Trimmed/utilized blade	1	35.0	-	17.0	-	5.0	-	.49

Table C21. Mean dimensions in mm, standard deviations and form ratios of flakes/blades from Baura 1 LSA Levels (Unit 1 Levels 1-5, Unit 2 Level 5, Unit 3 Levels 4b-5)

Flake/Blade type	#	Length	Range	Breadth	Range	Thickness	Range	W/L Ratio
Whole flake	1074	15.0±5.9	5-58	12.5±5.4	3-48	5.0±2.3	1-17	.83
Trimmed/utilized flake	19	18.9±5.8	9-31	15.7±4.7	10-25	5.4±2	3-10	.83
Whole blade	106	18.2±5.8	10-31	8.0±2.7	4-14	4.0±1.7	2-8	.44

Table C22. Mean dimensions in mm, standard deviations and form ratios of flakes/blades from Lusangi 1, 3 and 4 LSA/IA Levels (Lusangi 1: Unit 1 Levels 1-4, Unit 2 Levels 1-6, Unit 3 Levels 1-3; Lusangi 3: Unit 1 Levels 1-4, Unit 2 Level 1 and Lusangi 4 Levels 1 -3)

Flake/Blade type	#	Length	Range	Breadth	Range	Thickness	Range	W/L Ratio
Whole flake	80	16.2±5.4	8-36	10.9±4.3	6-27	4.7±2.3	2-15	.67
Whole blade	15	16.4±2.1	14-20	7.1±1.4	5-10	4.1±1.3	2-7	.43

Table C23. Mean dimensions in mm, standard deviations and form ratios of flakes/blades from Lusangi 1, 3 and 4 LSA Levels (Lusangi 1: Unit 1 Levels 5-13; Lusangi 3: Unit 1 Levels 5-10 and Lusangi 4: Unit 1 Level 3)

Flake/Blade type	#	Length	Range	Breadth	Range	Thickness	Range	W/L Ratio
Whole flake	376	15.8±7.4	5-81	11.6±5.5	4-54	5.0±3	2-31	.73
Trimmed/utilized flake	6	16.7±3.8	12-21	14.8±4.6	8-19	4.8±2.4	3-9	.89
Whole blade	51	17.0±7.1	11-51	7.6±3	4-21	4.2±1.9	2-12	.45

Table C24. Mean dimensions in mm, standard deviations and form ratios of flakes/blades from Markasi Lusangi 2 LSA/IA Levels (Unit 1 Levels 1-3, Unit 2 Levels 1-4, Unit 3 Layers 1 and 2, Unit 4 Levels 1-4)

Flake/Blade type	#	Length	Range	Breadth	Range	Thickness	Range	W/L Ratio
Whole flake	574	16.5±5.1	7-41	12.4±4.5	4-33	4.7±2.3	1-20	.75
Trimmed/utilized flake	19	17.2±3.2	12-23	12.9±3.2	9-20	3.7±1.3	2-6	.75
Whole blade	85	19.2±5.4	10-38	8.2±2.8	4-20	3.9±1.5	2-9	.43

Table C25. Mean dimensions in mm, standard deviations and form ratios of flakes/blades from Markasi Lusangi 2 LSA Levels (Unit 1 Levels 4-9, Unit 2 Levels 5-12, Unit 3 Layer 3, Unit 4 Levels 5-6)

Flake/Blade type	#	Length	Range	Breadth	Range	Thickness	Range	W/L Ratio
Whole flake	169	15.6±5.3	6-29	12.3±3.7	5-23	4.2±2	2-14	.79
Trimmed/utilized flake	6	20.7±5.8	13-26	13.8±3.8	8-19	4.0±1.4	2-6	.67
Whole blade	17	16.6±3.8	10-25	7.2±2.1	4-12	4.1±2	2-10	.43

Appendix D: Pahi Pottery Decoration Motifs Distribution by STPs

Table D1. Distribution of pottery of various decoration motifs at Baura

STP	Decoration motif categories													
No.	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	1	0	1	0	1	0	1	0	0	1	0	0	0	1
3	3	1	0	1	0	0	0	0	0	0	0	0	0	0
4	8	1	1	1	1	0	1	0	1	0	0	0	0	0
5	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6	1	0	1	1	0	0	0	0	0	1	0	0	0	0
7	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10	1	1	0	1	1	0	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	2	1	0	1	0	1	0	1	0	2	0	0	0	0
15	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16	4	0	1	0	0	2	0	1	1	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18	7	0	0	0	1	0	0	1	2	0	0	0	0	0
19	2	2	1	0	0	0	0	1	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21	2	1	0	0	1	0	0	0	0	0	0	0	0	0
22	2	1	0	0	0	0	0	0	0	0	0	0	0	0
23	2	0	1	0	1	0	0	0	0	1	0	0	0	0
24	2	1	0	0	0	1	0	0	0	0	0	0	0	0
25	1	0	0	0	0	1	1	0	0	0	0	0	0	0
26	0	0	0	0	0	1	1	0	0	0	0	0	0	0
27	0	0	0	0	0	0	0	0	0	0	0	0	0	0
28	1	0	1	0	1	0	0	0	0	0	0	0	0	1
29	1	2	0	0	1	0	0	0	0	1	2	0	1	2
30	0	0	0	0	0	0	0	0	0	0	0	0	0	0
31	4	1	0	0	0	0	0	0	0	0	1	2	0	0
32	0	0	0	0	0	0	0	0	0	0	0	0	0	0
33	2	0	0	0	1	0	0	0	0	0	1	1	0	1
34	2	0	0	0	0	1	0	0	0	1	1	0	0	0
35	0	0	0	0	0	0	0	0	0	0	0	0	0	0
36	0	0	0	1	0	1	0	0	0	0	2	0	0	1
37	1	0	0	1	0	0	0	0	0	0	0	0	1	1
38	4	1	0	1	0	0	1	2	4	2	2	0	1	0
39	0	0	0	0	0	0	0	0	0	0	0	0	0	0
40	4	0	1	1	0	2	1	1	0	0	0	1	1	2
41	1	0	0	0	0	0	0	0	0	0	0	0	2	0
42	8	0	0	0	0	0	1	0	3	1	0	1	1	0
43	8	0	0	0	0	0	1	1	1	0	1	0	0	1
Total	**74**	**13**	**8**	**9**	**9**	**10**	**8**	**8**	**12**	**10**	**10**	**5**	**7**	**10**

Table D2. Distribution of pottery of various decoration motifs at Lusangi.

STP	Decoration motif categories													
No.	A	B	C	D	E	F	G	H	I	J	K	L	M	N
44	4	2	0	1	0	1	0	0	3	0	0	1	0	0
45	0	0	0	0	0	0	0	0	0	0	0	0	0	0
46	0	0	0	0	0	0	0	0	0	0	0	0	0	0
47	0	0	0	0	0	0	0	0	0	0	0	0	0	0
48	0	0	0	0	0	0	0	0	0	0	0	0	0	0
49	0	0	0	0	0	0	0	0	0	0	0	0	0	0
50	0	0	0	0	0	0	0	0	0	0	0	0	0	0
51	0	0	0	0	0	0	0	0	0	0	0	0	0	0
52	0	0	0	0	0	0	0	0	0	0	0	0	0	0
53	0	0	0	0	0	0	0	0	0	0	0	0	0	0
54	0	0	0	0	0	0	0	0	0	0	0	0	0	0
55	0	0	0	0	0	0	0	0	0	0	0	0	0	0
56	1	0	0	0	0	1	0	0	0	0	0	0	0	0
57	2	4	0	0	0	0	0	2	1	0	0	0	0	0
58	2	0	0	0	0	1	0	1	0	0	0	1	0	0
59	3	1	0	0	0	0	0	0	2	0	1	2	0	0
60	0	1	0	0	0	1	0	0	0	0	1	2	0	0
61	0	0	0	0	0	0	0	0	0	0	0	0	0	0
62	0	0	0	0	0	0	0	0	0	0	0	0	0	0
63	0	0	0	0	0	0	0	0	0	0	0	0	0	0
64	0	0	0	0	0	0	0	0	0	0	0	0	0	0
65	0	0	0	0	0	0	0	0	0	0	0	0	0	0
66	0	0	0	0	0	0	0	0	0	0	0	0	0	0
67	0	0	0	0	0	0	0	0	0	0	0	0	0	0
68	0	0	0	0	0	0	0	0	0	0	0	0	0	0
69	0	0	0	0	0	0	0	0	0	0	0	0	0	0
70	0	0	0	0	0	0	0	0	0	0	0	0	0	0
71	2	0	0	0	0	0	0	0	0	0	0	0	3	0
72	0	1	0	0	0	0	0	0	0	0	0	0	0	0
73	0	0	0	0	0	0	0	0	0	0	0	0	0	0
74	1	0	0	0	0	0	0	0	0	0	1	0	0	0
75	0	2	0	0	0	1	0	2	0	0	0	1	1	0
76	3	2	0	0	0	0	0	0	0	0	0	0	0	0
Total	**18**	**13**	**0**	**1**	**0**	**5**	**0**	**5**	**6**	**0**	**3**	**7**	**4**	**0**

Appendix E: Pahi Zooarchaeological Remains

Table E. Analysis results of faunal remains

Site	Unit	Level/ Layer	Taxon	Side	Element	Size	**Total**
B1	2	1	Mammal		Bone fragments	2	**4**
		2	Mammal		Bone fragments	2	**8**
		2	Gastropod		Shell fragments		**6**
	3	2	Mammal		Bone fragments		**26**
		2	Chicken (*Gallus gallus*)	L	Femur		**1**
		2	Chicken (*Gallus gallus*)	R	Radius		**1**
		2	Gastropod		Shell fragments		**38**
		3	In-determined		Bone fragments		**4**
B2	1	1	Mammal		Bone fragment		**1**
B3	1	1	Mammal		Bone fragments		**11**
		1	Gastropod		Shell fragments		**2**
		3	Mammal		Bone fragment		**1**
L1	1	Surfa-ce	Rock Hyrax (*Heterohyrax brucei*)	L	Femur		**1**
		"	Rock Hyrax (*Heterohyrax brucei*)	R	Ulna		**1**
		1	Mammal		Bone fragments		**2**
		4	Mammal		Bone fragment		**1**
		4	Gastropod		Shell fragments		**18**
		7	Bovid		Tooth fragment		**1**
	2	2	Bovid		Neural spine	2	**1**
		2	Mammal	L	Humerus fragment	2	**1**
		2	Mammal		Skull fragments	2	**2**
		3	Mammal		Bone fragments	2	**6**
		4	Bovid		Teeth fragments	2	**2**
		5	Ostrich (*Struthio camelus*)		Eggshell fragment		**1**
	3	2	Bovid		Tooth fragments	4	**3**
ML2	1	Surfa-ce	Mammal		Bone fragments	2	**4**
		1	Gastropod		Shell fragment		**1**
		1	Ostrich (*Struthio camelus*)		Eggshell fragments		**4**
		1	Mammal		Bone fragments	2	**34**
		2	Mammal		Bone fragments	2	**30**
		2	Bovid	L	Petrosal	2	**1**
		3	Bovid		Tooth fragment	2	**1**

Table E. continues

Site	Unit	Level/ Layer	Taxon	Side	Element	Size	**Total**
	2	1	Mammal		Bone fragment	2	**1**
		2	Domestic cattle (*Bos Taurus*)	R	3^{rd} Lower molar Fragments	4	**2**
		4	Bovid		Tooth fragment		**1**
	3	1	Giraffe (*Giraffa camelopardalis*)	L	2^{nd} Lower molar		**1**
		1	Equid		Tooth fragment		**1**
		1	Bovid		Navicular cuboid	2	**1**
		1	Bovid		Metapodial Fragments	2	**2**
		1	Bovid		Metapodial fragment	2	**1**
		1	Bovid		Calcaneum fragment	2	**1**
		1	Bovid	L	Scaphoid	2	**1**
		1	Bovid	R	Ulna fragment	2	**1**
		1	Bovid		Teeth fragments	2	**3**
		1	Bovid		Phalanx 3	4	**1**
		1	Bovid	L	Magnum	2	**1**
		1	Bovid		Metapodial	4	**1**
		1	Mammal		Bone fragments		**1774**
		1	Ostrich (*Struthio camelus*)		Eggshell fragments		2
		1	Gastropod		Shell fragments		3
		2	Warthog (*Phacochoerus aethiopicus*)		Teeth fragments		4
		2	Bovid		Metapodial		1
		2	Mammal		Bone fragments		1655
		2	Gastropod		Shell fragment		1
		3	Mammal		Bone fragments		87
		3	Gastropod		Shell fragment		1
	4	1	Mammal		Bone fragment	2	1
		2	Mammal		Bone fragments	2	96
		3	Mammal		Bone fragments	2	7
		4	Chicken (*Gallus gallus*)		Bone fragments		10
L3	1	1	Chicken (*Gallus gallus*)		Humerus shaft		1
		1	Bovid	L	Incisor	4	1
		1	Bovid	R	Ulna	2	1
		1	Mammal		Rib fragment	2	1

Table E. continues

Site	Unit	Level/ Layer	Taxon	Side	Element	Size	**Total**
		1	Bovid		Metapodial	2	**1**
		1	Bovid		Metapodial (Proximal)	2	**1**
		1	Mammal		Rib Head	2	**2**
		1	Mammal		Bone fragments	2	**23**
		2	Vervet Monkey (*Chlorocebus aethiops*)	R	Humerus		**1**
		2	Mammal		Bone fragments		**6**
		3	Mammal		Bone fragment	2	**1**
		5	Mammal		Bone fragment		**1**
		8	Bovid		Tooth fragment	2	**1**
	2	1	Mammal		Bone fragments	2	**30**
		1	Bovid		Premolar fragment	2	**1**
		1	Gastropod		Shell fragment		**1**
		2	Chicken (*Gallus gallus*)		Humerus fragment		**1**
L4	1	2	Bovid	L	Calcaneum	1	**1**
		2	Gastropod		Shell fragment		**1**
Total							**3955**

Abbreviations: B1 = Baura 1, B2 = Baura 2, B3 = Baura 3, L1 = Lusangi 1, ML2 = Markasi Lusangi 2. L3 = Lusangi 3, L4, Lusangi 4,

Appendix F: Radiocarbon Age Data

Table F. Measured C13/C12 ratios, conventional radiocarbon date and associated finds

Sample No.	Site, Unit and Level (Depth)	Associated Finds	13C/12C Ratio	Conventional Radiocarbon Age
Beta 176185 (AMS)	Baura 1, Unit 1, Level 5 (83cm)	Lithics	-11.3 0/00	2500 ±40 BP
Beta 176184 (AMS)	Baura 1, Unit 2, Level 3 (39cm)	Lithics, Daub	-25.7 0/00	460 ±40 BP
Beta 176192 (Radiometric)	Baura 2, Unit 1, Level 5 (50cm)	Lithic, Slag, Tuyere	-25.0* 0/00	120 ±50* BP
Beta 176191 (AMS)	Baura 3, Unit 1, Level 1 (10cm)	Lithics, Pottery, Slag, Tuyere, Bone, Land Snail Shell	-24.8 0/00	140 ±50 BP
Beta 176186 (Radiometric)	Lusangi 1, Unit 1, Level 3 (27cm)	Lithics, Pottery, White Chalk	-25.0* 0/00	1660 ±100* BP
Beta 176187 (AMS)	Lusangi 1, Unit 2, Level 5 (97cm)	Lithics, Pottery, Ostrich Eggshell	-25.3 0/00	140 ±40 BP
Beta 176188 (AMS)	Markasi Lusangi 2, Unit 2, Level 4 (70cm)	Lithics, Pottery, Slag, Bone, Daub	-23.9 0/00	1030 ± 40 BP
Beta 176190 (Radiometric)	Markasi Lusangi 2, Unit 3, Layer 2 (97cm)	Lithics, Pottery, Slag, Iron, Tuyere, Bone, Land Snail Shell, Red Ochre, White Chalk, Burnt Clay	-25.0* 0/00	4510 ± 70* BP
Beta 176193 (Radiometric)	Markasi Lusangi 2, Unit 4, Level 2 (32cm)	Lithics, Slag, Tuyere, Bone	-25.0* 0/00	760 ±60* BP

If a ratio of an age are accompanied by an (*), then the C13/C12 value was estimated, based on values typical of the material Type.