Archaeological Fieldwork around Lake Tana Area of Northwest Ethiopia and the Implication for an Understanding of Aquatic Adaptation

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Abstract

I have in this thesis attempted to investigate prehistoric adaptations around Lake Tana- Blue Nile basin of Northwest Ethiopia. The archaeological excavation conducted at a small rock shelter on the shore of Lake Tana provided evidence of occupation going back to the sixth millennium BP. The faunal remains and the location of the site clearly indicate that the nature of subsistence can be described as an aquatic adaptation.

The archaeological assemblage dominated by wild fauna, mainly fish, and the abundant lithic tools and pottery material suggest prehistoric adaptation that was practiced in many aquatic sites of sub-Saharan Africa since at least the early Holocene. However, unlike many of those sites, Kurtiye rock shelter lacked elaborate fishing equipment such as bone harpoons and spears, stone rings and grooves, and pottery with distinctive decoration motifs (incised and dotted impressed wavy line). In addition, there was no evidence indicating adoption of new agricultural subsistence strategies until about the end of the first millennium BC. This appeared to contrast with the situation in many aquatic sites of sub-Saharan Africa.

The lack of evidence suggesting early sedentary settlement and transition to food production, in an apparently such rich aquatic area, may therefore reflect local variations and differentiations of aquatic adaptation. The absence of the distinctive markers of the aquatic culture of sub-Saharan Africa, bone harpoon and wavy line pottery, indicates that the site represents a local variation of the aqualithic type of adaptation. Certain pottery decoration motifs, however, show some similarities with material recovered from sites in the Sahara, Nile Valley and eastern Africa regions which may indicate regional and interregional contact, which could also involve diffusion or spread of material culture including domestic species. Nevertheless, remains of domestic animals appeared very late at Kurtiye. This is surprising if it is viewed from the severe climatic and environmental changes of mid Holocene and possibly extensive interregional contacts the site had.

Understanding the reasons why and how hunting, gathering and fishing persisted so long as the main economic activities in the region until the historic period is thus challenging. Based on examination of the archaeological evidence using palaeoclimatic and environmental data, pertinent theoretical perspectives and ethnographic insights, the thesis concluded that this situation might have been related to local environmental, socio-cultural and symbolic factors.

The long continuity of aquatic adaptation in the region might have been due to the abundance of wild resources, mainly aquatic. Various local environmental constraints including the cold plateau highlands might have affected human settlement and demography, early introduction of domesticates, and possible subsistence modification. Socio-cultural and symbolic traditions related to aquatic resources, as indicated in the ethnographic data, might have been additional factor. Their role seems crucial if we examine them in relation to the severe climatic and environmental changes of mid Holocene and wide interregional contacts. The contribution and importance of this factor may be inferred from the hunting and fishing Woyto of Lake Tana whose subsistence, socio-cultural, symbolic and ritual life have remained closely attached to the aquatic bodies.

Opportunities and constraints of the local environment and locally embedded socio-cultural and symbolic values may explain for continuation of hunting and foraging ways of life around the site. The nature of the material remain, the site and its ethnographic evidence examined therefore support the assumptions that prehistoric human adaptive response were influenced both by local environmental situation and human traditions. More archaeological data are critically required to support this interpretation.

Contents

List of Figures

LIST OF TABLES

Chapter one Introduction

1.1. Background to the Material Evidences and the Problem

The initial thesis project was to investigate the origin of agriculture in the upper course of the Blue Nile River basin in Northwest Ethiopia. With this objective, archaeological excavation was conducted in a small rock shelter on the shore of Lake Tana in 2011. However, the material remains indicated occupation and subsistence based mainly on utilization of aquatic resources. I thus modified the original project and focused on the understanding of prehistoric life ways and subsistence in the region.

The main objective of this thesis is therefore to investigate aquatic adaptation and occupation in Lake Tana basin of northwest Ethiopia. It also attempts to document the material culture of the region in late prehistoric times, and reconstruct their subsistence and socio-cultural activities. In addition, it tries to examine the material evidence in relation to material from other regions in order to get an understanding of local and external influences in subsistence or adaptation.

The excavation produced a large amount of lithic material, ceramics and faunal remains. Lithic artifacts were abundant and diverse, dominated by microliths and blades with significant amount of points and scrapers. Abundance of lithic tools and the large amount of wild fauna remains indicates that these tools were used for different activities related to hunting and foraging ways of life. Pottery was abundant, but grinding stones were few. There were no other plant food processing tools such as mortar/pestle and sickle blades at the site. I assumed that pottery was mainly used for processing animal foods, and possibly vegetables and root plants. In aquatic sites, the use of pottery is often associated with fish stew and soup. Its invention might be related to functional requirements to exploit aquatic resources (Sutton 1974; Stewart 1989:238; Haaland 1992).

The faunal remains belonged to wild species. There were only one cattle tooth dated to early first millenium AD and a single Caprine tooth from a context dated to second millennium AD. Fish dominate the faunal remains indicating the importance of aquatic resources in subsistence. Some of the pottery material could be comparable to material from aquatic sites of other regions such as the Nile Valley of Sudan, Lake Region of Kenya and the Sahara. Radiometric dates showed that occupation at the site goes back to 5600 BP. A couple of samples also indicated occupation as late as the mid second millennium AD.

Prehistoric human adaptation and occupation in aquatic areas have been documented in many parts of sub-Saharan Africa. The importance of such areas in human subsistence and settlement, and implications for changes in demographic pattern and socio-economic and cultural aspects of prehistoric societies has also been widely discussed. It has been argued that due to rich and predictable resources, aquatic areas could have contributed for the transition to sedentism (Phillipson 1977c:61; Brandt 1986; Clark 1988a; Stewart 1989:7-8; Haaland 1992, 1995a; Holl 2005:182-3). Sedenitism is considered as one important precondition to increased socio-cultural organization and complexities and further population growth. These interrelated socio-economic and cultural processes were conditions that could eventually lead to the emergence of agriculture (Brandt 1986; Haaland 1992; Smith 2005:55-64). On the other hand, rich aquatic resources might have favored continuation of hunting and foraging ways of life and delayed transitions to agriculture (Sutton 1974, 1977; Phillipson 1977c:61; Clark 1984:113-26; see also Butzer in Wendrof and Schild 1980:273). Based on similarities in the archaeological assemblages, regional connection in aquatic cultures in sub-Saharan Africa was also proposed (Sutton 1974, 1977; Haaland 1992; 1993:82; Robbins 2006). Yet, some scholars argued that the material remains from among such sites reflect local socio-economic and environmental adaptation (Ambrose 1985; Stewart 1989:2; Collett and Robertshaw 1980; Robertshaw et al. 1983; Holl 2005:181-3; Phillipson 2005:159-60).

As mentioned, the material evidences at the Kurtiye site on the shore of Lake Tana indicate long traditions of hunting and fishing activities based mainly on aquatic resources. The main question is how a hunting and foraging way of life continued to recent period and what were the factors that influenced inhabitants' life ways. In this thesis, I shall argue that specific environmental, socio-cultural and symbolic factors could have influenced and shaped prehistoric subsistence and adaptation of the people around Lake Tana. Understanding the influence of local environmental and cultural factors may help us to examine the reasons why people in this area maintained hunting and fishing ways of life until quite recent time. Investigating how these factors influenced settlement pattern and resource utilization may be useful to get an insight on the opportunities and challenges in prehistoric subsistence and patterns of change in aquatic adaptation. It could also provide insight to assess regional differences and similarities in human adaptation strategies and subsistence behaviors in aquatic sites. In addition, it may give an idea as to why agriculture is late in the region. The thesis thus attempts to answer,

1. What are the archaeological remains excavated from the site?
2. What is the time dimension of the occupation at the site? How long was the site occupied?
3. What were the subsistence activities and adaptation strategies of the people inhabiting the region in the late prehistoric times?
4. How did local environmental and cultural factors influence life ways and subsistence patterns of the inhabitants around the site? How can we understand the roles of these factors?
5. What can the material remains indicate about inter-regional interaction and contact?
6. How can the ethnographic evidence be used to get an understanding of prehistoric subsistence strategies and patterns of adaptation in the region?

1.2. Methodological problems and Approaches

As stated above, the thesis seeks to understand and reconstruct prehistoric aquatic adaptation and occupation around Lake Tana. It also proposes that local environmental and socio-cultural factors could have influenced or shaped subsistence life ways of the site occupants.

Reconstruction of prehistoric subsistence behavior is mainly using archaeological remains. Based on faunal and floral remains, it is possible to reconstruct subsistence, infer the palaeoenvironment and propose the challenges and opportunities it could have had on prehistoric human adaptation. Inferences about ancient subsistence behavior can also be made based on the types of artifacts present. However, socio-cultural and symbolic values and perceptions can influence human motives, decisions and actions manifested in technological traditions (see Hodder 1991, 2003; Watson 1995). It is yet difficult to understand and reconstruct the intentions and motives as well as the complex sets of human behavior and activities from the material remains alone (Haaland 1981:1-3; Howell 1984:353-5; Casey 2005; Barker 2006:3). Understanding the factors influencing human behavior and reconstructing how such factors influenced human subsistence, activities and decisions, and addressing mechanisms humans managed or responded to the impact of such factors are some of the main challenges we often encounter in the study of prehistoric societies and their subsistence behavior.

In order to understand such aspects of prehistoric subsistence around Lake Tana, I depend on the archaeological material excavated from Kurtiye rock shelter and supportive ethnographic data collected among the hunting and fishing communities of Lake Tana. I thought that reconstruction based on the material evidence alone might not sufficiently explain the diverse sets of activities and behaviors of the site occupants. Ethnographic data could provide valuable insight in the understanding of the material remains and their implications about past behavior. I thus used supportive ethnographic and textual data to address mainly the human dimension behind the material remains. In other words, such data would be relevant to investigate the role of socio-cultural organizations and belief systems as adaptation strategies of the site inhabitants. It is, however, important to be aware that ethnographic data cannot be used to represent past behavior. I therefore used such data with the assumption that it may give useful insight on how socio-cultural and symbolic values as well as environmental factors could have influenced past behavior. If used with caution, such data can provide valuable information to better interpret the material evidence, investigate unforeseen dimensions of the archaeological remains and to test existing approaches and formulate new hypotheses (Heider 1967; Howell 1984:356-8; Stewart 65-6; Haaland 1981:1-3, 1992; Andah 1993:254; D' Andrea 1999; Hildebrand 2003,2007; Barker 2006:3; Finneran 2007:72-3).

Since the study aims to investigate the subsistence base and activities of the people inhabiting the site, examination of the faunal and floral remains can provide direct evidence about the main source of ancient subsistence in the area. These data can also give evidence on the ancient environment and human environment interaction in the region. The faunal remains were thus identified to species level and their implications on the subsistence bases of site inhabitants were examined. Partly due to preservation problem, floral remains were absent. Attention is thus given to diet and isotope analysis from a human tooth recovered from the site. I assumed that such data could offer relevant information on the diet compositions of the inhabitants. An attempt was made to infer whether introduced crops (C3 plants), local crops (C4 plants) and/or both crops constitute the diet system of the site occupants. Since C3 crops were introduced from outside, I assumed that evidence on their utilization would provide useful data related to agriculture in the region. Isotope analysis was assumed relevant to infer what types of animal food (terrestrial/aquatic) were used as main subsistence of the inhabitants around the site.

As D' Andrea et al. (2011) argued this method is useful to reconstruct ancient diet when preservation problem limits the availability of organic remains at a site (see also Barker 2006:94-6).

Grinding stones and ceramic data were also analyzed to get additional evidence on subsistence. The presence of grinding stones and ceramics may help us establish the role of plant foods. In fact, ceramics could have been used for processing food from both plant and animal resources (see Haaland 1992). Lithic tools could be important for an understanding of the technology of harvesting and hunting. Thus, they were sorted into types and their functional implications were analyzed based on typology. Diachronic changes in lithic tool typology in a site can offer insight to changes in material culture overtime. However, the site has stratigraphic disturbance. Due to this problem, I only sorted the lithic material into types and described their relevant physical attributes. Based on this description, I attempted to see the lithic material of the site in relation to material from other sites in the region.

C-14 dating on charcoal and teeth was undertaken to establish the temporal dimension of activities and occupations on the site. Stylistic analysis of ceramic sherds was conducted to establish possible regional contacts and interactions across time and space. I mainly focused on the decorative motifs of sherds since these aspects of ceramic material are often considered important attributes to address this kind of issue.

In addition, I examined the archaeological evidence and the site occupation in relation to the palaeoenvironmental data recovered from Lake Tana and other regions. I assumed that this may give some clues to changes in subsistence and adaptation strategies in relation to changes in palaeoenvironment.

I also used ethnographic data collected about fishing activities and symbolic and ritual uses of fine grained lithic material in the region. I thought documenting contemporary fishing activities may be useful for getting some insight in the technology and seasonality of fishing and for understanding the factors influencing fishing activities. The symbolic and ritual uses of lithic material in the region may give some ideas about such dimension of the artifacts. This could be useful to understand the reasons behind circulations of material objects in the past and to indicate interregional interactions. To get an insight on the pottery material, I made use of ethnographic data collected on pottery making in the region.

Ritual and symbolic practices of the people living around the site today were documented using interviews and observations. Special attention was given to the Woyto people of the Lake Tana area since they are still dependent on the aquatic resources, their ways of life, perception, rituals and belief system related to aquatic resources. Strategies and technologies employed in the utilization of aquatic resources were documented using interviews and observations. Interviews included detailed discussion on their settlement pattern and history. Issues related to their dependence on aquatic resources for such a long time were assessed and discussed. I also conducted this survey to get additional insight on the interpretation of the material remains. The fact that the Woyto have until recently been hunters and fishermen in contrast to the surrounding farming people would give useful insight about the opportunities and challenges of prehistoric people of the area in the adoption of agriculture. It might be relevant to get an understanding of why agriculture was so late in the Lake Tana area. Environmental constraints were assessed to investigate if any such factors were constraints in the adoption of agriculture in the region. The ethnographic data could generally be useful to understand how cultural and social dimensions shaped the subsistence strategy of the ancient people. Fuller (2005:772-3) remarked that social constructions such as “sacrifices, ritualized reproduction, and the construction of bodily subsistence” can influence the spread of domestic species.

As Sutton (1974:539) has argued ethnographic studies among cultures that have maintained aquatic adaptation are crucial to get better understanding about archaeological material associated with such culture. He added that besides the growing number of archaeological studies regarding aquatic settlements and adaptation, there is a serious need for ethnographic research that is more insightful about “their diets and fishing methods, their baskets and boats, their settlements and even their cosmologies.” This would illuminate the existing discussion on aquatic adaptation and their material culture. Ethnographic data may thus be valuable in the understanding of human motives and decisions in subsistence, inferring culinary practices and their implications on the spread of domesticates, and in interpreting archaeological material (See Haaland 1992, 1995b; Marshall and Hildebrand 2002; Hildebrand 2003, 2007; Lyons and D’ Andrea 2003).

1.3. The Study Area

This study is conducted in the upper course of the Blue Nile river/Lake Tana basin. Bordering with the Sudan in the west, the region lies on the plateau of northwest Ethiopian highlands.

Towards the west, the plateau highlands descend down to form extensive lowlands along the Ethio-Sudanese border. It is also situated within comparable latitude with Sudan and is close to the wider Nile Valley/Red Sea interaction sphere.The region has diverse physiographic environments such as mountains, highland plateaus, escarpments and valleys, and wide flood plains with rich lacustrine or aquatic resources around the Lake Tana basin. In addition, it has many rivers and streams that eventually drain to the Sudan, their annual sediments are the main contributors to the volume of the Nile River that remained as the basis of occupation for different people in the Sudan and Egypt. Currently, different people who belong to the different language families of Northeast Africa, Afro-Asiatic and Nilo-Sahara, inhabit the region. Semitic speaking Amhara, Omotic speaking Shinasha, Cushitic speaking Agew, Bête Israel, Kemant, Woyto, and Nilo-Saharan speaking Gumuz all live in the region today. Semitic, Cushitic and Omotic Speakers all belong to the Afro-Asiatic language family (Simoons 1960; Bender 1975; Ehret 1979, 2003; Tamrat 1988, 1994; Kaplan 1992; Quirin 1979, 1998). Agriculture is the main source of livelihood for the various groups of people in the region. However, the Gumuz have until recently been dependent on hunting-gathering ways of life, fishing and shifting cultivation. The Woyto have been relied mainly on aquatic resources of Lake Tana and Blue Nile river although they recently started farming (see also Simoons 1960; Tamrat 1994). Details regarding the historical and cultural setting of these people in the region will be presented in chapter three.

1.4. Theoretical Perspectives

I will in this thesis focus on prehistoric aquatic adaptation in Lake Tana area. I therefore prefer to approach the research problem using theoretical perspectives developed in studying prehistoric subsistence in aquatic sites of sub-Saharan Africa. I shall first briefly present these perspectives to indicate how they could be of interest in the understanding of this problem.

Archaeological research related to aquatic adaptation has been one of the main themes in African prehistory. A number of archaeological surveys and excavations were conducted in the Nile Valley Sudan, Sahara-Sahel and Eastern African lakes region. Aquatic fauna (mainly fish), pottery, bone harpoons, net sinkers and lithic artifacts dominate the archaeological remains of these sites. Sites with similar material culture, mainly wavy line and dotted wavy line pottery and bone harpoons, were defined to indicate a similar tradition across different sites and regions (see Sutton 1974,1977; Haaland 1992; Holl 2005:174-86). Pottery with these decoration motifs "formed a model for an evolutionary sequence, and suggested a level of cultural uniformity for the Nilo-Sahara-Sahel Belt from the eighth to the fourth millennia BC (Mohammed-Ali and Khabir 2003:25)." As Holl reviewed, studies on aquatic adaptation in Africa go back to the remarkable works of Arkell in the Nile area of Sudan in the late 1940s and 1950s.

Sutton first introduced the term aquatic civilization to the phenomena that seemed widespread as far as the Sahara and the Great Lakes region of eastern Africa (see Haaland 1992; Holl 2005:178-9). This model emphasizes the role of aquatic environment in middle tropical Africa in the evolution of incipient agriculture and also its importance as successful alternative to agriculture (Sutton 1974, 1977; see also Holl 2005:175).

Sutton's work needs a more detail description since he proposed important ideas as regards aquatic sites of Holocene Africa. He surveyed the cultural developments stretching from the Great Lakes of east Africa to Sahara and Sahel regions of West Africa. Using archaeological material, climatic, environmental, historical and linguistic data, he suggested that the aquatic sites could be seen as part of a 'Middle African Aquatic civilization.' He focused on the archaeological material, mainly pottery with distinctive decoration styles and fishing equipment like elaborate harpoons, which showed strong similarities across this vast area (Sutton 1974, 1977). Sutton (1974) attributed this tradition to people who depended on aquatic resources. He proposed that aquatic adaptation might have developed in the early Holocene (8^{th} millennium BC) around the Equatorial region of East Africa to the Middle Nile and the Sahara as the humid climate favored abundant aquatic resources widely over these regions (see also Sutton 1977:28-9).

He suggested that the people who shared similarities in this material culture also speak similar languages which belong to the Nilo-Saharan language family. The persistence of Nilo-Saharan speaking people living along rivers and lakes of the entire Middle Africa to the present supports this claim (Sutton 1974:537).

Sutton argued that pottery could have been invented in Middle Africa and diffused across this region before the emergence of agriculture and/or herding. Although subsequent studies indicated quite an early invention of pottery in the Nile Valley (Haaland 1992), his rationale why pottery was invented around aquatic areas is quite important. He attributes it to the functional aspect of pots for making soup, porridge and fish stew. Harpoons might have been made to exploit larger aquatic resources of lakes and rivers (Sutton 1974).

He observed possible regional variation overtime, but the harpoons and pottery with such distinctive decorations continued to be the main features of aquatic tradition. Climatic and environmental changes and shrinking rivers and lakes heightened the differentiation and isolation leading to more local types of aquatic cultures in the fourth and third millennia BC. Although the dotted wavy line decorative motif persisted, more regionalized pottery traditions, increased abundance of grinding equipment, stone bowl and in some cases domestic animals occurred ovetime. There also appeared fishhooks and harpoons with a perforated butt other than the old notched variety. The differentiation seems very apparent in the Kenyan rift valley. There were no harpoons and fishhooks although remains of fish were found in a context dated to about 3000 BC. The diagnostic pottery tradition of the aquatic culture also showed significant changes (Sutton 1974: 540-2; 1977).

The second millennium BC was a period of decline in aquatic traditions. Across Middle Africa, arid conditions prevailed with climatic regime generally comparable to the present. Aquatic adaptation could thus no longer be the main occupation, although aquatic resources still supplement subsistence in many areas. This period coincided with expansion of pastoralists and/or agriculturalists across wide parts of Middle Africa. This event and associated socio-cultural developments might have made the surviving fishing communities to be seen as marginal to pastoralists or agriculturalists. Mainly around the lakes region of the Kenyan rift valley, a different culture, burial marker, became apparent. Sites of this time did not reveal evidence of fishing equipment. Domestic species, stone bowl and grinding stones became abundant. A strong cultural influence, fish taboo, was introduced against aquatic communities mainly around this region. Sutton suggested that this could be linked to the arrival of Cushitic speaking pastoralists from north (Sutton 1974:540-2; 1977). In the Upper Nile basin and Lake Victoria, the climatic and environmental situations were less severe than the Kenyan rift. Thus, despite cultural and economic influences from farmers and herders, the aquatic adaptation continued at least until the beginning of the Iron Age. He argued that the continuation of hunting and fishing in the first millennium BC in view of a growing pastoral economy around Lake Victoria may be due to local cultural factors. Symbolic traditions and cosmology related to the lake seems to be one important factor. He suggests, "in the interlacustrine pantheon, Mugasa, lord of the Lake and creators, whose goodwill ensures a successful catch, whose anger upsets the fishing boat, must be as ancient as the waters themselves (Sutton 1974:543-4)." It seems in areas where aquatic resources were available, such sorts of adaptation persisted for long parallel to agriculturalists/pastoralists. The climatic and environmental conditions of the late Holocene made the aquatic ways of life more fragile. However, its continuation as main occupation until the later part of the Holocene indicates its role as a successful alternative of subsistence (see also Sutton 1977).

Sutton thus argued for the importance of looking at the impact of aquatic life on the adoption of agriculture. The aquatic way of life would have been considered economically and culturally successful to the inhabitants around aquatic areas. "It is important to take notice of a human cultural barrier as powerful as any natural geographical one (Sutton 1974: 545)." Probably due to emphasis on the importance of food production, the attempt to dichotomize hunting-gathering and food production and emphasis on lithic material, the overall implication of the widespread fishing communities has been given less attention (Sutton 1974, 1977). He also underlined the need for more archaeological and ethnographic study in such environments to better elucidate this aspects of African prehistory (ibid).

Sutton's work is criticized for having over generalized the aquatic tradition and associating it with a particular language family (Holl: 2005:179). However, archaeological excavations in aquatic contexts still revealed material remains that show these regional similarities. Ceramics and harpoons from Lake Turkana for example indicated similarity with the Nile Valley and Sahara. What is not understood is the processes of why and how these similarities occurred (see Robbins 2006:80-2). Robbins (2006) and Prendergast and Lane (2010) argued, despite the criticism against Sutton, recent findings still suggested that the abundant, stable and predictable resources in many aquatic environments fit very well into more secured adaptation and sedentary life in early to mid Holocene Africa.

Generally, Sutton's model primarily relied on climatic and environmental factors to explain this wide spread phenomena. The wet early Holocene climate permitted rich abundance of resources around lacustrine and riverine areas of middle tropical Africa. These favorable conditions led to the emergence of "a highly distinctive way of life" around lakes and major rivers. The decline and differentiation of aquatic culture could be attributed to major climatic and environmental changes occurring at different times in the Holocene (Sutton 1974, 1977). As mentioned earlier, he attempted to look at the cultural factor, but more emphasis was given to environmental and climatic factors.

Sutton's explanation of why agriculture was late in many aquatic areas is very important to consider since it implies the economic and cultural importance of aquatic life. He emphasized aquatic adaptation could represent an alternative way of prehistoric subsistence alternative to a shift to food production (Sutton 1977:32). The similarity in decoration motifs of ceramics across wide areas should not be overlooked as well. Functional necessity can influence invention of similar technology in different areas. Decoration motifs have no utilitarian functions. Their widespread similarity may thus imply some sort of cultural connection. Here it is important to refer to the points emphasized by Garcea. Similarity in pottery decoration might suggest its importance in symbolizing prestige and social interaction (Garcea 2004:131). This may be one important stimulus for diffusion of ceramic decoration motifs or the technology.

Haaland used a model that focuses on aquatic adaptation to investigate the evolution of food producing communities in Africa. Her model (1992, 1993:83, 1995a) takes into account the crucial role of local environment particularly the rich aquatic environment in creating the preconditions for the transition to food production in the Nile Valley central Sudan.

She argued that the invention of pottery had far-reaching consequences in setting the necessary preconditions in the processes towards food production. First, it made possible food to be prepared through boiling and steaming. Such food preparation technique enabled utilization of wide ranges of food resources since it made food more palatable and digestible. It for instance enabled exploitation of diverse varieties of fish as well as cereal foods. This was indicated in the appearance and abundance of fishing technologies such as harpoons and net sinkers and grinding stones. These technologies and the increased diversity of fish fauna implied intensive utilization of aquatic resources including fish of deep-waters. Second, as it expanded the ranges of resources for human dietary consumptions, the invention of pottery had consequences on population growth. “Boiled food reduced breast-feeding period and the duration of post-partum amenorrhea.” This had consequences on the fertility of women that ultimately brought increase in local population. Third, since pottery is heavy and fragile, its invention could have reduced human mobility. Such constraints, intensive utilization of aquatic resources and consequent population growth led to sedentism. The combinations of all these processes resulted in further increase in population thereby leading to scarcity of resources. This might in turn have influenced people to increase plant management practices and/or activities related to cultivation of local crops. The emergence of these interrelated socio-cultural phenomena set conditions for the beginning of food production in the Nile Valley by about 6000 bp (Haaland 1992:46-50; 1995a).

The role of utilization of broad-spectrum resource as preconditions for agriculture is still being debated. For example, Phillipson (1977:57-8) argued that aquatic environments were crucial for the rise of sedentary life. Haaland (1995a) considered sedentism as one important prerequisite for food production. On the other hand, Garcea (2004) suggested that the pathways that followed the pre-agricultural broad-spectrum resources exploitation varied from place to place. People may adopt different subsistence strategies due to local climate, resource, geography and social organizations. It is thus important to view the archaeological record as representing a more complex process than mere domestication (see Garcea 2004:110).

Stewart (1989:1-8, 237-40) proposed an ecological approach as alternative ways of looking at the material remains on fishing sites in sub-Saharan Africa. Her model focuses on investigating the material remains of aquatic sites in terms of local environmental changes and adaptation strategies of the inhabitants.

Stewart examined prehistoric aquatic sites of east African lakes regions and the Nile Valley in a comparative perspective where she found a similar pattern of aquatic adaptations. When the local environment was favorable, only few selected types of fish taxa were exploited. As drier conditions prevailed and/or increased human pressure on the resources occurred, different types of fish taxa including smaller and faster species were exploited. Fishing technologies and fish processing tools also varied in response to the abundance of aquatic resources and changes in local environment. She argued that during increased lake and river levels in the early Holocene, selected types of fish were easily caught on floodplains or shores by harpooning and spearing. However, following climatic deterioration and depletion of resources, available fish species were caught using new fishing technologies. Net sinkers as a new fishing technique emerged, and pottery for fish processing became thus abundant overtime. The abundance of ring stones and grooved stones imply the importance of fishing with nets. The pottery and net sinkers are indications of new adaptation strategies to more efficient fishing and exploitation of wide ranges of fish species including smaller ones. According to Stewart, this can be inferred from the coincidence in the abundance of pottery and increased diversity in fish taxa at the site. Therefore, wide regional similarities in the material remains in fishing sites reflect related human adaptive responses to changes in local aquatic environments or increased pressure on local resources. The emergence, continuity and decline of such sites should therefore be investigated in terms of the availability and scarcity of local aquatic resources instead of a single origin of aquatic culture or migration /diffusion. She also indicated that fishing sites might have led to sedentism depending on the nature of the aquatic sites. Thus, the Nile Valley favored continuity of aquatic resources utilization and eventually sedentism while increased aridity and other local factors led to decline of aquatic adaption in Lake Turkana area since around mid Holocene.

Her interpretation of the archaeological assemblages of aquatic sites from local environmental contexts is quite important. However, explaining similarities of aquatic sites as reflecting only local phenomena might have certain limitations. This is evident particularly when the similarities in material culture cannot be understood in terms of functional necessities. For instance, similarities in motifs of pottery decoration across sites cannot be explained in functional terms. In addition, she sees the material culture associated with fishing sites mainly in an ecological perspective i.e. in terms of resources abundance/ scarcity and predictability and consequent changes in human adaptive strategies. Socio/cultural and symbolic values that could have influenced human adaptation and subsistence behavior are less emphasized.

The excavation at Kurtiye rock shelter offered material that could be related to other aquatic sites. The abundance of aquatic fauna, mainly the few types of fish taxa in the entire faunal assemblages, and the pottery material showed a pattern similar to many early Holocene aquatic sites of sub-Saharan Africa. However, it lacked material such as harpoons, fishhooks and net sinkers that may be explained in terms of regional pattern of aquatic subsistence adaptations.

The aquatic model developed by Sutton and elaborated by Haaland, and the model suggested by Stewart (1989) could be relevant to discuss how life ways were organized in the Holocene Lake Tana environment. It would allow me to see the material remains of the site in a comparative perspective. This may also be relevant to assess how adaptation and broad spectrum aquatic resource exploitation could have influenced agricultural evolution in the region. But these models are limited in terms of understanding the cultural symbolic aspects of aquatic way of life. To focus on this aspect, I will make use of an ethnographic perspective.

1.5. Hypothetical Assumptions

I will here present my interpretation of the archaeological material I excavated in the Lake Tana region. The material excavated was very limited to give information on early transition to agriculture. This led me to focus the research on the question of how and why hunting and gathering seem to have persisted for so long. This may be explained in terms of environmental constraints and opportunities, and socio-cultural and symbolic factors.

Environmental Factors

The influence of the environment may be approached in terms of the opportunities and challenges it had on human settlement and subsistence.

1. The lacustrine environments of the site and its surrounding. The site is situated on the edge of the Lake. The lake and its surrounding might have sustained abundant wild resources. Local hunter-gatherer and fishing communities might have been dependent on these resources for long. The abundance of wild resources might also have maintained the population density below the maximum threshold necessary to adopt agriculture. Shift to more laborious activities of crop management would not be a choice if resources were available in abundance.

2. The influence of environment on human settlement and density. The site is located in the highlands of northwest Ethiopia. The mountain highlands in particular might have certain influence on the density of human settlements. As Aldenderfer's (2006) argued the high mountains of Nepal, Ethiopia and Andean Plateau might not have supported dense occupation until late Pleistocene and possibly early Holocene. Early inhabitants of these regions would have encountered physiological problems of adaptation to the high altitude. Dense settlement on the highlands of Ethiopia might have been possible following after significant changes in paeloenviroment and climate in mid Holocene (see Finneran 2007:48).

Archaeological surveys in northern Ethiopia suggested that prehistoric sites were sparse. Most of the sites surveyed tend to reflect shallow occupations. This may imply absence of marked demographic pressure until late Holocene (Harrower et al. 2010:460-1). It may also suggest seasonal rather than permanent settlements. Human induced clearance of natural forests seemed to have taken place only in late Holocene (Bard et al. 2000, Lamb et al. 2004; Lamb et al. 2007) and was considered to be quite late in the Lake Tana area (Lamb et al. 2007). This may indicate that the area might have limited population density for much of the Holocene. However, detailed site surveys are essential to further assess the contribution of this factor for the long continuation of hunting foraging ways of life in the region.

3. The impact of the highland plateau on the spread of domestic animals. The highlands might have been a constraint to domesticates, especially to cattle. Ethiopia is outside of the natural habitat of the wild prototypes of cattle. When these animals were introduced into the highlands, they might have encountered adaptational problems. Arrival of domestic animals to the interior plateau and their incorporation in the existing economy could be a gradual and late phenomenon. Insight from recent study by Lesur et al. (2007) seems to support this. They compared faunal remains of cattle from southwestern Ethiopian highlands to those of the Nile Valley and Sahara. Cattle remains from the Ethiopian highlands tend to be smaller in body size. This could be related to adaptation problems to highland environments. Topographic factors may be one possible reason for late introduction of animal husbandry to the highlands (Lesur et al. 2007). Ethnographic data from the study area suggested that cattle from the lowlands often have difficulties in adapting to the highlands. Farmers from the highlands are reluctant to buy cattle from the surrounding lowlands arguing that it cannot adapt the highlands. This may imply the possible impact of such factors in the early spread of domestic animals to the region.

4. **The palaeoenvironment of the region**. Due to extensive farming activities, the region is now devoid of forests. However, the surviving isolated protected patches of forests in the study area suggest dense forest environment, which might have been similar in the past (see chapter three). Recent palaeoenvironmental reconstructions indicated that the highlands were mostly covered with woodland and forests in the early to mid Holocene (Bard et al. 2000, Lamb et al. 2004; Umer et al. 2007; Marshall et al. 2011). The lower sections of the plateau probably had more dense forest particularly in the humid phases of the Holocene. Open savanna types of vegetations could have been patchily distributed. The limited extent of grassland environment might have contributed to the late introduction of domestic animals. Environmental factors such as availability of pasture and water were considered crucial in the spread of domestic animals in Africa (see Bower 1991; Haaland 1992; Marshall and Hildebrand 2002). Bower (1991) in particular argued, being grazer, cattle need extensive grassland environment. The spread of cattle to the moist and forest margin of tropical Africa might have appeared after significant expansion of grassland ecosystem following increased aridity in middle/late Holocene (see also Clark 1962; Williams 1984; Marshall 1990; Neumann 2003). Related environmental factor that should be considered for the late arrival of domestic cattle in this area is animal disease. Neumann (2003:85) explained that sub-Saharan Africa environment caused high degree of mobility to both foragers and pastoralists.

Nevertheless, due to the risk of *tse tse* fly, pastoralists encountered a serious problem to move beyond areas receiving rainfall above 1000 mm. Long ago, Clark suggested diffusion/spread of livestock in sub-Sahara Africa might have taken place mainly along a route free of tsetse fly (Clark 1962:220). The impact of animal disease was thus one of the main challenges in the spread of domestic animals in many parts of sub-Saharan Africa (see Gifford- Gonzalez 2000). As Brandt and Carder (1987:240) pointed, many parts of the highlands and around the Rift Valley of Ethiopia are free from cattle disease. However, the western lowlands lie in *tse tse* belt (ibid). *Tse tse* fly and other cattle disease are still serious problems in this region (see Simoons 1958; Bourn and Scott 1978). The problem would be severe if there were thick bush or dense vegetations with hot and humid conditions. Such environments were strong barriers to the spread of cattle since it is ideal area to the fly (Ambrose 1984:222). The study area is situated east of the low lands of western Ethiopia, which is hot and humid with dense bush cover (see chapter three) and this *tse tse* infested environmental zone could be a barrier to early introduction of livestock to the highlands from the west.

Socio-cultural and Symbolic Factors

Here, I will assess the socio-cultural preferences, ideological and symbolic dimensions as factors for understanding prehistoric subsistence and adaptation in the study area. These factors may be important if we assess their role in view of regional contact and availability of local cultigens in the region.

The material evidence from Lake Tana, particularly ceramic decoration motif suggests contact with people to the west in the Nile Valley Sudan and possibly other sites. Evidence of agriculture based on domestic animals and cultivation of sorghum in Sudan is as old as 6000 bp (Haaland 1992) with evidence for possible domesticated sorghum occurring much later dated to around 3860+/-60 bp, from Kassala area (Beldados and Constatni 2011). In the lowlands around the Kurtiye site, sorghum and other crops such as *teff*, finger millet and even chickpea are widely cultivated. Yet, the site only offered evidence of subsistence based on hunting and foraging. How can we understand this phenomenon? Since the material evidence for my argument are from a small rock shelter located on the shore of the Lake, there could be sites with different material evidence farther in the main land.

Based on the available evidence, one possible explanation as outlined above may be related to environmental factors. Yet, these factors may not sufficiently explain the nature of prehistoric subsistence and human behavior. Thus, I proposed that

1. The local population might have developed specific cultural and social experiences based on local resources. In view of available aquatic and terrestrial resources, foragers in Lake Tana area might have preferred to maintain the existing dietary, socio-economic, and symbolic practices. This might have led to resistance to changes and adoption of new ways of subsistence.

Some studies indicated the shift from foraging to food production may not be explained in terms of external factors such as climate, environmental and demographic factors alone (see Verhoeven 2004; Casey 2005:238-40; Barker 2006: 411-4; Harrower et al. 2010:462). In many parts of Africa, for example, farmers and foragers have lived in the same region for centuries or millennia. There are also studies that suggest, some hunting and foraging people in Africa adopted domesticates such as cattle for social and cultural reasons. In addition to their desire to widen subsistence basis, people may thus acquire domesticates for prestige and status, due to changing social relations such as for initiation rites, sacrifices to ancestors and other ritual practices. It is also indicated in different studies that foragers prefer to preserve existing ways of life even during environmental stresses (Clark 1971:72; Marshall 1998; Verhoeven 2004; Casey 2005:238-40; Barker 2006: 317-9, 392). Reasons for subsistence changes should also be sought in terms of socio-cultural, economic and symbolic aspects of foragers (ibid). Harrower et al. (2010:462) in particular have examined the archaeological material along the southern Red Sea region. They suggested that the late transition to food production in this region could be attributed to local ecological and cultural preferences, experiences and specific socio-historic factors.

Here I will focus on two interrelated factors: Food ways and its symbolic roles, and social and ideological/belief systems of the inhabitants in relation to their surrounding environment.

A. Food ways and its symbolic roles. The food ways of the inhabitants based on aquatic resources appear to be important in the continuation of hunting and foraging life ways around the site. Beyond its nutritional values, food has a strong symbolic meaning. It defines human relations with nature, cosmology and ideological beliefs, and interaction among people. It also demarcates people's identity and status (see Haaland 1992, 2006, 2007, 2009). Food systems can be maintained according to the social values and /or nutritional motives that would significantly influence the adoption or rejection of new food items (ibid; Fuller 2005:762; Hastorf 1999, 2009). Food tradition does not only influence the adoption of domesticates from outside, but it also influences the selection of locally available species (Fuller and Rowlands 2010:31). Dietary habits and values related to aquatic resources might have contributed for the long continuity of hunting and foraging life ways around the site.

B. Social and ideological/belief systems of the people in relation to the surrounding environment. Social and ideological/belief systems of the inhabitants in relation to the surrounding aquatic resources and environment might have influenced changes in subsistence. My ethnographic study of the Woyto fishing community suggests that aquatic resources such as fish and hippopotamus seem to have been the most preferred and culturally valuable resources among Woyto of Lake Tana. Both the Lake and the Blue Nile River are symbolically and ritually interconnected to the Woyto society. They perform different communal gatherings and ritual practices around these water bodies. Their origin myth, identity and subsistence are all explained in terms of these resources. This may imply the role of such socio-cultural factors in reluctance to adopt a subsistence based on domesticates.

In the shift from foraging to farming, social and ideological dimensions of foragers and worldviews played crucial roles. Hunter-gatherers had developed long-term relations with plants and animals as well as their environment. They developed elaborate ritual and symbolic traditions based on wild animals and plants. These practices or systems were part of economic and ideological adaptations to their environment. Socio-cultural and ideological factors could thus influence human decisions to new ways of subsistence (Bar-Yosef 1998:173; Verhoeven 2004; Mitchell 2005:62; Abawa 2009). Likewise, Clark (1971: 72) suggested that adoption of domesticates among hunter-gatherers could most likely have occurred after social, economic and psychological adjustment to the new way of subsistence. The shift to food production might have occurred following significant changes in the perceptions of foragers about their surrounding environments, changes in ideological, and belief system (Barker 2006:103). Harrower et al. (2010:462) argued that "sociohistorical dynamics and changing notions of relations with nature offer the arguably most promising avenues towards more sophisticated explanations of southern Red Sea transitions to food production."

If such dietary and symbolic values and social and ideological/ belief systems of the inhabitants of Lake Tana had a long tradition, one might assume that continuation of aquatic adaptation in the region may be related to such factors. My studies showed that among the hunting and fishing communities of Woyto of Lake Tana, recently cattle replaced the role of hippo in their rituals when hunting hippopotamus is prohibited by law. The substitution of hippopotamus by cattle in Woyto rituals may be a point to consider in getting an understanding of socio-cultural values in the spread of domestic animals to a particular area in the past. People may adopt domesticate species because of the values which are not related to dietary consumptions.

1.6. Organization of the Thesis

The thesis is organized into eleven chapters. The preceding chapter has provided the general background to the objectives, methodological problems and approaches as well as theoretical frameworks and research hypotheses of the thesis. The next chapter reviews the status of archaeological research in the Holocene Ethiopia. In order to get background information in the interpretation of the archaeological material from Kurtiye rock shelter, I presented a brief review of the previous research regarding the later prehistory of the country.

Since the thesis focuses on investigating the influence of environmental and socio-cultural factors in human adaptation and changes in subsistence behavior, a detailed review of the present and palaeoclimatic and environmental situations as well as the cultural and historical background of the region is provided in chapter three.

Chapter four discusses the data acquisition methods, archaeological survey and excavation procedures, and analysis of the context of the site. The temporal dimension of site occupation and factors influencing the site formation processes are treated in chapter five. The next four chapters present details of the archaeological material excavated from Kurtiye rock shelter. The inventory on the lithic material is provided in chapter six. Lithic tools and debitage, and the functional implication of the lithic tools are discussed under this chapter. The pottery material is presented in chapter seven. To get additional insight for the interpretation of the archaeological material, some ethnographic data on pottery production are included. Based on decoration of sherds, comparison of the Kurtiye pottery material to other sites is made and its implications on regional or interregional contacts and interactions are also examined.

In chapter eight and nine, the faunal and floral remains are presented. The type and quantity of the faunal remains are treated in chapter eight. Chapter nine deals with the floral remains recovered from the site.

In chapter ten, ethnographic data on aquatic adaptations among people living around Lake Tana is discussed with details on the economic, socio-cultural and historical background of the people whose subsistence have until recently relied mainly on aquatic resources. This data may provide useful insight for understanding prehistoric human adaptation and pattern of subsistence changes in the region.

In Chapter eleven discussions of the result and concluding summary of the thesis are presented. This chapter discusses such major issues as site occupation, nature and pattern of prehistoric subsistence and adaptation around Lake Tana, changes in subsistence and culture overtime, and implications of the archaeological material on interregional and regional contact. It also attempts to investigate explanations as to why and how foraging ways of life persisted so long in the region. Using the archaeological material recovered from Kurtiye rock shelter and insight from ethnographic data, the thesis discusses about the role of local environmental and socio-cultural factors in influencing human subsistence behavior around Lake Tana. It also tries to show the possible implications of this finding in the understanding of aquatic adaptations in other sites or areas.

Chapter Two Status of Archaeological Research on Holocene Prehistory of Ethiopia

In this chapter, I shall review the status of archaeological research regarding the Holocene prehistory of the region. Examining the archaeological data excavated from different parts of Ethiopia and the Horn may serve as a background to understand the archaeological material I recovered from Kurtiye rock shelter. Archaeological excavations conducted around Lake Tana and Lake Besaka in the early 1970s and 1980s respectively seem more relevant and related to the aim of this project. Material from these aquatic sites are thus reviewed in detail.

In order to obtain wider perspectives on the understanding and interpretation of the material remains, I have also examined archaeological material available from other parts of Ethiopia and the Horn. Artifactual and ecofactual evidence and temporal dimension of occupations excavated from various sites in the region are thus assessed to better understand the material remain of Kurtiye rock shelter. Assessing archaeological material remains recovered from other areas and their interpretation may be useful to have clear picture about the possible implications of the Kurtiye archaeological material on prehistoric subsistence. Here, I will present the Holocene archaeological data of Ethiopia and the Horn in terms of the regional distribution of the sites.

Fig. 2.1. The later prehistoric archaeological sites of Ethiopia and the Horn (modified from Hildebrand 2003:7)

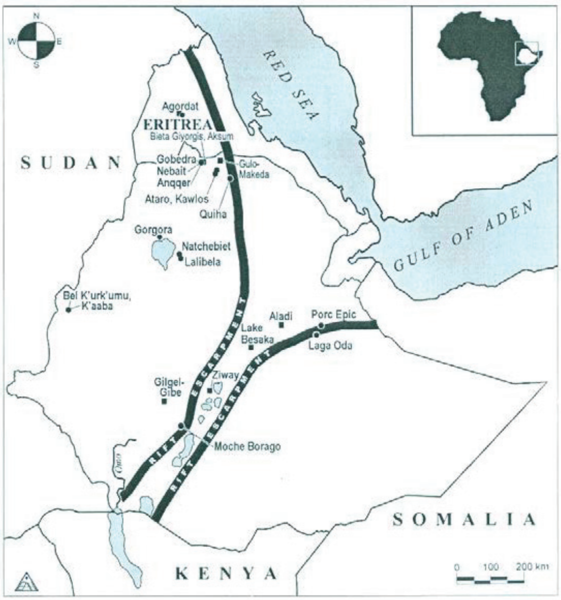


Fig.2.2. Archaeological sites of Late Pleistocene and Holocene Ethiopia and Eritrea (taken from Hildebrand and Brandt 2010: 257)

2.1. Archaeological sites

2.1. 1. Northwest Ethiopia

Excavations at Nachabet and Lalibela caves and Gorgora rock shelters are the only archaeological study that can be cited in northwest Ethiopia (Gojjam and Gonder provinces). The first two cave sites are located some 35 Km to the northeast of Bahir Dar town while the latter is close to Gorgora town on the northern edge of Lake Tana.

Nachabet and Lalibela Caves

These sites are located on the plateau escarpment east of Lake Tana. Dombrowski excavated the two sites in the late 1960s and early 1970s. Her excavation was primarily targeted at investigating evidence related to the origin and development of agriculture in Ethiopia. The excavation revealed occupation dated from around mid first millennium BC to second millennium AD. The material culture belongs to a Late Stone Age tradition. These sites are still considered relevant since they yielded the earliest crop remains in the region. Botanical remains such as naked and hulled barley, chickpea, horse beans, pea and possibly vetch were recovered from a context dated to the middle of the first millennium BC (Dombrowski 1970, 1971, see also Negash 2001:10). These cultigens are of Near Eastern origin and imply the possible arrival of foreign domesticates to the area at least around this time. Crops native to Ethiopia such as *teff* chaff were only found in the stratum dated to the early second millennium AD, although this may not preclude the possibility of early cultivation of local crops in the region (Dombrowski 1970, 1971). Remains of domestic indigenous crop-*teff* dated to around mid first millennium BC from northern Ethiopia (Boardman 1999) and pottery impression of this crop recovered in Yemen (Phillipson 1977c:60; Endes and Wilkinson 1998:99) may support this assumption.

The faunal remains represent different types of animals, wild and domestic species, including aquatic species such as fish and hippopotamus. Bovine (domestic cattle and buffalo) represent the largest amounts of the faunal remains. They appeared in the lower levels of the upper occupation phase and increased in concentration towards lower bottom levels. Faunal remains of sheep or goat appeared in the two lower strata. Some fragments of Equus, sp. possibly ass or Zebra are found from the lower stratum (Dombrowski 1971:144-9,156. The Ovicaprid fauna is the only evidence in Ethiopia that could be attributed to such an old period (see Brandt and Carder 1987).

Generally, Dombrowski's work indicated that agriculture based on cultivation of barley and legumes, cattle and possibly sheep could have been practiced in the region since at least the mid fifth millennium BC (Dombrowski 1970, 1971:144-9,156). The excavation from these sites yielded one of the earliest evidence of domestic species in the country. Possible regional contacts were also implied. Yet, evidence of occupation at the site did not go beyond mid first millennium BC. We thus know little about the nature of occupation and subsistence in the region for much of the Holocene. However, the wide ranges of wild fauna remains including fish and hippopotamus along with domestic crops and animals may indicate the subsistence was also based on aquatic and terrestrial resources as well as long tradition of broad-spectrum resource utilization.

These sites also offered abundant and diverse archaeological material. The lithic industry consists of flake and blade fragments, scrapers (the most dominant), backed blades, burins, and crescents that are typically attributed to Late Stone Age tradition (Dombrowski 1970, 1971). Fragments of pottery, grinding stones, polished stone, round stone balls, pendants, shells and possibly knives from bone and stone were also excavated. Iron slag and iron are found from the upper levels. Pottery from the lower occupation phases significantly differ from the upper contexts. They contain brushed red-orange sherds, fine black and dark red polished ware possibly small open bowls and wide rimmed jars. Sherds from the lower occupation phases are mostly undecorated. Fragments of clay griddle lid indicating processing of *injera* (Ethiopian staple food) is found only from the upper contexts dated to early second millennium AD. Except for one finely burnished red ware with parallel ridge decoration that may be related to Aksumite ware, none of the material from these sites shows any affinity with material recovered from other areas (Dombrowski 1970, 1971:160). The channeled ware may be compared to the Jebel Mokram group in eastern Sudan and could suggest contact with Sudan (Fattovich 1988).

Gorgora Rock Shelter

Gorgora rock shelter is the other archaeological site in the study area. It was excavated by Major Moysey in 1943. The site is situated at a volcanic hill few km north of Gorgora town, near the northern end of Lake Tana. The area available for occupation is very limited (5x 2.5m) and access to the site is difficult. However, its location above the extensive plains could provide a commanding view of games in the surrounding plain. Based on the nature of the site and tools, mainly the big unifacial and bifacial points, the site was proposed to be a temporary hunting camp. Its location around the lake and the wide plains, and the variety of lithic tools including ceramics may suggest favorable habitation since Middle Stone Age (Clark 1988b; Clark and Williamson 1984). However, probably due to preservation problem or selective collections of the material remains, no organic remains were reported from the site. A single grinding stone was found only from the context identified to the Middle Stone Age, which might have been used for processing pigments. This obscures us from inferring the full range of subsistence basis of the site occupants (ibid). Aquatic resources of Lake Tana and wild animals of the surrounding escarpments might have favored wide ranges of subsistence based on aquatic and terrestrial resources.

Based on similarities in the pottery material, it is presupposed that the Gorgora site might have maintained some degree of regional contact and interaction. For instance, Barnett (1999b: 106-113) reinterpreted the material of Gorora rock shelter and suggested wider regional interactions. She described that simple, horizontal linear incisions, fingernail impression, complex linear incised decorations and surface polish are common decoration motifs of the pottery excavated from Gorgora rock shelter. The horizontal linear incisions and fingernail impressions are comparable to ceramic decoration motif of Gash Delta Sudan and Lake Besaka of eastern Ethiopia. She also suggested that some of the sherds, particularly the fine sand or silt tempered orange-red to very dark brown and buff colored, might have been non-local. Furthermore, she proposed that ceramics from older levels might be related to African ceramic traditions dated from the 8th to the 2nd millennia BP. Yet, as she mentioned, Gorgora ceramics lack the typical red-orange ware common in the Ethiopian highlands and Ethio-Sudanese border such as in Agordat, Jebel Moya, Gobedra, Yeha, and Lalibela cave near Lake Tana. She thus argued that the absence of this type of ware might suggest that Gorgora material may be dated prior to the 5th-3rd millennia BP and might have been an independent tradition. However, it seems difficult to establish such chronological pattern since the site is not dated. The samples are also limited and vertical mixing of sequences are highly probable (Barnett 1999b:106-113; see also Brandt 1986; Finneran 2007:60).

Lithic assemblage consists of various types of tools reflecting different traditions. The big unifacial and bifacial points, backed flakes, crude scrapers, levallois cores, few burins and utilized pieces and waste flakes generally characterize the site as belonging to the Middle Stone Age (Clark 1988b). However, as Brandt (1986) reviewed, the site has long continuous sequences with tool tradition attributed to the so-called mode 3 to mode 5 (aceramic and ceramic) material. Mode 5 industry with backed blades and geometrics are found in the upper two levels that may indicate Late Stone Age occupation. According to Barnett (1999b:107), the lithic material belong both to Middle and Late stone age traditions. The bottom level contains points, burins, blades and scrapers that belong to the Middle Stone Age. Immediately above this level is sterile. The succeeding upper levels contain scrapers, microlithc crescents and backed blades that could be ascribed to the Late Stone Age.

2.1.2. Western Ethiopia

Recent test excavations at K'aaba and Bel K'urk'umu shelters, located 100 km southwest of the Blue Nile River in Benishangul-Gumuz region of western Ethiopia, provided aceramic and ceramic bearing occupation sequences. Located at the edge of the escarpment, about 1500 meters above sea level, the two sites are very close to the Ethio-Sudanese boarder. Occupation sequences containing side scrapers, denticulates, levallois- discoidal cores and unifacial points are attributed to the Middle Stone Age while the sequences with end scrapers and some elongated flakes are attributed to the Late Stone Age tradition (Fernandez et al. 2007).

The contribution of this work is paramount in view of the dearth of archaeological work from this part of Ethiopia. It is particularly significant in addressing possible ancient contacts and interactions with Nile Valley Sudan and Sahara. Based on archaeological material from these sites, the authors suggested that the mid Holocene arid condition might have driven "aqualithic" groups and early herders of the Sudanese Nile Valley farther to wetter regions of Ethiopia. Alternatively, they proposed that there could have been increased contact with central Sudan and the Ethio-Sudanese border. The site of Bel K'urk'umu rock shelter in particular contains abundant ceramic material that suggest ancient links with central Sudan and possibly to the Saharo-Sahelian areas. Strong similarity with Mesolithic/early Khartoum and Neolithic tradition of the Middle Nile and the central Saharan cultural traditions are clearly inferred based on ceramic decoration motifs (Fernandez et al. 2007). The incised wavy line and rocker impressed (mainly packed and spaced Zigzag) and big dotted decorations in the lower older contexts are for instance very similar to early Khartoum ceramics. The dotted wavy line decorations are comparable to the Mesolithic material of central Saharan and Middle Nile Sudan. Some decoration motifs such as plain comb rocker impressions and simple comb impressions are also similar to Sudanese Neolithic ceramics and to late Neolithic or Jebel Moya style. Cylindrical grinder of granite, polished axe, fragmented pottery pendants, unburnished clay pellets and pencils in red ochre are similar to material excavated from Sudanese sites. This further supports ancient contact and perhaps cultural influence from the Sudan (ibid).

The earliest archaeological context containing pottery at Bel K'urk'umu site is dated around 5000-4500 bp (BC 3800-3070). The late arrival of pottery typical to the Sudan and Saharan sites in western Ethiopia may probably be due to distance. Dating factors may also account for the apparent time lag in the occurrence of such ceramic tradition in western Ethiopia. At Bel K'urk'umu rock shelter, earliest pottery appeared at the lower middle level, but the lithic industry do not show any noticeable changes across levels. This may imply that "the people carrying the pottery, or the pottery or its actual technology, came to the site at a certain moment of its occupation (Fernandez et al 2007: 120)."

Furthermore, Fernandez et al. (2007) indicated that the ceramics that are similar to Sudanese Mesolithic and Neolithic ceramics are found only from these rock shelters. Excavations from other sites of Benishangul such as Menge rock shelter farther to the interior and Kunda Damo south of Assosa town produced pottery only with simple impression, incisions and grooved decorations. Ceramics with such decoration are generally attributed to more recent tradition. These sites are dated to 275 bp and 1985 bp respectively. This may suggest that "the earlier cultural contacts with the Sudanese plains might have been restricted to the areas on the edge of the escarpment (Fernandez et al. 2007:120-3)." They, however, argued that the escarpments might be area of refuge for people from Sudan and Sahara during mid Holocene climatic and environmental instabilities. This region could also be an area of refuge to people who resisted emerging hierarchical societies in central Sudan since around mid Holocene. The similarities manifested in the pottery material may thus imply movement of people or contact influenced by both environmental and social factors (ibid: 117, 122-3).

None of these sites has offered animal or cereal remains. But hunting–gathering ways of life seems to have continued until more recent times. This is reflected in the continuation of old pottery types and lithic tools to the early first millennium AD, even then after. Subsistence based on agriculture might possibly have begun in this area since around 2000 bp. Cereal pollen and evidence of possible human impact on the local environment are inferred from the upper contexts of the two rock shelters. The continuation of hunting and gathering ways of subsistence until much later in the region could mainly be due to cultural conservatism of the site inhabitants (Fernandez et al. 2007). The authors thus recognized the possible role of the socio-cultural factors in influencing human subsistence strategies.

Farther south, in Keffa province of southwestern Ethiopia, thorough archaeological survey and test excavations were conducted in a number caves and rock shelters (Hildebrand et al. 2010). This densely forested moist area was proposed as a place of refuge in time of climatic instabilities and might have been an early center of domestication of indigenous plants such as *enset* (*Ensete Ventricusome*) and coffee. Excavations revealed the oldest occupation sequences dated only to mid Holocene. Domestic cattle and caprine appeared very late, dated to 1920±70 BP, but the site lacked crop remains (Hildebrand et al. 2010). The implication of the evidence from this area, as suggested by the authors, is that the rich highland ecology might have sustained hunting and gathering ways of life even in the historic period.

Ceramics appear after about 2000 bp, but they lack significant similarities with those in the Sudanese lowlands. None of the decorations is similar to material from central Ethiopia, south Sudan or Northwest Kenya either. However, the simple impressions and incisions, and grooved decorations may be related to ceramics from Benishangul area of western Ethiopia. The lithic assemblage is dominated by different microliths with few backed blades, scrapers, burins, utilized and modified flakes (Hildebrand et al. 2010).

Another archaeological study focusing on the evolution of animal husbandry is available from Wolayta area of southwestern Ethiopian highlands. Faunal evidence from Moche Barego rock shelter indicated the very late introduction of domestic animals to this area. All the remains recovered from occupations dated from around the fourth millennium BC to the first half of the first millennium AD include only remains of wild animals. The authors attributed this phenomenon to the rich highland ecology, and to the cultural and topographic factors that might have hindered early spread of domestic animals to the region (Lesur et al. 2007). As Hildebrand et al. (2010) indicated the appearance of pottery in this site is also very late which could be, comparable to findings from many sites in Keffa.

2.1.3. Northern Ethiopia

In northern Ethiopia, relatively more excavations are carried out, and yielded lithic tools, grinding stones and ceramics, faunal and crop remains (Hildebrand 2003:8-9). Most of the excavations offered evidence related to Pre-Aksumite and Aksumite period. Traces of occupation going back to early to mid Holocene are also inferred from Gobedra, Baahti Nebait and Anqqer Baahti from around Aksum, possibly Quiha (near Mekele town), and rock shelter and cave sites in Temben south of Mekele.

Test excavation at Gobedra rock shelter near Aksum produced archaeological remains which include abundant lithic and pottery material as well as remains of domestic species such as finger millet, dental fragments of domesticated ox and camel tooth. The radiometric dating indicates that occupation at the site could be attributed to the early Holocene. Based on remains of domestic species, it was initially assumed that the site could imply early traces of agriculture in the region perhaps as old as the mid Holocene. However, actual dating of the seed gave quite late date for finger millet (ca. 1000 AD) demonstrating later intrusion. Domestic cattle remain is attributed to early first millennium BC. The date for the camel tooth is still controversial. The site also yielded long blades with minimal retouch and backed microlithic industries and pottery. The earliest pottery bearing context is dated to between mid fifth and third millennia BC (Phillipson 1977c:60, 68, 2005: 125, 204; 2012:15; Finneran 2007:83-84). Based on similarity in the decoration motifs of ceramics, possible contact with the Sudan was suggested. Significant similarities have been indicated particularly with the Kassala and Butana and Jebel Mokram groups of southern Atbai ceramic traditions (Brandt and Carder 1987; Fattovich 1988a; Phillipson 2012:16).

Excavations at Baahti Nebait and Anqqer Baahti rock shelters near Aksum revealed occupation that can be traced back to the early Holocene. Occupation as old as ca. 10000 BP is inferred from Baahti Nebait. The two sites yielded remains of domestic crops and domestic bovid. Yet, they are proved contaminated or to be later intrusions and therefore could not give reliable data on the economic basis of the site occupants (Finneran 2000a, 2000b, 2007: 83, 86). Pottery and lithic tools are comparable to the Gobedra assemblages. Based on decoration, similarities with ceramics from the early second millennium BC Butana-Sudan and Handoga-Djibouti are also proposed (Finneran 2007:61-2). Similar to Goberda, the lithic industry is dominated by long blades and microlithic tools. Microliths and scrapers (mainly circular) were more abundant in the upper contexts. The long blade industry may be associated to early Holocene. The long blades from these sites and Gobedra rock shelter do not show pronounced retouch (Finneran 2007:48-51, 53-4). Yet, due to stratigraphic disturbance interpretation of material evidences and nature of prehistoric subsistence of the site occupants is problematic (ibid; Hildebrand 2003:9).

Excavations at Mai Agame, Ona Nagast and Beita Giyorgis in Aksum produced remains of both Near Eastern and local crops, but they are not older than mid first millennium BC. Domesticated wheat, barley, lentils and *teff* are dated to C. 2500 BP and *noog* (oil seed) and Brassica sp. is dated to mid second millennium BP (Phillipson and Reynolds 1996; Bard et al.

1997; 2000; Boardman 1999). African crops such as sorghum, finger millet, oat (Avena sp.oat) and *noog* appeared only from contexts attributed to Aksumite period (Boardman 1999). From Ona Nagast and Beita Giyorgis remains of domesticated cattle, sheep/goat dated to about 2500 BP is identified (Barnett 1999b:48; Bard et al. 2000). These excavations also provided ceramic griddle fragments, but the oldest griddle appeaed only after the second century AD. Increased concentration of griddle fragments were available from sites belonging to late Aksumite period (Phillipson 1993). The absence of ceramic griddles, primarily used for processing of food from local cereals, from older occupation sequences or sites may pose challenges in the reconstruction of ancient subsistence behavior based on local crops in the region. The extent and focus of archaeological excavations conducted in the region and/or the nature of ancient dietary habit and food preparation techniques may account for the absence of such evidence from earlier contexts. Recent studies on carbon and nitrogen isotope analysis of human and animal skeletal remains from Pre-Axumite and Proto-Aksumite settlements in eastern Tigray indicated exploitation of both Near Eastern and indigenous crops. The proportion of sample result for introduced crops is, however, high (D' Andrea et al. 2011).

Quiha rock shelter near Mekele offered different lithic tools, ceramic along with remains of cattle and Equus sp. (Negash 1997; Barnett 1999b: 128, 1999a). Ceramics show diverse decoration motifs such as woven mat, comb and rocker stamp impressions, linear incisions with different patterns, punctuates, channeled/ridged and scraped motifs. Some of these decoration motifs may be related to ceramics of central Nile Valley, eastern Sudan and even to parts of North Africa and to Lake Turkana area (Barnett 1999b:128-38a see also Clark 1988a). The lithic assemblage includes broad blades, circular scrapers and backed microliths and modified flakes (ibid). As Clark commented, larger blades of Quiha have only marginal retouch (Clark 1988a). Based on comparative dating, mainly on the basis of pottery decoration motifs, Barnett proposed that earliest pottery and remains of domestic animals at Quiha could be as old as the sixth or the seventh millennium BP (Barnett 1999a:19). However, the site was excavated in 1940s, and lacks dated context (see Barnett 1999b:137; 1999a). Thus, such interpretation remains problematic to draw relevant conclusions.

Recently Negash (2001) excavated five cave sites in Temben, southern Tigray. His work mainly focuses on establishing the culture history of Temben. Archaeological excavations in the region offered evidence of prehistoric occupation that might be traced back to mid Holocene. The faunal remains along with the material remain such as pottery has enabled him to reconstruct prehistoric subsistence and ancient interaction and contact that the site occupants participated. Based on similarity of the pottery material to pottery from eastern Sudanese sites, he suggested that pastoralists might have occupied the highlands of Tigray since about 5000 BP. Sherds from one of the sites, Danie Kawlos, have various decoration motifs (check- and rocker- stamped, dot, mat, incised and zigzag) that are comparable to ceramics of the Gash group of eastern Sudan and Agordat of Eritrea. Such similarities may indicate interregional contact and interaction between the interior highlands of Tigray and eastern Sudan and Agordat area. Earlier studies likewise suggested interregional contacts between eastern Sudan and the northern highlands of the Horn (Negash: 2001, 210-3, 217-9). Grindstones and lithic tools were also recovered. The lithic artifacts are dominated by microliths; few burins and different types of scrapers are fairly similar to the Quiha and Gobedra material and may indicate possible regional contact.

The earliest context from Danei Kawlos site that contains domestic cattle is dated to 3380 ± 160 BP. Cattle might have been introduced from eastern Sudan more likely through contact and exchange. Mid Holocene arid conditions might also trigger movement of people in the region (ibid: 216-7). Faunal remains he reconstructed include both domestic stock and wild species. Although remains of domestic cattle were inferred from relatively older contexts, remains of wild animals were also investigated. Presence of wild and domestic animals and the absence of grindstones in some of the sites may thus suggest quite different economic adaptation even within the same area (Negash 2001: 67, 216-8). The wild fauna remains recovered from these sites are mainly small animals. This may be related to increased aridity or due to intensive occupation and utilization of the surrounding landscape possibly before the arid phase of mid Holocene. The relatively older domestic cattle recovered in one of these sites, Danei Kawlos, may support the latter assumption (Negash 2001; 256-7). The lack of domestic faunal remains from other sites within the same region, despite the arid climate and/or possible intensive utilization of local resources, could also imply the role of other local factors influencing human adaptation. Sadr (1991) argued that, as investigations in eastern Sudan imply, factors other than environment may also influence prehistoric adaptation (see also Finneran 2007:66-7).

Farther in the north, from Agordat in western Eritrea, surface collections from around Dandaneit, Shabeit, Kokan, and Ntanei offered abundant archaeological material. These include flake debitage, microliths, ceramic, grinding stones, pecked and polished stone axes, stone dishes, headless figurines of domestic Bos, and other artifacts such as spherical and disc macheads, stone beads and stone bracelets, copper ring and imported amazonite beads. Based on similarities in the lugged stone axes with the Egyptian bronze lugged axes, the earliest occupation was assumed to be as old as early second millennium BC (Clark 1988a; Phillipson 2005:204-5). Furthermore, pottery is supposed to have regional similarities particularly to the Nubian C-Group and Kerma sites, the Kassala and Jebel Mokram phases of the Atbai ceramic tradition of eastern Sudan and Gash valley. The ceramic tradition was also thought to have wide regional distributions extending to northern Butana area (Shaquaddad) and Erkowit in the Red Sea to the Northeast (Clark 1988a:59-60). Fattovich (1988) proposed that the site could be a regional variant of the Atbia ceramic tradition that belongs to indigenous people of western Eritrean lowlands. Obsidian microliths mostly crescents, pots, axes, and ornaments may also indicate contact with Nubia and possibly Egypt and the highlands of the Horn.

Test excavation conducted recently in one of these sites, Kokan, indicated that the site is disturbed and highly eroded (Brandt et al. 2008). Yet, it offered different assemblages such as ceramics, lithics and ground stones and polished stones. The newly discovered ceramic material indicates occupation at the site might have begun around 2300 BC. The occupants of the site could be strongly related to the Gash group people as early as 2300 BC. They could also have contacts with agropastoral and pastoral people and even to urban communities of Nubia, and possibly Egypt, Butana, the Gash Valley, the Eritrean/Ethiopian highlands and the Red Sea area. The quartz dominated lithic industries such as end and side scrapers, notches, denticulates and backed tools show similarities with lithic tools from eastern Sudan notably the Gash Group sites and to the late Neolithic of Shaqadud cave of Butana in east-central Nile. Through direct or indirect trade interaction, eastern Sudanese pastoral and agropastoral communities might have influenced this area since late Neolithic times. The area might be the centre of trade and interaction between the Nile Valley and Eritrean/Ethiopian highlands particularly around 400 BC. Occupied apparently by Nilo-Saharan speaking agropastoralists, Agordat could perhaps be crucial interaction sphere of people occupying these areas (ibid).

Recent archaeological investigation around Asmara provided rich archaeological evidence on settlement and subsistence dated to first millennium BC. Excavations at a number of sites yielded evidence of domestic cattle and Ovicaprines along with indigenous and Near Eastern crops (D' Andrea et al. 2008; Curtis 2009). *Teff* appeared in a context dated to mid first millennium BC while Near Eastern crops, wheat, barley and linseed were recovered in the context dated to 800-600 BC (D' Andrea et al. 2008). Small blades, geometric microliths, and abundant and diverse scrapers characterize the lithic material. The ceramic material are described as burnished and/or slipped red, black and brown wares with comp, punctuate and variously executed incised decoration motifs. Other archaeological material such as stone bead, clay zoomorphic and stone figurines of bull's head are also abundant (see Curtis 2009). Despite the location of northern Horn, relatively close to the Red Sea–Nile Valley and contact traceable to quite earlier time (Fattovicth 1996; Philips 1997), evidence on the transition to agriculture is still late.

2.1.4. Eastern and East-central Ethiopia

Sites in the Rift Valley or adjacent edge of the plateau escarpments in eastern Ethiopia offered evidence of Terminal Pleistocene and Holocene Occupations (see Brandt 1986; Clark 1988b; Finneran 2007: 47, 50-1, 60). Lake Besaka and Laga Oda rock shelter may be more related to the discussion on Holocene human subsistence and changes in prehistoric adaptation.

Lake Besaka is the only archeological site that clearly demonstrates a long tradition of aquatic adaptation in Ethiopia. As described above, the Besaka archaeological evidence will be more relevant on the understanding and interpretation of my archaeological material. Here, I will give a more detailed examination of the archaeological material and pattern of prehistoric adaptation around Lake Besaka.

Lake Besaka is located in southern Afar rift, east-central Ethiopia, some 200 km east of Addis Ababa. Four open sites were excavated on the western edge of the lake. The site provided evidence related to long tradition of broad-spectrum adaptation based on both aquatic and terrestrial resources. Occupation, though discontinuous, is dated from around 22000 to 3500 bp (Brandt 1986). By correlating changes in the archaeological assemblages with climatic and environmental data, Brandt investigated the nature of prehistoric adaptation around the lake. He argued that before the severe terminal Pleistocene aridity, Lake Besaka might have been quite large accommodating abundant aquatic resources. The lake and its environs could thus offer wide ranges of resources to Hunter/gatherers. Remains of warthog, small to large bovid, hippopotamus, bird and reptile were identified from a context dated to about 22000 bp. However, during the terminal Pleistocene aridity (18000 to 12-10000 bp), there was no sufficient evidence which could imply occupation at the site. This may be related to climatic and environmental changes. With the deterioration of the aquatic environment, hunter-gatherer communities might have followed more increased mobile ways of subsistence. Limited faunal remains dominated by small to medium size bovid with few fish bones were found only in a sequence dated to the end of the Pleistocene (ibid; Brandt 1982:299-301).

However, abundant remains of aquatic species such as fish, hippopotamus and crocodile were recovered from the context attributed to the early Holocene. There were also remains of terrestrial fauna such as hartebeest, warthog, boar, Zebra and carnivores. This occupation sequence coincided with the onset of more humid conditions and increased lake level. The favorable aquatic environment and its surrounding might have supported different varieties of aquatic and terrestrial fauna in great abundance. The wide arrays of faunal remains indicate increased reliance of foragers on more predictable and rich aquatic resources during this time. In addition, the occupation sequences were thick with huge archaeological remains probably suggesting more sedentary life based on the rich and predictable aquatic resources and surrounding woodlands (Brandt 1986:72-3). Pottery and grinding stones were found from a context dated to the later parts of early Holocene. Still there appeared indications of food storage and remains of other commodities that possibly imply a more sedentary life. Despite abundant aquatic faunal remains, harpoons, fishhooks and other fishing equipment were not recovered. During this occupation phases, microliths became abundant. Geometric microliths, crescents, which were absent in earlier occupations became more numerous. This, according to the author, may be functionally related to fishing activities although they were possibly used for other purposes as well (ibid; 1982:301-2).

A marked change in the compositions of archaeological remains is inferred in the upper phases (increase in the amount of end and convex scrapers). There were no remains of aquatic fauna recovered as well. This situation coincided with a shift to arid climate around 4000 BP leading to salinity of the lake water and shrinkage of the lake. Occupation on the lakeshore seemed to have been abandoned. A shift in subsistence from hunting, gathering and fishing to pastoral economy might have followed instead. Bovid teeth identified tentatively as domestic cattle teeth were dated to 1500 BC which further suggests subsistence change around the site (Brandt 1982: 303-4, 1986). Brandt associated this situation to changes in climate and environment and human adaptive responses. However, intentional burial, ornamental items of distance sources and huge amount of material remains such as pottery and grinding stones recovered may imply society with elaborate socio-economic and cultural traditions (Brandt 1986). Lake Besaka is located within the Rift Valley. Changes in climate could therefore be serious to bring about significant impact on human adaptation, but the role of socio-cultural and symbolic factors in subsistence modification and change should also be assessed.

The site produced large amount of lithic and ceramic material. Scrapers, microliths, backed blades, burins and few points and long blades mainly dominate the lithic material. Based on a context dated stratigraphically and pedological analysis, the earliest ceramic bearing occupation phase is attributed to an age between 6000-7000 bp (Brandt 1986). Most of the sherds are unburnished, often smoothed and with diverse decorations such as fingernail, mat and comp impression, punctuates, incisions and crisscross motifs (Brandt 1982:129, 212-3, 282-3). Barnett (1999b:115) and Hildebrand (2003:10) argued that, in terms of decoration, the sherds from lower levels are comparable to ceramics from the Gobedra, Gorgora and even to Gash group of eastern Sudan. This may support the assumption that domestic cattle were perhaps introduced to Rift Valley area and then to eastern Ethiopian plateau from eastern Sudan via northern Ethiopia (see Brandt and Carder 1987).

Another site often mentioned in relation to prehistoric subsistence in Ethiopia is Laga Oda rock shelter. It is located at the foothills of Harar plateau of eastern Ethiopia. Excavation result showed long occupations from around 15000 to 5000 years BP. Based on "sickle sheen gloss and polish" on lithic tools, the site is thought to have pre-adapted economy based on exploitation of wild grasses since around 13,000 BC. This practice is also assumed to have led to early cultivation of certain species. Increased concentration of tools with mastics adhered to microliths in a context dated to 1560 BC may further suggest phytolith producing grasses and plants more probably *teff* or sorghum were being harvested around the site (Brandt 1984:177; Clark 1988a; D' Andrea et al. 1999). Neither remains of these plants nor other crops was found. Although the site did not yield crop remain, it is assumed that the long practice of wild grass exploitation might have possibly led to early beginning of crop domestication (Brandt 1984). The site is still considered crucial for it yielded one of the oldest domestic cattle remains in the region dated to about 1500 BC (Clark and Williams 1978; Brandt 1984). The artifactual assemblages included microliths, few end scrapers and curved-backed flakes, decorated and undecorated pottery and ochre. Microliths could have occurred from the earliest occupation on (Brandt 1984).

2.2. Rock Arts

Another source of evidence cited in connection with the later prehistory of the region is rock arts that mainly depicted humped and humpless, long and short horned cattle, sheep, goat and camel, human and some geometric scenes and other activities such as milking and ploughing scenes. Along with long horned bovines, spear, sword and shield are also depicted. The rock arts include engravings and paintings, the latter being dominant. Rock engravings are limited to few sites in Eritrea, Tigray and southern Ethiopia. Generally most of these rock arts are restricted to certain particular areas in northern (including Eritrea), eastern and southern Ethiopia. Since depiction of wild animals is limited and cattle being the most widely represented, the rock arts of the Horn of Africa are often termed as pastoral rock arts. Due to the absence of wild prototype of domestic animals in the Horn, the rock arts are generally assumed to indicate migration of people and/or domestic stocks, and contact with the surrounding regions (Brandt and Carder 1987; Phillipson 1993; Fattovich 1988; Negash 1997, 2001:183:4; Finerrann 2007:91-101). However, the exact age of the rock arts is difficult to identify and therefore may give only indirect clues about the introduction of domesticated animals and associated interregional interaction or contact. In the study area, during the field survey, two rock art sites with depictions of wild animals and geometric motifs were found. This is quite different from the rock arts of Ethiopia and the Horn described above. It could be seen as representing subsistence based on wild resources at least around the site.

Summary:

The above general review indicates that archaeological investigations so far conducted in the country is limited to a few areas. Studies centered on aquatic sites are scarce. Furthermore, some of these sites lack sufficient dated contexts. Thus, our understanding about Holocene adaptation and transition to agriculture is still limited. Interestingly however, some of these sites yielded evidence that show significant interregional or regional similarities that may in turn indicate ancient contact or interaction perhaps with wider regions. This is mainly evident in terms of ceramic material recovered from a number of sites in northern and northwestern and even few sites in eastern Ethiopia. Pottery from these regions tends to show remarkable similarities with material recovered from central and eastern Sudan, the Sahara and even eastern African sites. Some of these sites also had long occupation sequences going back to early or late Pleistocene. However, available evidence regarding prehistoric subsistence based on domestic species is late even compared to the surrounding regions. Despite continued archaeological endeavors, the earliest domestic faunal and floral remains are still dated only to mid second millennium BC and mid first millennium BC respectively. As the above review shows they are recovered mainly from sites in northern, northwest and eastern Ethiopia.

The picture that appeared in western and southern Ethiopia in general tends to reflect continuity of hunting and gathering economy even to the Christian era. Sites in Wolayta and in Keffa area in southern and southwestern Ethiopia, Benishangul and Gambela areas of western Ethiopia were excavated recently. As mentioned, parts of these areas were proposed as refuge areas during climatic and environmental changes possibly leading to early traces of indigenous agriculture. Nevertheless, this review demonstrates that the shift in prehistoric subsistence was quite late and slow even compared to other parts of Ethiopia. In some of these sites, pottery is recovered only in the younger contexts. It also lacked interregional affinity which may imply more localized tradition or occupation. In fact, some sites in western border (Benishangul area) yielded material remains, mainly pottery that has similarities with ancient material remains of the Sudan and Sahara. This suggests quite old contacts, but lacks evidence of domestic species. This situation in general is contrary to the assumption that the highlands of western and southern Ethiopia could be one probable area for early transition to agriculture.

The existing evidence which demonstrate long continuity of hunting-gathering ways of life from most of these widely scattered sites may entail the need for thorough examination of the factors influencing prehistoric subsistence and occupation in the region. Although evidence of transitions to agriculture in the entire region seems generally late, the overall picture suggests some local variations in the material culture and pattern of subsistence even within specific regions. Looking into specific or localized cultural, social, historical, and ecological contexts, as Hildebrand (2003:29-30) and Harrower et al. (2010) proposed, may give better opportunity to understand the processes and patterns of prehistoric adaptation and subsistence transitions in the region. Yet, as Finneran (2007:66-7) critically commented the influence of specific economic, socio-cultural and symbolic factors that had long accompanied the hunting and gathering societies are least explored. The limited archaeological research and theoretical framework that focused on more general and external factors may account for the lack of understanding on the processes and causes of prehistoric subsistence transitions in Ethiopia and the Horn (see also Brandt 1986; Hildebrand 2003: 1-4; Fernandez et al. 2007; Harrower et al. 2010 for the review).

Chapter Three Physiographic Environment and Cultural Setting of the Study Area

In this chapter, I shall describe the geographic location, present physiographic environment, the palaeoclimate and environment, and the cultural and historical settings of the region under investigation.

3.1. Physiographic Environment

Description of the physiographic setting of the area can provide a context to better understand the site and its occupation in the past since human ways of life depend on the type of natural environment they live (see Tanaka 1982).

Ethiopia and the Horn have diverse climatic and physiographic environments including extreme dry hot lowlands in the Afar depression and the cool tropical highland mountain peaks (up to 4620 meters above sea level). More than 42 % of the country has elevation higher than about 1500m. Such topography also makes Ethiopia one of the highland mountainous countries in the continent. With its rich biodiversity, the highlands accommodate about 80% the country's total population. The vast highland plateaus are divided by the Great Rift Valley into Northwestern and Southeastern plateaus (Brandt 1986; Phillipson 77:1-3, 1993; McCann 1995:23). Different valleys and numerous gorges also dissect the high plateaus. Within these broad and major physiographic environments, there are also the following sub regions.

1. The hot and humid lowlands of southwestern and western Ethiopia bordering the Sudan.
2. The hot and arid regions of the Danakil depression and Rift Valley areas.
3. The extensive lowlands of eastern Ethiopia that slopes down farther to the east with a parallel increase in temperature and aridity.
4. The extensive and favorable highland plateaus of northern, central, western, southern and eastern Ethiopia (Brandt 1986; Phillipson 1993).

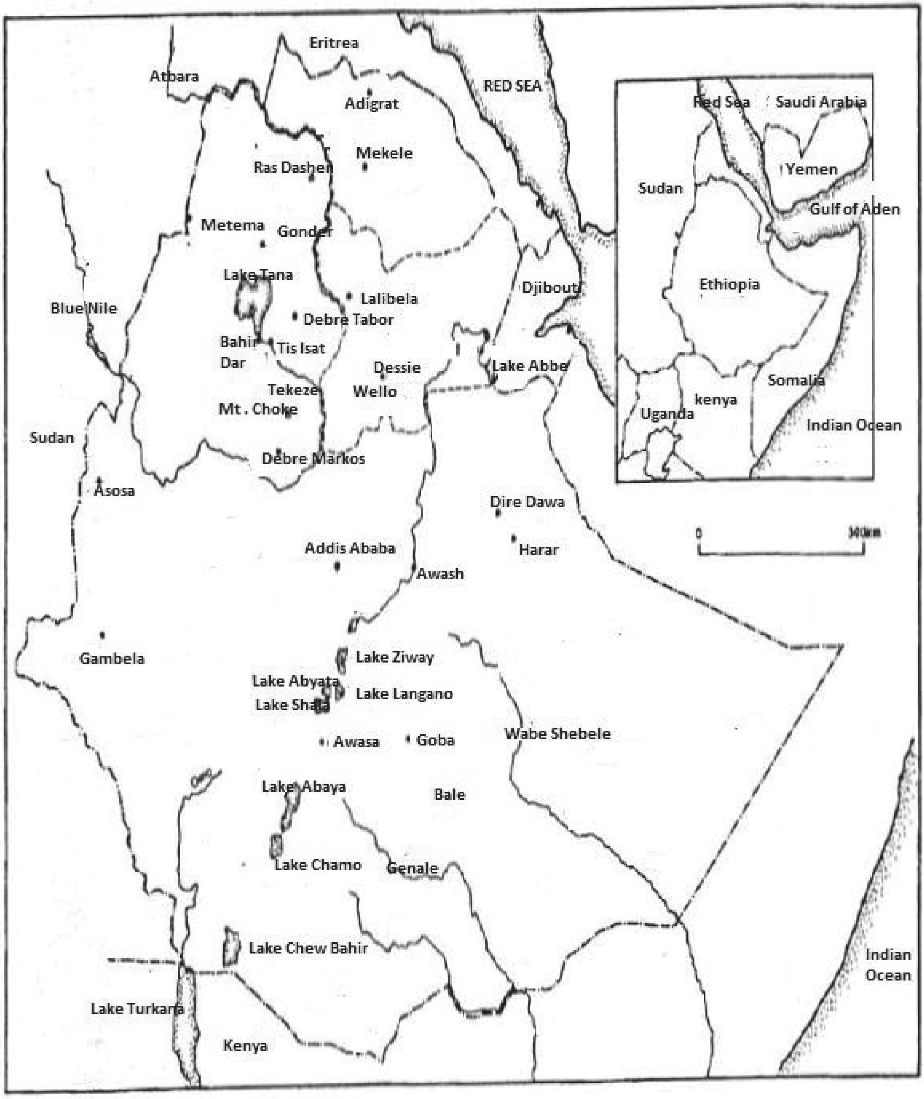


Fig 3.1. Some of the sites cited in this section (Modified from Conway 2000a)

The study area lies in northwestern parts of the Ethiopian plateau. The geographic location and extent of northwest Ethiopia is not precisely demarcated or defined. As cited in different studies, this region may represent areas that lie between Tekeze in the north and the Blue Nile drainage systems in the south. Tentatively it is located between latitudes around $8^{o}30'$ and 15^{o} 00' N and longitudes about $36^{0}00'$ and $40^{0}00'$E. In the west, the region shares a very long border with the Sudan. In the east and southeast, it overlooks the Afar depression and the Rift valley. This region has different physiographic features such as highly dissected and deep gorges; depression, extensive plateaus, river valleys, mountain foothills and lowlands. It also consists of the highest mountain peaks in the country such as the Semen (4620m), Choke (4050m) and Guna (4231m) (Ismail and Abdelselam 2012:38). The highest massif of the Semen Mountain, the extensive central plateaus and the Lake Tana depression and the hot lowlands of western plains bordering the Sudan are the main geographic features of the region. Bordering the Sudan farther in the west, there are extensive hot and humid woodland lowlands. The lowlands bordering the western margin of the Northwestern Ethiopian highlands have an average elevation of about 1000 meters. It also descends to 500 meters in some areas. Most of the plateau of the region is highly dissected forming rugged topography, deep gorges and steep valleys that are difficult to cross (Wolde-Mariam 1972:37-40).

The extensive plateaus also have flat-topped mesas and high mountain peaks dominated by the temperate Afromontane and the bush–and thicket vegetation and steep-sided valleys (Brandt 1986:42; Ismail and Abdelselam 2012:34). Conway (1997: 268) indicated that the highland plateaus of this region are not flat and plain. They are rather "hilly with grassy downs, swamp valleys and scattered trees". In some places, the Blue Nile flows at an elevation of 1300 m lower than the surrounding plateaus. At the base of the plateau, elevation drops gradually westwards down into Sudan at a height of about 700 m. Such different land features could therefore have implications on different ecological adaptation and niches in ancient times. It could also play a role in the evolution as well as spread of agricultural complexes since "geography is a key element in the internal evolutions and external relations of past societies" (Boivin et al. 2009:252). In describing the importance of the highland ecology, Gemechu (1988) summarized that the growth, productivity and diversity of vegetation including crops is limited mainly in high altitude areas. Most crops such as *teff* for example grow very well below 2500m.

In northwest Ethiopia, there are at least three main geographic features that need to be described. These are Lake Tana, Blue Nile and Tekeze river basins.

3.2. The Lake Tana Basin

One of the major geographic features in the region is the Lake Tana depression. Lake Tana is "a saucer-shaped depression in the Ethiopian highland plateau situated at the head of the main channel of the Blue Nile River." It is the largest lake in Ethiopia and the third in the entire Nile basin. The Tana basin in general lies on 2000m high plateau and covers a total area of 16,500

$km^{2.}$ The lake covers 3156 km^2 and has a mean depth of 9 m and its maximum depth is about 14 m. Elevation at the lake is about 1786 m (Hautot et al. 2006; Kebede et al. 2006: Lamb et al. 2007; Haile et al. 2009). Geologically, this area is situated at the center between three main geologic features in the region. Faulting /sinking of the land at the converging center of these geologic structures due to tertiary basalt flow led to the formation of the Tana depression. This formation processes also shapes the later drainage patterns of the region (Chorowicz et al. 1998:351; Hautot et al. 2006; Lamb et al. 2007). Around Lake Tana, the tertiary basalt is assumed 500-1500 m thick. Except in the southeast, high hills or mountains surround the Lake Tana depression. The escarpment that overlooks to the Sudan plains in the west and the escarpment of the northwestern plateau margin that overlooks the Afar plain in the east surrounds the Lake Tana depression (ibid).

The west-facing escarpment, some km west of Lake Tana serves as the main water shed between rivers draining eastwards to the Lake and westwards to the Sudan. Main rivers drain to different directions from the high plateaus that surround the Tana basin. These include Beles, Dinder and Tekeze (Atbara) which flow to southwest, west and northeast of Lake Tana respectively. The Tana basin is bounded between watersheds that extends 8-25 km to the west, and 25-75 km to east of the lakeshores that converge around the northern side of the lake (Chorowicz et al. 1998). Probably because of rivers draining opposite to the lake from its surrounding high plateau, Lake Tana contributes small percentage of the catchment area of the Blue Nile River. The maximum volume leaving the lake is less compared to the water of the Blue Nile where it leaves the Ethiopian border in the west (Conway 1997: 61). The Lake Tana thus contributes only about 7% percent of the Blue Nile discharge (Kebede et al. 2006:235). Yet, the lake covers a wide surface area as compared to its catchment. Probably due to its limited catchment, the highest period of over flow occurs in September some two months after the maximum rainfall in the highlands. In addition, the lake acts as huge reservoir of the summer rain (Conway 1997). According to Vijverberg et al. (2009), Lake Tana contains almost half the country’s freshwater resources. It is also surrounded by wetlands that are often flooded with water during the rainy season. The extensive plain lands that are subjected to flooding include the Dembia, Fogra and Kunzula areas. Such wetlands provide fertile ground for the reproduction and survival of different aquatic animals such fish and hippopotamus. It has also some permanent swamps, and in the past, the swamp environment might have covered much wider areas. Currently the lake environment abode many varieties of fish and birds. There are 27 fish and 215 bird species (ibid).

Although the Lake Tana basin has limited catchment area compared to the entire plateau, there are more than 40 streams and rivers draining to the lake. Gilgle Abay, Gumara, Ribb and Megech Rivers are the major rivers that feed the Lake. They altogether contribute about 95% annual inflow to the lake (Kebede et al. 2006; Lamb et al. 2007). In terms of surface area the Gilgel Abay catchment is the largest in the Tana basin. It has a total catchment area of about 500 km^2. Moreover, elevation in this catchment varies from about 1790-3500m. The Gilgel Abay catchment has extensive flat plains before it ends to Lake Tana. This catchment, close to its sources area, far south of Lake Tana is characterized by mountain ranges and uplands (Haile et al. 2009).

Lake Tana shows relatively less annual lake level variation despite significant changes in the dry to wet seasons in the region. The variation in the level of the lake is about 1.5 m. The highest lake level occurs usually in October and its minimum lake level occurs in May to June immediately before the rainy season. Compared to other tropical east African and Ethiopian rift valley lakes, Lake Tana has quite a regular lake level for the past 40 years (Kebede et al. 2006:236). Therefore, Lake Tana probably requires major change in rainfall to stop its overflow. At least there should be 40 to 50% decrease in precipitation for Lake Tana to be a closed lake. However, several incidents of being a closed lake might have reappeared in the Holocene (ibid).

The Tana basin consists of wide gently undulating plains interrupted in some places by rocky mountainous landscapes, which rise significantly above the surrounding areas. To the west of the lake, there are massifs such as the Belaya Mountain. Within the Tana basin, the topography has small mesas with gently incised valleys and reliefs surrounding the lake. There are still many shield volcanoes to east of the lake Basin. The lake is very close to the great escarpment that divides the extensive highland plateau in the interior and the western lowlands bordering the Sudan (Dupuis 1936: 18-20, 22). As the source place of the most important and big river in northeast Africa and the biggest lake water in the region, this basin could have had important place in subsistence and cultural history of ancient inhabitants (see Lamb et al. 2007). Even today these two major water bodies are considered essential cultural and historical asset to people of the region. It has also served as the main source of subsistence to the Woyto minority ethnic group.

3.3. The Blue Nile and Tekeze River Basins

Blue Nile and Tekeze rivers are the two major rivers that emerge from northwest Ethiopian highlands and drain into the Sudan.

Locally known as Abay, the Blue Nile River is the most important water body in northeast Africa. It contributes the largest amount of water to the Nile River. It is also considered as very vital sources of water for the rise of early agriculture and civilization in the lower Nile basin in general (Gani and Abdelsalam 2006; Lamb et al. 2007). It contributes around 70% of the annual flow of the Nile although in some sources it is stated that it accounts about 56%. In terms of volume of discharge, this drainage basin is the largest in the country and the second largest in terms of area coverage (Lamb et al. 2007). According to Conway (2000:49), it covers about 17 % of the country (176,000 km^2).

The river originates as a small spring at mount Gish (2890m) in Sakala district of central Gojjam plateau some 100 km south of Lake Tana. Joined by other small streams, it first flow northwards and joins the lake in the name of Gilgil Abay. From Lake Tana, it emerges in the name of Abay or Blue Nile and it then flows southeast, curves south, southwest and finally flows northwest to the Sudan. Crossing about 900 km, before it enters to the Sudan, Blue Nile is the longest river in the country. Moreover, its catchment includes wide areas between the elevated ranges of mount Guna in the north, and the western escarpments of the Ethiopian rift and the Afar Depression in the east and southeast (Kebede et al 2005; Gani and Abdelselam 2006; Ismail and Abdelselam 2012:38). Forming a deep and meandering course, the Blue Nile River dissects the northwestern Ethiopian plateau and separates from the central highlands. With a depth of about 1600m, it has the deepest and most extensive canyon in the entire Nile basin. It is also surrounded by undulating terrains as well as flat grassland areas along its meandering streams. The river basin is composed mainly of volcanic rocks with some pre-Cambrian basement and sedimentary deposits (Conway 2000b:49; Gani et al. 2007:4). The elevation within this river basin varies from lowlands to high plateaus: ranging from 500m to 4000m above sea level in the western lowlands and northeast and eastern plateau (Kebede et al. 2005). The vast portion of the highland plateau drained by this river has, however, elevation above 1500m (Conway 2000b:49). Throughout its course, the Blue Nile flows through different ecology ranging from humid to semi arid environmental conditions (Conway 1997:267). In the Sudan, few tributaries, notably the Dinder and the Rahad all of which had their origins from the highland plateaus northwest of Lake Tana, join the Blue Nile (Vijverberg, et al. 2009).

Tekeze is the other major river basin with a deep gorge located some hundreds of km north of Lake Tana. Rivers from southwestern Tigray, northwestern Wollo and Northern Gonder provinces drain to the Tekeze River. From its southern most reaches, this major river flow northeast, north and then northwest direction and joins the Nile in Sudan. It has a total length of about 608 km within Ethiopia and it is known as Atbara River in Sudan. The Tekeze basin covers an area of about 69000 km^2. It is separated from the Lake Tana Blue Nile drainage basin by long chains of the Semen mountain that stretch from Ras Dashen in the north to Guna in the southeast(Ismail and Abdelselam 2012:38). Many rivers and streams originating from north, east and northeast of Lake Tana drain mainly to the Tekeze River (Gani et al. 2007). Angarab and Guang rivers from North Gonder are the main tributary of the Tekeze River (Arsano and Tamirat 2005). These two rivers provide a significant amount annual flood to lower Nile countries both during the rainy and dry seasons (Williams 2009).

3.4. Geology

The study area lies in the center of the northwest Ethiopian highlands and its geology is the result of Cenozoic faulting, uplift and volcano. The outflow of huge basaltic lava (about 2000m thick) and volcanic ash have covered the original Precambrian and Mesozoic sedimentary rocks. These phenomena also resulted in the formation of extensive basaltic plateau (Kebede et al. 2005:1659; Ismail and Abdeselam 2012:34). The Tertiary flood basalt initially occurred in the Oligocene were overlain by vast Miocene basaltic lava flow and many huge shield volcanoes that occurred particularly in the eastern, northern and southeastern sections of this plateau. Very conspicuous shield volcanoes such as Ras Dashen, Choke and Guna Mountains can be mentioned respectively north, east and southeast of the Lake Tana basin (Pik et al. 1998; Chorowicz et al. 1998; Hautot et al. 2006). Furthermore, vast areas surrounding east and north of the Lake and areas adjacent to the western shore of the lake are covered by Mio-Pliocene volcano. This volcano also covers vast areas southeast of lake Tana stretching as far as the Choke Mountain in the eastern portion of the Gojjam highlands and around the Blue Nile gorges. Oligocene flood basalts, on the other hand, cover extensive areas far to the northwest and west of Lake Tana. Still narrow stretch of land south of the southern shore of the lake is mainly covered by quaternary basalt and trachyte (Gani et al. 2007:5; Ismail and Abdelsalam 2012:39).

However, within these major tertiary and quaternary flood basalts and shield volcanism, there are pockets of Mesozoic and Tertiary deposits found exposed in few locations surrounding the Lake Tana basin. Mesozoic sedimentary deposits and rocks are found exposed along the gorges of major river valleys and west of Lake Tana such as in Metemma area (Gani et al. 2007). There are also thick exposed Mesozoic strata at Tana escarpment (some 130 Km west of Lake Tana). Oligocene fluvial sediments are found in Chilga valley located about 100 km north of the Lake Tana (Chorowicz et al. 1998; Hautot et al. 2006). In addition, Quaternary lucastrine and fluvio-colluvial sediments are often exposed around many river channels of the region (Kebede et al. 2005; Gani et al. 2007). According to Kebede et al. (2005:1659), Precambrian basement crystalline rocks are the oldest rock in the region. They are found exposed mainly in low-lying areas farther west of the Tana basin and along the lower basins of the Blue Nile River (Chorowicz et al. 1998; Mohr 1983; Ismail and Abdelselam 2012:35; Kebede et al. 2005:1659). These rocks are mainly high-grade gneisses and volcano-sedimentary green schist associated with ultramafic rocks. Thick succession of sand stone and limestone belonging to Mesozoic sediments are also available along the Blue Nile gorge. Except for these few pockets of Precambrian rocks, Mesozoic sediments and Quaternary volcano, Oligocene and Miocene-Pliocene flood basalt and volcanoes cover almost the entire northwest Ethiopia. Alkaline basalt with ryholite are found in few areas interspersed with the flood basalt that dominates the vast majority of the Plateau in northwest Ethiopia (Mohr 1983; Chorowicz et al. 1998; Ismail and Abdelselam 2012:35; Gani et al. 2007).

The geology where this study is conducted is not available in specific details. However, the above general descriptions indicate that areas adjacent to the northern shore of Lake Tana belong to the Mio-Pliocene volcano. Since the study site is located on the northern shore of Lake Tana, its geology is generally dominated by Tertiary lava flow and volcano (see Yemane et al. 1985; Gani etal. 2007). Mohr (1983) also indicated the rock geology of the vast portions of the region is predominantly basaltic in nature. Rhyolite is also found alongside the predominantly basaltic rocks. Some isolated volcanic hills are still standing around the study site. Basalt and ryhiotite are also common near the site. In addition, some fine-grained rocks such as chalcedony, chert and agate and even quartz are found along the eroded riverbeds and course as well as near the edge of Lake Tana.

3.5. Climate

As Kebede et al. (2006:235) described the entire Lake Tana-Blue Nile basin is characterized by tropical highland monsoon climate. Primarily the climate of this region is the result of the seasonal movement and shift in the location of the Inter-Tropical Convergence Zone (ITCZ). It receives maximum amount of rainfall during the summer months from June to September. The remaining months are relatively dry. During the summer season, this low pressure wind belt moves north to about 19^0 north of the equator. This brings the rain bearing moist air masses, mainly from the Atlantic and Indian Ocean. Therefore, roughly more than 70 % of the rain occurs in June, July, August and September. Around October to May the Inter-Tropical Convergence Zone moves far to the south bringing the northeast continental dry and cool air mass over northwest Ethiopia. So the region remains dry with only little amount of rainfall. Due to such seasonal character of the climate, about 80% of the annual flow of the Blue Nile River occurs during July to October (Conway 1997:51; Lamb et al. 2007; Kebede et al. 2005). On the average the Lake Tana-Blue Nile basin receives about 1410 mm rainfall per annum (Lamb et al. 2007) while Romilly and Gebremichael (2010) suggest that the entire northwest Ethiopia has an average annual rainfall of 1630 mm .

The total annual rainfall in the region is generally high despite significant variations from place to place. It can vary from 1000 mm in the lowlands to 2000 mm in the highlands. Occurring mainly from Mid June to Mid September, the Lake Tana basin in particular receives maximum annual rainfall ranging from 950 to 1500 mm (Yemane et al. 1985). Areas south of Lake Tana are relatively moist than the north. Rainfall also decreases westwards to the lowlands bordering the Sudan (Conway 1997; Kebede et al. 2005:1659).

On the other hand, annual temperature variation in the basin is generally very small. The annual temperature around Lake Tana is about 20 ^{0}C with its annual variation of 3 to 6 ^{0} C. The presence of high cloud cover in the summer greatly regulates and reduces the effect of high overhead sun temperature. Hence, the hottest period in the region occurs from March to May instead of July and August. The role of elevation in regulating the local climate is also very significant. Elevation in the region generally varies from around 500m to 4050 m. Within 1000m elevation difference, there is a difference of about 5.8 ^{0} C in temperature (ibid; Conway 1997:51). According to Haile et al. (2009:1697), local factors such as difference in altitude, slope and location in relation to moist wind and large water bodies influence the local climate. Despite variation at a local scale, rainfall in general increases with elevation (Gemechu 1988).

Nyssen et al. (2004:288, 290) summarized that "the climates of Ethiopia are complex: ''within short horizontal distances, climates from tropical to sub humid and subtropical to arctic can occur. Rain and temperature vary mainly with elevation". Places at similar altitude may have different amount of precipitation due to difference in their latitude. In addition, "because rain increases with altitude, and evapotranspiration decreases due to lower temperature, mountain areas are much moister and have a much longer rainy season than lowland areas at the same latitude (ibid)." Similarly, Conway (2000b) commented that in addition to the impact of the Inter-Tropical Convergence Zone, climate in the region is significantly influenced by elevation. However, it can generally be said that the climate is more of temperate at higher elevations and tropical at lower elevations.

The presence of large water body such as Lake Tana, the mountainous terrains and their relative orientation to rain bring wind lead to local variation in rainfall in the region. The variation in rainfall is relatively high in the low lands. A specific case study in the Blue Nile-lake Tana basin demonstrated that areas 12 km apart have a difference of 375 mm annual rainfall. This is due to variation in the orientation of the terrain. The west facing terrain gets rainfall of 375 mm higher than east facing terrain (Nyssen et al. 2004). This generally indicates the presence of significant micro climatic variations and microenvironments in the region (see Haile et al. 2009).

Based on altitude, in many parts of the country, there are traditionally defined agroclimatic zones, *Kola, Woyna Dega* and *Dega* agro climatic zones. Areas below 1800 m with mean annual temperature of 20-28^{o}c are categorized as *Kolla* zone. Areas having elevation between 1800 and 2400 m with mean annual temperatures of 16-20^{0}c belong to *Woina Dega* zone while those above 2400 m with mean annual temperatures of 6-16^{0}c are defined as *Dega* zone (Conway 2000a:550-51). Even at very high altitude areas, the local inhabitants identify another agroclimatic zone: *Wurich, which* is often regarded as the coldest zone. The lowlands below *kolla* where the total amount of the annual rainfall is very low have *Berha* agro climatic zone. However, it should be noted that these classifications could not be taken as precise and rigidly defined across all areas (McCann 1995:26-8; Hurni 1998).

The *kola* and *Woyna Dega* agroclimatic zones can generally be regarded as productive areas where different crops could be cultivated. Especially in the *Woyna Dega* zone abundant varieties of crops such as *teff*, sorghum, finger millet, barley, wheat, pulses, maize, *noog* are cultivated. *Teff* and sorghum, finger millet and groundnut are grown in the *Kolla* zone. Barley in *Wurich* and wheat, barley, and pulses widely grow in *Dega* agroclimatic zone (Hurni 1998). The study area generally has both *Kolla* and *Woyna Dega* agroclimatic zones. In the highlands adjacent to the Lake Tana plains *teff*, barley, finger millet, wheat and different varieties of crops are being cultivated. However, the lowland plains around Lake Tana such as the Foggera and Dembiya plain mainly cultivate *teff* and chickpea. Sorghum is also cultivated in the well-drained sandy soils.

3.6. Vegetation

The natural vegetation of Ethiopia is also the reflection of local climate and topography. The variation in altitude and climate allowed diverse types of vegetation. The distribution and type of the natural vegetation have had clear vertical zonation. They range from desert and semi desert in the arid lowlands to savanna woodland, dense evergreen and bushes in the highlands and afromontane vegetation in the more elevated highlands or mountains. In the ancient past, the highlands of Ethiopia might have been covered by dense natural vegetation. Except few pockets of surviving natural vegetation, currently the highlands are almost devoid of significant vegetation cover. Remains of Juniperus (Pencil cedar), podocarpus, olea, hagenia and other local species are found only in some limited areas (Blower 1968). Conway (1997) also explained that according to variations in altitude and local climate, the original vegetation of the region had great difference even with short distances. However, they are now destroyed due to long agricultural tradition and dense population settlement. Although it is not well quantified and documented, some studies estimate that around 40% of the country had dense forest cover. Now, the country has maintained only about 3% its natural forest. Hence, the patchily and highly scattered surviving vegetation of the region today may only be an indication of past vegetation type and distribution (Bishaw 2001; Darbyshire, et al. 2003). As remnant vegetation in some parts of central Ethiopia indicates much of the highlands would have been covered by montane forests with pronounced variations with altitude. Thus, areas below 2000m were dominated by savanna vegetation whereas probably between 2000-3500m have some evergreen montane forests such as Cedar, Olea europaea, Rapanea simensis and Kosso. Ericaceous vegetation is dominant in areas between 2900-3700m (Bussuman 2006). Pankhurst (1995) remarked that deforestation in Ethiopia had long history despite we lack documented evidence. Such old age practices of deforestation might have been common around areas of dense settlement. As travelers' account suggests the densely settled highlands and urban areas were devoid of dense forests probably from the late medieval times onwards, although they had dense natural vegetation in the ancient times. Similarly, McCann (1995:36) indicated that much of the Ethiopian highlands were covered with open grassland and savanna vegetation for much of the historic period. However, particularly in Northern highlands, the dry evergreen forests and grasslands and a large part of the moist evergreen forests have changed to open farmlands and pasture. In addition, acacia woodlands once dominant in the eastern and western escarpments are now subjected to short-fallow cultivation.

The study area has diverse physiographic environment primarily due to variation in elevation. Hence, in the past, there could have been different types of vegetation depending on the local ecology, climate and altitude. However, in the highlands where I conducted the field survey, the natural vegetation is almost destroyed due to intensive farming activities. Few traces of the original natural vegetation are available only in limited areas that are mostly inaccessible for agriculture and human occupation. There are scattered big trees and bushes around some big river valleys, such as along the flat banks of the Blue Nile River and gentle escarpments of the Blue Nile gorge. There are scattered acacia trees around the gorge northeast of the Blue Nile Bridge near Dejene Town. According to local informants, these trees produce incense. In addition, very dense forests with big indigenous trees are found at Tara Gadam some 80 km to the north of Lake Tana and within many rural churchyards. These are protected sacred forests. Some thorny bushes are available in the hills of the Blue Nile Valley, around stony mountain hills and terrains north and northeast of Lake Tana. In the less populated and lowland areas around the lower and western course of the Blue Nile, thorny bushes with dense grassland savanna are common. Nevertheless, they are currently subjected to destruction due to investment and private consumptions. I noticed deliberate bush fire in the hot lowland parts of Blue Nile Valley, which according to the local people is a very common practice these days.

In addition, there are dense forests still standing in the Zegie peninsula at the southwestern edge of Lake Tana. The survival of this vegetation is essentially attributed to religious and cultural reasons. The area is center of many monasteries and churches, some of which were established in the early medieval time. According to local information, the founding members of these religious institutions put spiritual sanctions on the local people not to destroy the forest and practice farming. Still these days, the local populations of the peninsula do not practice farming. They make a living on the products of the forest. They especially engage in coffee production and trade. Botanist describes this forest vegetation as part of dry afromontane vegetation (Alelign et al. 2006). Geographic explorations in the late 1960s along the source and course of the Blue Nile indicated that the area around Bahir Dar was mainly covered by bush grassland with thick undergrowth. Such abundant grass and wet ecology was very suitable for the smaller antelope: Duiker and bushbuck (Blashord-snell et al. 1970).

Recent study around the northern catchment of Lake Tana indicated that the region have had significant amount of forest cover, woodland, revirine, grassland and shrub lands. However, they are destroyed at a dramatic rate within a short period. According to this study (from 1957 to 2003), the areal coverage of dense forest and riverine vegetation was reduced by 87 % and 71% respectively. Woodlands, shrubs and grasslands are destroyed by 90%, 37%, and 9 % respectively (Molla et al. 2010). Yemane et al. (1985:125-6) argued that the original vegetation of northwestern Ethiopian highlands could have been evergreen montane forest with trees such as *Olea Africana, Podcarpus gracilior, Juniperous procera and Sapotaceae*. Surviving traces are found mainly in some areas above 2000m, the mountains east of Lake Tana and the islands of the lake. The lowlands farther west of the lake are mainly dominated by bush land. The vegetation type along areas surrounding the lake is largely thick vegetation and a chain of undifferentiated woodland. Alelign et al. (2007) summarized that the natural vegetation around Lake Tana ares ranges from transitional vegetation to humid evergreen forests to upland dry evergreen forest and undifferentiated afromontane forest. The vast sections of the northwestern Ethiopian highlands have remnants of the undifferentiated woodland vegetation (Bekele 1993; see also Yemane et al. 1985). According to Bekele (1993:11), this type of vegetation is mainly dominated by trees such as "*Balanites aegyptiaca, Boswellia papyrifera, Combretum collinum, Stereospermum kunthianum and Terminalia spp.*"

Fig. 3.2. Surviving forest near a monastery in Addis Zemen (Tara Gedam)

Fig. 3.3. Forest near the foothills of the western escarpment in Gonder

Fig. 3.4. Forest on the edge of Lake Tana in Gorgora

Fig. 3.5. Grasslands along the plains in the Blue Nile gorge near Bure town (in Gojjam)

3.7. Soil

One of the most important natural components influencing the distribution of both human and animal life as well as natural vegetation is soil. The Ethiopian highlands and mountains have for long been ideal for human adaptation because it has very favorable climate and ecological elements such as rich and fertile soil. Its soil type and fertility generally differ from place to place due to the nature of the parent material, local climatic and ecological conditions such as flood, wind and other human and natural factors. The dominant soil type in the entire country can however be considered the result of the decomposition of its huge volcanic rocks (Wolde-Mariam 1972; Hurni 1988; McCann 1995:25-6). The Ethiopian highlands have red clay loam to black soils. The highly acidic and well-drained reddish brown soils are more predominant in the highlands whereas black cotton vertisols are most common in the lowlands and valley bottoms (ibid). Hurni (1988) in particular stated that the highly mountainous north and surrounding areas have predominantly brown to dark soils (Phaeozems, Andosols). The western parts of the country are mainly characterized by reddish soils on deeply weathered bedrock (Nitosol, Acrisols). Along the Lake Tana basin, there are quite varied types of soil. Chomic Luvisols, Eutric Cambisols, Eutric Fuluvisols, Eurtic Leptosols, Euritic Regosols , Haplic Nitosols and Lithic Leptosols are the most dominant(Setegn et al. 2010). Hurni (1988) generally attribute fertile reddish soil are more common in Gojjam highlands, a province that lies entirely within the Blue Nile-Tana Basin. As Conway (1997) suggested, vertisols or latosols generally constitute the most widespread soil types of the basin. Despite such different and specific descriptions about the soil types, it is widely argued that the region have the most fertile soil favorable for agriculture and human occupation. This is particularly true before they were subjected to continued agricultural practices and consequent degradation and erosion (See Hurni 1988; McCann 1995:25-6). As Wolde-Mariam (1972) indicated due to its poor drainage, the sticky water logging black clay soils are usually left for grazing. On the other hand, areas with reddish brown lateritic soils are the most extensively utilized for cultivation. The wide plains mainly around the study area is dominated by the water logging black clay soil while the small isolated hills have reddish soils with stony landscapes.

3.8. Wildlife

Similar to the natural vegetation, the diverse and favorable natural environment of Ethiopia had once accommodated immense varieties of wild life. These highly varied environments still contain around forty-five species of small and large ungulates (Brown 1969). The mammalian fauna as indicated by Yalden et al. (1996) are very diverse. They documented around 277 terrestrial and 11 aquatic species from Ethiopia and Eritrea. Some of these species are endemic to the region. Most of the endemic species are confined around the plateau lands. The vast majority of the terrestrial fauna have wide geographic distributions. Fauna of desert and semi desert, sub-Saharan savanna, forest and mountain environments are found. Most of the terrestrial faunal are of the type common to savanna ecology.

Yet, in most parts of the highlands, the wildlife resources are almost destroyed due to destruction of their natural habitat through extensive farming and long hunting tradition. Few inaccessible areas such as rocky, scrub mountain foothills, however, maintain some wild animals such as greater Kudu, bushbuck, waterbuck, warthog, reedbuck, duiker, semen fox, galada baboon, walia Ibex and some other species. Around the lower course of the Blue Nile, there are still some wild animals like tora Harte beest (Alcelaphus buselaphus tora) (Blower 1968). Oribi was widely distributed in the western lowlads stretching from Tekeze River in the north down to Akobo River in the south. Lion in the Blue Nile gorge and elephant in the Tekeze area and Dinder and Beles river basin (west of Lake Tana) were also reported (Bolton 1973). Pankhurst (1995) indicated that probably due to the introduction of modern firearms since the eighteenth century, many parts of the country have lost their wild life resources at a very dramatic rate (see also Largen and Yalden 1987). Bolton mentioned "the wild life situation, especially with regards to big game is very different from that which prevailed a few decades ago. Large mammals throughout the Empire have undergone a serious decline in numbers (Bolton 1973:563)."

Around Lake Tana, big aquatic animals such as hippopotamus and crocodile are common. Both animals are found along river Blue Nile. Hippopotamus is the most common big wild animal available around Lake Tana today. Otter, Nile monitor (*Varanus niloticus*) and a python (*Python sebae*) are also found. The lake and its largest wetland in Ethiopia harbour around 27 different species of fish 20 of which are endemic to this lake. The lake has rich fish density belonging to the family Cyprinida that includes the genera of Varicorhinus, Garra, labeobarbus and Barbus. It also contains around 215 bird species and 83 of them are endemic (Vijverberg et al. 2009). Generally, the lake has four fish family: Cyprinida, Balitoridae, Cichildae and Claridae. The latter three are represented only by one species each. Respectively, they are Afronemacheilus abyssinicus, Oreochromis niloticus tana and Clarias gariepinus (Nagelkerke 1995). Although the lake is thought to have lower rate of fresh water crustaceans and Zooplankton, its vast wetlands with its seasonal and permanent swamps serve as the main nurseries for diverse aquatic mammals, fowls and fish (Vijverberg et al. 2009). Taddesse (2011) has summarized that the lake has more diversified fish species than other lakes of Ethiopia. According to Wudneh (1998), the fish of Lake Tana have seasonal and spatial pattern of distribution, some even migrate to the mouth of the main rivers feeding the lake particularly during their spawning periods. Some prefer deep water while others live in shallow or littoral zones. Generally, however, the fish fauna of Lake Tana often show spatial rather than temporal variation. Since there are no forests in the surrounding of the Blue Nile and Lake Tana, I did not encounter any wild animal except the hippopotamus. However, Blashford-Snell et al. (1970) reported that smaller antelope such as duiker and bushbuck and other species were abundant around Bahir Dar. Woyto elders explained that, in addition to hippopotaus there were many varieties of wild animals around Bahir Dar. They mentioned such animals as *Tinchel* (hare), *Kerkero* (wartdog), *Dekula* (bush buck), *Buher*(reedbuck), *Gosh*(buffalo), *Shikoko*(hyrax), *Anbesa*(Lion), *Nebir* (leopard), *Midaqua* (antelope), *Jart* (Crested porcupine), *Jib* (hyena), *Tota*(grivets) and others. Hunting for those animals was considered to have both cultural and economic values among the various groups living in the region.

3.9. Palaeoclimate and Environment

As Barnett (1999b:8, 85-6) argued human subsistence behavior is highly influenced by climatic and environmental conditions. Change in climate affects the environment and its resources available to humans. This in turn led them to take different adaptive responses. Gasse (2000) argued that in Africa, the availability of fresh water is the most crucial factor in dictating the distribution and density of population settlement. Any attempt to understand past socio-economic and cultural change should thus include investigation of ancient climate and environment of the region under study. This provides crucial information to understand and reconstruct human activities and subsistence changes in the ancient past. In the following section, I shall present the palaeoclimate and environment of Ethiopia and the Horn in late Pleistocene and Holocene. Evidence of possible human impact on the local environment is also assessed.

The dates used in this section are in BP (for calibrated), bp (for uncalibrated), but for calibrations that are not clearly indicated, I presented the dates as they appear in the literature.

Palaeoclimate and environment data in the Horn of Africa are limited. Reconstructions are made mainly from inferences based on studies from other regions. Such reconstructions suggest that, like most part of Africa, the region had experienced significant climate oscillations since ancient times (Brandt 1986). Increased research in the last two decades from different parts of Ethiopia provided a better picture on past environment. Relatively increased data are now available from sites in northern Ethiopia than ever (see Marshall et al. 2011).

3.9.1. Late Pleistocene

During the terminal Pleistocene dry phases (18000 to 12-10000), many lakes in the Ethiopian Rift Valley and Afar could have been dried up implying severe aridity in the highlands (Brandt 1986:71). Similarly, Nyssen et al. (2004) argued that the Ethiopian highlands experienced cold and dry conditions from around 20000-12000 bp. Sediment cores from Lake Tana indicate increased aridity in late Pleistocene. There was remarkable decrease in runoff and rainfall, low lake level with reduced sedimentation and desiccated surface prior to 16400 BP (Marshall et al. 2011). The lake might have been completely dried around 18700 BP (see also Lamb et al. 2007:294-5). Correlation of seismic stratigraphy, geochemical and magnetic data from Lake Tana showed overflow of the Blue Nile, increased runoff and erosion by about 15300 BP (Marshall et al. 2011). However, the general arid conditions continued until about 15100 BP even though there were shallow–water environment and papyrus swamp between 16700-15100 BP. The lake margin remains dry until the short refill event of after 15100 BP notably at 14750 BP. Indicators of dry event and decreased lake level is inferred between 13000-1200 BP, possibly until 11500 BP. At broad general scale, the timing and the general pattern of late Pleistocene Lake level changes in Lake Tana is comparable with other regions. It can be compared to the climate pattern such as in Lake Victoria and Albert, lake Tanganika, and lake Abhe, Ziway-Shala in the Ethiopian Rift Valley as well as in the Sahalian lakes (Lamb et al. 2007:296-7; Marshall et al. 2011:158). The dry episodes are essentially related to the southward retreat of the ITCZ (Inter-Tropical Convergence Zone) and week circulation in the African-Asian monsoon system (Marshall et al. 2011).

3.9.2. Early Holocene

Following this late Pleistocene dry episode, a shift to wet phase was inferred around the Lake Tana basin. This is parallel to lake level increase and overflows across sites north of 5^0N at the beginning of the Holocene (Marshall et al. 2011:158). Very high flood level is inferred from the Blue Nile River around 8600, 7700 and 6300 BP. However, there were reduced rainfall and runoff at about 8400 and 7500 BP in the Blue Nile basin (Williams 2009:7). A general decline in precipitation in the region occurred since after 6800 BP that culminated into a very intense arid phase at 4200 BP. Nevertheless, this process might have begun by about 8500 BP (Marshall et al. 2011). This may indicate “a non-linear site specific gradual process rather than a linear response to an abrupt change in climate (Marshall et al. 2011: 159).” Correlation of climate change and response of local vegetation demonstrate this trend. Lake sediment analysis in the Rift Valley indicated that there did not appear abrupt decline of woody plants in lake sediments during the arid intervals suggesting a slow response of plants to changes in Holocene climate (Chalie and Gasse 2002; Lamb et al. 2004:890; Umer et al. 2007).

Multi-proxy lake sediment analyses from other parts of Ethiopia likewise indicated more humid situations during the early Holocene. They had freshwater conditions from 10000 BP, in fact with a decreasing trend in overall rainfall, until about 6300 BP (Stanley et al. 2003). Reconstruction of past climate from the Ethiopian Rift Valley lakes witnessed rising lake level during early to mid Holocene. From 11400-5700 BP, Lake Ziway, Abiyata, Langano and Shalla merged into one big lake (see Gillespie et al. 1983; Grove 1993:39-41; Chalie and Gasse 2002). A summery by Lamb (2001) also showed that Rift Valley lakes of Ethiopia had marked rise in lake level and they overflowed into the Awash River in the early Holocene. Nevertheless, there were marked lake level regressions indicating arid conditions within the general early Holocene wet phase. For instance, dry episodes were inferred at about 9450 BP, 8500 BP, 8200 BP, 7800-7200 BP, 5900 BP (ibid; Chalie and Gasse 2002, see also Gillespie et al. 1983; Grove 1993:39-41). Additional data from Lake Tilo, in south central Ethiopia in the Rift Valley showed general humid conditions between 8840-5500 bp with a brief intense dry condition at 7800 bp. As inferred from Lake Shala-Ziway and other eastern African lakes, this arid event covered wider regions (Lamb et al. 2004).

In Northern Ethiopia, from Mai Maikden in Tigray province, alluvial/colluvial sediment analysis indicated that the region had more humid climate during the early Holocene. Data from long sediment sequence analysis dated between 7310±90- 5160±80 bp witnessed wetter condition in the Holocene. A dry event was inferred around 4710±70 bp and the climate deteriorated towards a more arid situation then after (Berakhi et al. 1998; Dramis et al. 2003). This general pattern of both the wet and arid phase is more or less similar to results obtained from the Rift Valley and Afar areas of Ethiopia. It is also similar to Holocene climatic fluctuation to wider parts of the Horn and North Africa (ibid; Bard et al. 2000). Evidence from the Blue Nile River near Khartoum, for instance, showed more humid climate from early Holocene until 8000 BP. Reduction in humidity, but wetter conditions than the present, was inferred between 8000-7000 BP. This was followed by arid condition between 7000-6800 BP with minor humid phase for the next 300 years (Lario et al. 1997.586-7). Moreover, the fluctuations in the Holocene wet/dry events in the region may be attributed to large scale climate influencing factors (Dramis et al. 2003:282).

3.9.3. Middle/Late Holocene

From about 11500–4800 bp, there was a general increase in lake level, river flow and increased arboreal tree, but with significant dry intervals. Dramatic shift to aridity with increased soil erosion occurred in Ethiopia from around 5000-4800 bp (Nyssen 2004:86-7). Recurrence of high lake-level in the Rift Valley lakes, Lake Hayke, Afar, and swamps of the southern Ethiopian mountains was inferred from the early Holocene until 5000 bp. Since then, general dry conditions prevailed with brief wet conditions (Dramis et al. 2003). The beginning of mid Holocene aridity around Lake Ashange (Northeastern Wollo) seemed to have occurred since 5600 BP (Marshall et al. 2009). Lake level declined in the Rift Valley and Lake Abhe in Afar between 5000-4500 bp and 4500-4100 bp respectively. Similarly, in Lake Tilo south central Ethiopia, a dry event was inferred around 4500 bp. At 5500 bp salinity of lake water with significant decline in woody plants was investigated across different areas. Significant decline of Lake Shala-Ziway was evident by about 4800 bp. Decline in woody plants with subsequent expansion of grasslands, following marked aridity, was documented from many tropical African sites (Dramis et al. 2003; Lamb et al. 2004; Marshall et al. 2011). Similarly, Gillespie et al. (1983) and Conway (2000a:141) suggested dry condition in the region since around 5000 years ago. Stanley et al. (2003) and Lamb (2001) respectively remarked that around 4200 BP and 4500 bp, lake levels in the main Ethiopian Rift Valley declined which were comparable to the modern level. In Afar, northeast Ethiopia, a similar dry event occurred after 4000 BP and in Shala-Ziway after 4500 BP (Grove 1993:39-41). The Ethiopian highlands were generally dry from 6200 to 5800 bp, with more severe aridity after 4500 bp (Barham and Mitchell 2008:357-9).

The arid condition in the Nile Valley area Sudan might have been established around 4500-4000 BP implying aridity farther in the Ethiopian highlands. In fact, some sources suggest that the wet humid phase might have ended by about 4500 BP (Lario et al. 1997.586-7). According to Gasse (2000), the main Nile flood was highly reduced around 4200 BP due to dry situation in Ethiopia and Equatorial Africa. A number of proxy indices including written texts from Egypt generally confirmed severe climatic change and aridity in the entire Nile basin by about 4200 BP (Stanley et al. 2003: 4000-1). Grove‘s summery (1993:35-42) indicated that in most parts of the tropics, there had been humid climate from about 6500- 4500 BP. Yet, marked decline of the Blue Nile River in Sudan was inferred sometime after 5500 BP. Hildebrand (2003) reviewed that the northern half of Ethiopia had similar alignment in rainfall and general climate pattern with North Africa. Barham and Mitchell (2008:357-9) explained that from 5500-3300 bp, east African highlands had in general dry conditions with an abrupt aridity around 4500 and 3700 bp.

Lamb et al. (2002) indicated that despite short humid phases recorded from different areas, mid Holocene ardification generally prevailed in the region after about 5000 BP. There were, however, some wet phases in different parts of the country around 2400 and 2150-1000 bp in Tigray and southern Ethiopia at 3800 and 1400 bp (Dramis et al. 2003). Wet episodes were inferred from Lake Tilo between 3700 and 3200 bp (Lamb et al. 2004), Lake Awassa between 4000-2800 BP(Lamb et al. 2002), and in Afar around 2500 BP (Grove 1993:35-42). Increase in lake levels implied recurrent wet conditions in the general dry mid/late Holocene period.

This event was mainly dictated by global factors (Dramis et al. 2003; Lamb et al. 2007; Marshall et al. 2011).

According to Bard et al. (2000), despite the humid condition from 500 BC to 500 AD, the present climate pattern of the region was established in the second millennium BC. Similarly, Barham and Mitchell (2008: 357-9) argued that the modern lake level was established since around 3000 bp. Yet, Grove (1993:41-42) suggested that the present climate condition in many parts of Africa might have been established after 3500 BP, but lake levels comparable to the present might have occurred around 1800 BP.

In summery it can be argued that the region experienced climatic fluctuations at different times in late Pleistocene and Holocene. Furthermore, contrary to what had been assumed, African Holocene climate was not so stable and regular. Many dry episodes had occurred during the general humid early to mid Holocene climate (see also Gasse 2000; Dramis et al. 2003; Marshall et al. 2011). There could also be significant differences in the duration and intensity of wet verses dry phases across areas. For example, mid Holocene evidences from Lake Tana (Lamb et al. 2007) and from Lake Tilo (Lamb et al. 2004) did not show dramatic and abrupt termination of the Holocene wet phase (see also Chalie and Gasse 2002). Marshall et al. (2011:148-9) commented that discrepancies in the timing of wet/dry changes between sites may be due to local factors, the nature of data, and the scale of resolution or other technical factors. Yet, most of the results on the onset of the mid Holocene arid phase in the region seemed to be concentrated between 5500 to 4200 BP. Despite the discrepancy on the time regading onset of the mid Holocene aridity in Ethiopia and the Horn from researcher to researcher, the general trend shows that those changes in climate are motivated by shifts in the position of the Inter-Tropical Convergence Zone across time, space, and associated trends in the strength of the African monsoon.

3.9.4. Evidence of human impacts on the natural environment

Compared to the reconstruction of the palaeoclimate and environment, investigation of human impact on the natural environment of Ethiopia and the Horn appears to be less explored (see Nyssen et al. 2004:287; Marshall et al. 2009). Available evidences generally showed significant human influence on the local environment during late Holocene. Lake sediment and geomorphic analysis from Wollo and Tigray provinces in northern Ethiopia for example showed pronounced human impact on natural vegetation in last 3000 years. In this region, Podocarpus–Juniperus dominated forests were substituted by Dodonaea scrub and grassland vegetation since around 500 BC. Domination of the Chenopodiaceae, Plantago and Rumex in the pollen sediments often available in the upper contexts are indications of human interferences or disturbances. As inferred from the few surviving scattered forests, the original type of natural vegetation in the highlands was also dominated by Juniper-procera forest (Conway 2000a; Bard et al. 2000; Darbyshire et al. 2003; Dramise et al. 2003; Nyssen et al. 2004; Fernandez et al. 2007). According to Nyssen et al. (2004), buried soils dated to about 5000- 4000 bp were found in Tigray. Buried soils are indication of human activities. This implies that deforestation of the original forest in the region might have been slightly older. They further argued that this could be attributed to economic activities in the region since the second millennium BC. However, intensified human impact seemed more evident from 100 BC to 400 AD. Intentional clearance of natural vegetation (Juniper forest) since around 3600 BP was also inferred from sediment analysis from Adigrat and Adi Kolen in Tigray (Terwilliger et al. 2011). Soil sediments that are anthropogenic in origin were evident in the Lake Ashange catchment in Wollo after about 2900 BP. This situation remarkably increased in intensity since 1500 BP (Marshall et al. 2009). The decline of the original vegetation and its subsequent replacement by the secondary forest or grassland vegetation in this period was the result of human induced land degradation. This event is explained in relation to migration of Semitic speaking people over northern highlands and subsequent introduction and expansion of agriculture (see also Darbyshire et al. 2003; Dramise et al. 2003; Nyssen et al. 2004; Marshall et al. 2009).

In the Rift Valley and surrounding highlands, human induced destruction of the natural vegetation took place in late Holocene. Clear evidence of human impact was inferred from Lake sediment analysis since around 2000 BP in Bale mountains (Umer et al. 2007), and Lake Tilo after about 2400 bp (Lamb et al. 2004).

Around Lake Tana, Lamb et al. (2007) argued that there was increased sedimentation to the lake since around 4200 BP. This may be attributed to less dense vegetation cover in the catchment. Evidence of intensive human impact through burning and cultivation was evident after about 1700 BP. This was indicated by the abundance of magnetic minerals in topsoil of the lake core sediment. A trend similar to other areas is inferred from Benishangul area of Western Ethiopia. Pollen analysis indicated intense human interference on local ecosystem near the archaeological sites since around 2000 years ago (Fernandez et al. 2007:117).

Generally, combination of human activity and the progressive aridity of the period might have significantly affected the natural environment of Ethiopia and the Horn in late Holocene (Darbyshire et al. 2003; Dramise et al. 2003; Nyssen et al. 2004; Umer et al. 2007). Regeneration of vegetation was also reconstructed in other areas in later times. Evidence from Tigray showed regeneration of Podocarpus–Juniperus around 1400-1700 A.D. This may be due to the drought initiated depopulation and/or increased rain. Evidence of increased drought was recorded from east African lakes from around 980 AD to 1270 AD. Rainfall above the average was documented by about 1300 AD to 1800 AD in Kenya, which could also be the case in Ethiopia. This could have stimulated expansion of forests (ibid).

3.9.5. Holocene climate and pattern of natural vegetation change

The changes in Holocene climate could have had paramount impact on human population. Famine and drought, migration, and rise and fall of civilization are consequences of such events (Gasse 2000). In addition, following the oscillation in the palaeoclimate, there could be retreat and expansion of natural vegetation across latitudes and altitudes. Since Ethiopia has a mountainous landscape, changes in the vertical distributions of natural vegetation following oscillations in the climate could be significant. This might have impacts on human subsistence and on changes in subsistence strategies.

Barnett (1999b:89-91) attempted to show the shift in the vegetation zones across altitude due to climatic changes in the Holocene. She proposed that the montane forests could have expanded upward to higher altitude areas with more dense and expanded evergreen forest in the lower parts of the highlands during the humid phases of the Holocene. As the forests expanded, the steppe and savannah vegetation retreated and greatly reduced. Both the altitudinal limits of vegetation and diversity of plant species had changed in response to changes in climate. For instance, areas between around 1500 and 3300 m a sl. were covered mainly with evergreen thicket and lush montane forests. The forest canopy significantly increased during this time. On the other hand, during Holocene aridity the extent and density of forests greatly declined even in higher altitudes with a concomitant expansion of scrub and grass. In the lower altitudes, there occurred substitution of evergreen species by vegetation adapted to arid conditions. This created more open environment. Following the oscillations in climate, the natural vegetation could have significantly changed across altitude. In fact, the late Holocene wet intervals led to expansion of vegetation cover across vast portion of the highlands. Areas that are more elevated were, for instance, dominated by montane forest savanna. Although there could be areas with dense wooded lands, environment similar to the present would have been established in the late Holocene arid phases. Ericaceous scrub in higher altitudes and acacia dominated savanna-woodlands in lower altitudes had thus prevailed over the Ethiopian highlands (ibid).

Palaeoenvirontament reconstruction in the Bale Mountain of southeast Ethiopia also showed change in the type, intensity and altitudinal limits of natural vegetation. In the early Holocene, Erica forest and shrubs expanded across the plateau in the catchment. The altitudinal limit of this vegetation also extended over altitudes greater than present day forest limit. On the other hand, dry Afro mountane forests were limited and confined mainly around lower altitude. Mixed broad Afro mountane forests had expanded to higher altitudes at about 6500 BP. Dramatic decline of forest vegetation with a retreat to lower altitudes was inferred since around 4500 BP. Most of the plateau highlands of the area were then covered with Afroalphine dwarf vegetations and grasses. The upper limits of forest vegetation significantly retreated following the increased aridity of the time (Umer et al. 2007). Due to lack of pollen sample in the core sediments, such kind of reconstruction around Lake Tana is currently unavailable (see Lamb et al. 2007; Marshall et al. 2011). Local and regional factors might have led to a different pattern of response of the natural vegetation to palaeoclimate changes. Yet, a pattern indicated in other areas may generally be proposed to the intensity, type and altitudinal changes of vegetation in the Holocene Lake Tana area. Thus, during the humid phases of the Holocene, large parts of the region would have dense vegetation with diverse plant species. During the dry parts of the Holocene, the density and type of natural vegetation might have been limited. According to Berakhi et al. (1998:137), the transition to more arid conditions after mid Holocene might have aggravated human impact on the environment.

In sum, although the trend in the expansion and contraction of natural vegetation zones seems to have been presented at more general level, such changes could have significant impact on the availability of wild resources essential to human subsistence. This would have impacts on subsistence choices and changes in adaptation strategies at different times and areas in the Holocene. Detailed palaeoclimatic and environmental trends investigated at micro regional scale could thus be more useful to address processes and reasons for prehistoric subsistence changes in the region.

However, most of these palaeoclimatic and environmental studies focused on establishing the ancient climate and environment, and presumably with the intention to relate to the phenomena at global, continental and regional trends. Integrating this data with archaeological remains and research projects that primarily aim to understand archaeological problems at a specific site or region may help us to better understand how local environment could influence transition to agriculture in the region.

Some of these studies also indicated the presence of small isolated forests in the agriculturally inaccessible area and around churches and monasteries in Ethiopian highlands suggesting extensive forest cover before the expansion of agriculture in the region. This might have its impact on the spread and expansion of agriculture to the area.

Another important contribution of the above studies is that intensive human induced impact on the natural ecosystems in the region could have likely occurred mainly during the late Holocene (see also Bard et al. 2000; Darbyshire et al. 2003; Dramise et al. 2003; Nyssen et al. 2004; Harrower et al. 2010; Marshall et al. 2011). As these studies indicated the intensity and duration of the wet verses dry episodes could also vary at a local scale. Some areas such as lacustrine environments could thus have been favorable for long human occupation and adaptation through exploitation of aquatic resources. Such local environmental conditions, like the Lake Tana basin, might have a delaying effect on the transition to agriculture. Alternatively, such areas could have allowed increased concentration of population leading to resource stress and encouraged shift in prehistoric subsistence patterns. Correlation of archaeological evidences with palaeoclimatic and environmental data may therefore help to investigate the influence of local environment and socio-cultural factors on human subsistence patterns and changes in adaptation strategies.

3.10. Cultural and Historical Setting

Ethiopia and the Horn is inhabited by different groups of people who belong to the speakers of Semitic, Cushitic, Omotic and Nilo-Saharan languages. Semitic, Cushitic and Omotic languages have their origin from the Afro-Asiatic ancestral language family. This ancestral language family is thought to have evolved in Northeast Africa more probably around southeastern Sahara or areas adjacent to Ethiopia and the Horn. Speakers of Afro-Asiatic sub-branch now represent the vast majority of the Ethiopian population (Levin 1974:27-9; Zewde 1991; Marcus 1994; Tosco 2000; Ehret 1984: 27, 2003:75-6, 79). Speakers of the Nilo-Saharan language constitute only limited proportion of the country's population (Zewde 1991; Tosco 2000). The speakers of ancestral Nilo-Sahara language family might originally to have been dwelled around central and southern Sahara (Drake et al. 2011) while Ehret (1997:163) argued that originally the Nilo-Saharan speakers could have been settled in the Middle Nile Basin.

The Semitic speaking people currently occupy vast areas in northern, north western and parts of central and eastern Ethiopia and the Horn. Cushitic speakers are mainly distributed over southeast, south, southwest highlands, parts of central highland, eastern, and southeastern lowlands. Speakers of the Omotic language are found only in Ethiopia. They are confined to southwest and southern Ethiopia. The Nilo-Saharan speaking people are limited today around the lowlands along the Ethio-Sudan boarder. Pockets of settlement of minority ethnic groups are found within the dominant ethnic group (Wolde-Mariam 1972:8; Brandt 1986; Phillipson 1993:353; Tosco 2000).

As mentioned, in the study area, there are different groups of people such as Semitic speaking Amhara, Cushitic speaking Woyto, Agaw and Kemant, Omotic speaking Shinasha as well as Nilo-Saharan speaking Gumuz (see also Tamrat 1988, 1994). The Semitic speaking Amhara occupy the highlands of the region. Cushitic speaking Agew, Woyto, and the Kemant are found alongside the Semitic speaking Amhara forming small enclaves of settlement. The Gumuz, one of the speakers of Nilo-Saharan language, are predominantly distributed in the western lowlands of Gojjam, Gondar and Wellega provinces. Their geographic distribution is mainly associated with the Blue Nile River and its tributaries (Bender 1975; Tamrat 1988). In addition, "the Gumuz are to be found on the hills to the southeast of Roseire in Sudan (Ahmed 1999:53)." The Omotic speaking Shinasha live in a small isolated area close to the western lowlands of the region. They are found dwelling close to the Agew and the Gumuz in Metekel sub province of

Gojjam. The Bete Israel (literary called Felasha), who belong to Cushitic speaking linguistic family, lived to the north and northwest of Lake Tana alongside the Amhara and the Kemant (Leslau 1951). The Woyto are predominantly confined to small area surrounding Lake Tana (see also Gamst 1965; Simoons 1960; Quirin 1998).

However, the current or recent distribution of these various groups of people might not represent their geographic distribution in the ancient time. There were frequent population movements and migrations, conquests and annexations and resultant intermixes. These processes might have influenced the present day population distribution of Ethiopia and the Horn (see Lewis 1960; Trimingham 1952; Wolde-Mariam 1972:11-20).

Historians, linguists and anthropologists argued that the Cushitic speaking Agew had earlier wider geographical distribution in northern Ethiopian highlands. Probably from 3500 BC to 1000 BC, Cushitic speakers had inhabited much of north and north central Ethiopian highlands. Minority ethnic groups such as the Agew, Kemant and Beja people, who currently live in this area, are survivors of the ancient Cushitic speaking people (Tamrat 1972:5-6, 1988; Levin 1974:28-35; Kaplan 1992; Qurin 1998; Tosko 2000). In fact, Ehret (2003:75-6, 79) proposed that the ancestral Cushitic speaking people (Agew) might have been spreading over the highlands as early as the seventh and sixth millennia BC. They could have inhabited the highlands of Northwest Ethiopia perhaps since around 5000 or 4000 BC (Dombrowski 1971:70). Such old settlement of the Cushitic speaking people in this region is not yet substantiated with supportive archaeological evidence. However, the Cushitic speaking Agew are considered the most dominant people over many parts of Northern and Central highlands before the emergence of Aksum. Long before the arrival of Semitic speaking people farther to the highland interior to the south, the Cushitic Agew had also moved as far as the Blue Nile and the upper Awash Rivers and integrated some of the Omotic speaking people of the region (Tamrat 1972:5-6, 1988; Levin 1974:34-5; Ehret 2003:97,128). The presence of Cushitic speaking Agew as far south as Gojjam province was indicated in the sixth century AD inscription of Aksum (Dombrowski 1971:70; Tamrat 1988). Historical sources also support the presence of Cushitic speaking Agew in Gonder during the Aksumite period (Hablesilasie 1972; Huntingford 1989). The first century AD inscription of Adulis specifically mentioned that the people to the south of the Tekeze River and around the mountains of Semen were Cushitic speaking Agew. Their language is reported to have been spoken in the Semen and Wogera districts of Gonder, and along both sides of the Tekeze River (Tamrat 1988). Today, Awngi, the southernmost Cushitic language in northwest Ethiopia is spoken among the Agew of Gojjam to the south of Lake Tana (Tosco 2000). Another Cushitic speaking Agew, the Kemant in Gonder succeeded to maintain some of their cultural tradition despite continued pressure from the Semitic speaking Amhara. However, since around the thirteenth century AD, northwest Ethiopian highlands were under continued influence from the Amharic speaking Medieval Christian state. In the subsequent decades and centuries, the region fell under this kingdom (Tamrat 1972; 1988; Kaplan 1992; Quirin 1998). When the Semitic speaking people occupied much of the region, the Nilo-Saharan and Cushitic speakers were assimilated into the Semitic speakers or survive in pockets of settlement in relatively remote and inaccessible areas of western Ethiopia (ibid; Dombrowski 1971:7).

In the ancient time, the Nilotic Speaking Gumuz might have penetrated into the highlands of northwest Ethiopia. According to Murdock (1959:181) and Levin (1974:28-31), this people spread to the Ethiopian plateau from Sudan possibly since about 3000 BC. Tamrat (1988, 1994) argued that the ancient inhabitants of the highlands of Gojjam might be the Nilo-Saharan speaking Gumuz who now occupied the western lowlands. Their confinement to the western margin of the province is due to pressure from the Semitic speaking Amhara in the historic times. Henze (2000:73) also described that during the Aksumite times and after its collapse, the ancestors of the Gumuz could be one of the people who inhabited the region around the Lake Tana and upper Blue Nile. Based on their oral tradition, Endalew (2006:15) suggested that the Gumuz had spread over the highlands of Gojjam as far as the Lake Tana area. Oral tradition among the Semitic speaking Amhara similarly imply that the Gumuz had probably lived in many parts of Gojjam and in the western highlands of Gonder in the ancient times. There is strong claim among the local people that the widely scattered old stone structures near Bahir Dar town and areas south and west of Bahir Dar are cultural remains of the Gumuz people. This oral tradition gives support to the claims suggested by some scholars: the Nilotic speaking Gumuz had expanded over the northwestern highlands, but they were overrun by successive waves from people belonging to the Afro-Asiatic linguistic family (see also Lewis 1960; Tamrat 1988, 1994). Fernandez (et al. 2007) suggested that the western escarpment of northwest Ethiopian highlands acted as area of refuge during climatic deterioration in the Sahara. The people from Sudan might have moved to the region following this event.

Speakers of the sub-branches of the Nile-Saharan language have been distributed over wide regions. They are thought to have been spread widely from around upper Niger River areas of south-western Sahara, Lake Chad region, central Nile valley area to the Ethio-Sudan boarder, and further south in western Kenya, Uganda, and northern Tanzania and in southern Sudan. Due to subsequent expansion of people belonging to Afro-Asiatic language family, the Nilo-Saharan speakers are now found in isolated pockets of settlements in different regions. However, in the ancient time, they could have spread over extensive areas (see Sutton 1974:573; Phillipson 1977c:6; Haaland 1992; Ehret 1993:106-8, 1997:163; Drake et al. 2011)). In addition, their settlement pattern and distribution were related to aquatic environments (Drake et al. 2011).

Another group, the Omotic speaking Shinasha, might also have spread as far as the source of the Blue Nile in the ancient time. This people constitute the surviving entities of the northern most branches of Omotic speaking people (Klaus and Tesfaye 1994; Ehret 2003:82,128). In fact, other scholars locate their early settlement south of the Blue Nile. Huntingford (1989) argued that in the seventeenth century AD, the Omotic speaking Gonga or the Kaffa people (the Shinasha are the member family) were located on both sides of the Blue Nile River. Probably the Shinasha crossed the Blue Nile River from south and settled in western Gojjam following the sixteenth century Oromo population movement (Tamrat 1994).

Compared to the other linguistic groups of people, the arrival of the Semitic speaking Amhara to the region seems quite late. It has been a common opinion among some historians and anthropologists that the Semitic speakers had emigrated from South Arabia and settled in northern Ethiopian plateau since the early first millennium BC. They gradually spread to the interior highlands to the south. Moreover, the émigré Semitic speaking populations were assumed to have great influence on the ancient civilization of Ethiopia including the introduction of agriculture and state formation (see Messing 1957:5-12; Lipsky 1962:7; Perham 1969:11-13). Nevertheless, it is now assumed that agriculture based on cultivation of local crops were already in place when this émigré population arrived (Simoons 1958; Ehret 1979, 1997; Phillipson 2012:13-6). The Cushitic speaking Agew were dominant "in the cultural milieu within which the earliest Semitic expansion took place in northern Ethiopia throughout the Pre-Aksumite and Aksumite period (Tamrat 1988:8)." There is also a growing criticism regarding the arrival of the Semitic speaking people in northern Horn in the first millennium BC. The Semitic language was spoken in the region long before this time (Phillipson 2012:11).

Whatever the truth about the emigration of the Semitic speaking people from outside and their influence on ancient northern Ethiopia is, the arrival of Semitic speaking Amhara to the Lake Tana area generally seems late, particularly attributed to the medieval period. For instance, Dombrowski (1971) argued that Amharic is almost unknown in the region before the thirteenth century AD and could therefore be a later introduction. Tamrat (1972, 1988, 1994) described that effective expansion of the Christian state in the area took place since after the reign of King Amde Siyon (1313-1344). With continued expansion of the Christian state, the region gradually came under the growing influence of Christian highland state. Significant number of Amharic speaking people from the then Christian empire (South Wollo and North Shewa) also accompanied the expansion of the state and settled in Gojjam and Gonder. Subsequently, the local inhabitants became dominantly Christian with Semitic speaking Amhara identity. Therefore, most of the Cushitic speaking people were incorporated into the Christian state, but some of them such as the Cushitic Agew became bilingual, devoted Christians and developed profound Christian identity (Tamrat 1972). Yet, alongside Christianity, traditional practices and beliefs had survived for a long time in the region. For example, the Agew in Gojjam were practicing the Sky god until they were completely converted into orthodox Christianity in the seventeenth century AD. Generally, the conversion into Christianity and the spread of Semitic speaking Amhara in this region seems to be relatively late. Cushitic speakers could be considered as the earliest people across wide parts of the highlands of northern Ethiopia (see Tamrat 1972; 1988; Levin 1974; Ehret 1979, 2003; Phillipson 1993:353, 2012:11). Traces of occupation such as surface structures attributed to the Gumuz in the study area and oral traditions cited above imply that the Nilo-Saharan speaking Gumuz might have penetrated at least to the western sections of the highlands perhaps quite in earlier time. In fact, Tamrat (1988) citing oral sources proposed old presence of the Gumuz in certain parts of Gojjam highlands. The Woyto, today speak Amharic (originally thought to be Cushitic speakers), might also have been remnants of ancient hunting, gathering and fishing people of Lake Tana area(see also Clark 1988a). Many people in different parts of Africa lost their original language at the expense of their dominant neighbors, but kept their identity and subsistence based on hunting, gathering and fishing (Phillipson 1977c:8-10).

Except the Woyto and the Gumuz, all other groups of people in the region are now settled agriculturalists. They cultivate different types of crops both indigenous and introduced, and involve in animal husbandry. Domestic animals such as cattle, sheep, goat, horse and donkey constitute an integral part of economic and social life of these people. The Woyto are entirely dependent until recently on hunting and fishing activities around the aquatic resources of Lake Tana and its surrounding. According to local elders, the Woyto used to exchange aquatic product such as fish and hippo skins for grain and animal products from the Amhara farmers. Besides, they were providing their labour to the neighboring Amhara farmers and obtained grains in return. The Gumuz are mainly hoe based semi-sedentary agriculturalists. They are also dependent on hunting-gathering, fishing, and animal husbandry (Cheeseman 1936; Simoons 1958). Depending mainly on naturally available resources for their survival, the Gumuz people lack elaborate agricultural tradition and material culture (Simoons 1958; Tamrat 1988).

According to Awas et al. (2010), the Gumuz and Berta peoples of western Ethiopia utilized about 185 different plant species. More than 70 % of their subsistence is acquired through collecting and gathering. The Berta people belong to the Nilo-Saharan language and currently live in western Wellega south of the Blue Nile. Similarly, as some Wotyo elders explained the Woyto used to collect different wild herbaceous and root plants of the Lake Tana ecosystem. The Gumuz exercise different religious practices such as Islam, Christianity and indigenous religious beliefs (Awas et al. 2010; Fernandez et al. 2007). The Woyto today claims to be adherents of Islam, but they still believe in the spirits of Lake Tana and the Blue Nile River. The non-Woyto Muslims therefore argue that the Woyto are not strict adherents of Islam.

Probably, due to long period of interaction and integration, there is no significant difference in the material culture between Semitic speaking Amhara and the Cushitic speaking Agew of the region (Taddesse 1988). Simoons (1958) observed quite related agricultural implements and practices among these people in Gonder. He sees significant difference between the Semitic speaking Amhara and the Cushitic speaking Agew of the highlands on the one hand and the Gumuz living in the western lowlands of Gonder on the other. The main agricultural implement of the Gumuz is the bamboo stick, which is not even tipped with iron. The crops they cultivate using this digging stick is also different from the highland people who depend on the oxen plow. The Gumuz cultivate sorghum, finger millet, *noog,* cotton and sesame. Wheat, barley, *teff* and the different varieties of pulses are unknown (ibid; Mekonnen 2009:352-3). Due to animal disease such as Trypanosomiasis, animal husbandry is rare among these people (Awas et al. 2010; see also Simoons 1958). Mekonnen (2009) indicated that among the Gumuz animal husbandry is not their main subsistence. Unlike the neighboring highland people, the Gumuz do not use cattle as source of labor as they mainly depend on hoe to subsist their life through shifting cultivation. They raise cattle and goat for meat, but consumption of milk and milk product is almost not their dietary habit. These animals are even mostly used for the "purpose of ritual offering such as sacrificing animals at death rituals (*keməša*) and other similar human and spiritual-godly relations (ibid: 350-1)."

Significant differences can also be found in their diet. As I observed during the fieldwork among the Gumuz of Gonder, near Metemma, porridge and local beer (*borde*) are the main diets of the Gumuz. Porridge is mainly prepared from sorghum and the local beer from finger millet. However, to the Agew and the Amhara, the main diet is *injera* (local bread mainly made of *teff*) prepared using ceramic griddle. Their local drink is also different from that of the Gumuz. The Gumuz potters made ceramic griddle, but they never used it for home consumption since their stable diet is porridge prepared using pot or vessel. It is entirely meant for market.

Chapter Four Survey and Excavation

4.1. Survey

In January and February 2011, I conducted a brief archaeological survey around the Lake Tana-Blue Nile area of northwest Ethiopia. Although the scheduled time for my fieldwork stay in Ethiopia was short and the excavation should be carried out before the rainy season, a number of potential sites were visited during this brief period of field survey. Two provinces (Gonder and Gojjam) that are located in the upper course of the Blue Nile River and the Lake Tana Basin were selected as the main target areas for the survey.

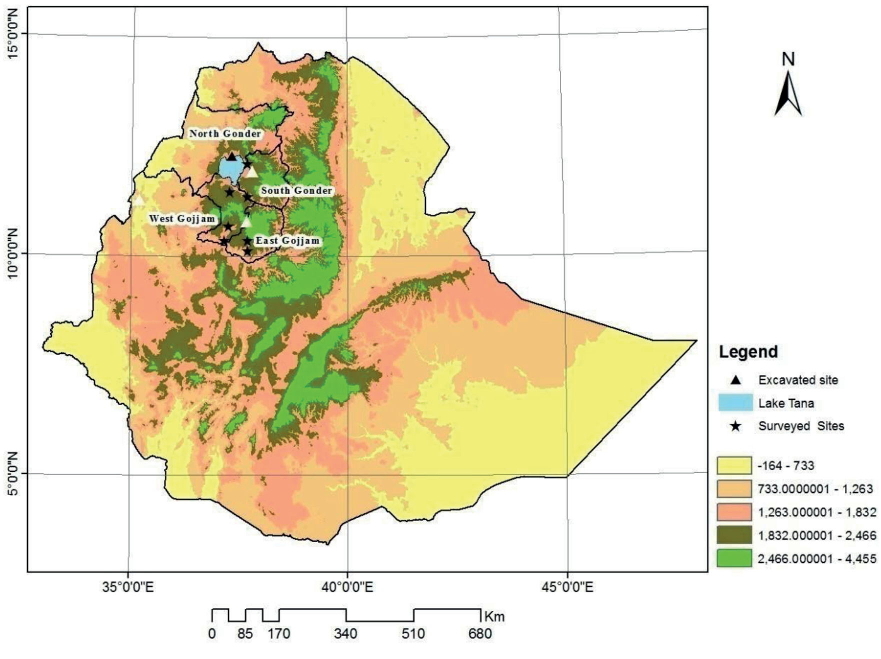


Fig. 4. 1. Map of some of the sites surveyed during the fieldwork

The survey was conducted based on preliminary data gathered from local informants and written sources, and using pedestrian survey and actual examination of surface findings. Before I began the actual field walk reconnaissance, available information was gathered from written sources and from Tourism and Culture Bureau of the Amhara National Regional State of Ethiopia.

Based on this information, four administrative zones or sub provinces were proposed as potential area for further and detailed field survey. North Gonder, South Goder, West Gojjam and East Gojjam administrative zones were proposed as potential area. In selecting these areas for pedestrian survey, their geographic location in relation to the Blue Nile and Lake Tana basin was taken into account (see Fig .4.1.).

Once I selected these areas as potential sites according to my objectives, I also contacted and consulted people working in the Tourism and Culture offices in each administrative zones. In addition, information was gathered from elderly people about available caves and rock shelters found in their locality. Data regarding the nature of such places and possible traces of ancient occupation were also gathered. The same procedure was applied to people working in lower administrative districts as well as to elders from local villages. Since I speak the local language, Amharic, I had no problem to communicate with informants. I was also able to get their trust and understanding. In some remote areas such as in the Blue Nile gorge in Gojjam, I spent nights in rural houses without any problem.

Based on such background information, I surveyed a number of sites in those provinces. Nevertheless, during the actual field survey, my main target was discovering and investigating ancient cave sites and rock shelters. The focus on caves and rock shelters is based on the assumption that such areas would provide long occupation sequences relevant to the time period this project deals with. These sites may also provide better preserved archaeological material since open sites could largely be disturbed by the extensive farming activities in the region. In the region, almost all land suitable for farming are brought under cultivation or grazing. However, some potential open-air sites were surveyed during the fieldwork. The areas surveyed have a couple of sites that have traces of ancient occupation. The specific locations of all the sites surveyed were recorded using GPS and finally plotted on a map.

4.1.1. Survey in Gonder

In Gonder, two administrative zones were surveyed. The survey was limited mainly to areas that are near to Lake Tana or located within the Lake Tana Basin. This is due to the focus of the research project. Two districts from South Gonder administrative zone: Dera and Addis Zemen, and Gorgora from north Gonder Administrative zone were thus chosen for the actual pedestrian reconnaissance (see Fig .4. 1.).

A. North Gonder. In North Gonder Administrative zone, the survey was targeted to the plateau escarpments south of Gonder town and its foothills and the plains lying along the edge of Lake Tana. Abundant surface collections are found both on open surfaces and on rock shelters particularly near Gorgora town. The area is rich in lithic material, ceramics, grinding stones, and surface structures. The lithic industries available as surface collections mainly belong to Late Stone Age tradition. There are also petrified woods exposed in gullies that might belong to Oligocene deposit (Kaplman pers. comm.). One of these sites with dense concentrations of archaeological evidences is Kurtiye rock shelter where my excavation was finally conducted. In addition to the abundant surface material, the landscape and the location of the rock shelter makes the site promising to address the objective of the study. It has extensive flat plains, escarpments and hills that are close to the lake. It also has small streams and rivers that drain to Lake Tana.

Fig. 4. 2. Circular stone structure on the edge of Lake Tana (west of Gorgora town)

Fig. 4.3. Surface finds from around Kurtiye rock shelter (collected during the survey)

B. South Gonder. In South Gonder Administrative Zone, a number of rock shelters and cave sites were investigated in Addis Zemen and Dera districts. These districts lie east of Lake Tana. They both have different landscape that slopes down westward to the lake. In Addis Zemen, most of the places visited do not have surface material. Besides, many of the cave sites and rock shelters surveyed are now serving as monasteries, although such sites might have been suitable for ancient occupation. Their current use as important religious centers limited the chance to conduct test excavation and assess their archaeological context.

Fig.4.4. The Monastery of Washa Endrias within the natural rock shelter in Addis Zemen

Still some sites were surveyed in Dera district of south Gonder Administrative zone. Close to the monastery of Wonkshet, there is a place with huge debris of iron slags. There is also a big circular stone structure, which could possibly be ancient burial site. There are also some ceramic sherds uncovered during the construction of a new building in the monastery. The sherds are stored in a small room in the monastery, and some of them may be of particular interest. Compared to the modern pottery of the surrounding area, these sherds have quite different surface finish or fabric and style suggesting different cultural traditions. Since the sherds having this attribute are very limited, they might have been brought from elsewhere. The site is located close to the Blue Nile River near Tis Abay waterfall. Due to its location at the foothills of the mountain overlooking a wide plain and the Blue Nile River below, the area seems ideal for ancient occupation. Unfortunately, the site lacks lithic material as surface indictors.

Fig.4.5. The landscape near Wonkshet Monastery

Fig.4.6. Iron slag near Wonkshet Monastery

Fig.4.7. Circular stone structure near Wonkshet Monastery

Fig. 4. 8. Some of the pot fragments from Wonkshet Monastery

Fig. 4.9. Metal artifacts, sherds, pebbles and hammer stones from Wonkshet Monastery

4. 1. 2. Survey in Gojjam

Two administrative zones, West Gojjam and East Gojjam, were the focus of the survey in this area (see Fig .4. 1.).

A. West Gojjam. In West Gojjam Administrative Zone Bahir Dar Zuria, Genji, Jabi Tehinan, Bure and Sekela districts were surveyed. In Bahir Dar Zuria district, around two km east of Meshenti town (about fifteen km south of Bahir Dar), many stone structures with late Stone Age lithic tools and some fragments of ceramics are found on a small mountain hill. Local informants claim these structures as belonging to the Nilotic speaking Gumuz people.

Further south of this district, thorough survey was undertaken along the source of the Blue Nile in Sekala district. At about five km west of Gish Abay town, the capital of the district, there is a rock shelter with huge occupation debris. The site is near to the source of the Blue Nile. It has dense humus deposits with tiny pieces and partly decomposed bones. This place seems a potential archaeological site. Pottery sherds and lithics are not available on the surface. However, the nature of the rock shelter (a shallow shelter with easy accessible wide-open area) and the nearby stream might have made it suitable for occupation. Another small rock shelter located on the sides of a small escarpment south of Gish Abay was visited during the survey, but there is no any observable surface collection.

Fig.4.10. Rock shelter near Gish Abay

Fig.4.11. Circular stone structures near Dangila, 85 Km south of Bahir Dar

Further south, in Jabi Tenan district near the town of Finote Selam, there is wide plain area mainly covered with scattered shrub. There is also a small pond and streams that drains to the Blue Nile. The area consists of many circular stone structures and abundant potsherds. Local informants described these structures as remains of ancient settlement that could be attributed to the period before the destruction and flood during Noah while some informants attribute these structures to the Nilotic speaking Gumuz. However, there are no lithic artifacts.

The other site in west Gojjam is Beko Abo in Bure district. It is located in a mountain escarpment overlooking the Blue Nile gorge. It has rock arts that depict small circular features with radiating lines. Most of these figures are depicted in red pigment. Some other scenes probably python and few seed like things possibly coffee are painted in black color. Some of the geometric paintings are similar to rock arts that Fernandez et al. surveyed in Benishagul Gumuz regional state (Fernandez 2011). However, the shelter cannot be excavated since its base is very rocky. Some of the circular geometric scenes are similar to rock arts found in south central Africa. Rock arts depicting such kinds of motifs are for instance reported from Zambia (see Barham and Mitchell2008:381-2).

Fig. 4.12. Rock art from Bure District

Fig.4.13. Part of the landscape near the rock art site in Bure, the Blue Nile Gorge

B. East Gojjam. In East Gojjam administrative zone, I conducted the survey in Baso Liben, Dejene and Awobel districts. In Awobel district, near the Chemoga River Valley, about 10 kms southwest of Debre Markos Town, microlithic industries made from chalcedony and ceramic fragments are widely available on open farmlands. Besides, petrified wood is exposed to the surface by landslides. Further south of this site, I visited a small rock shelter in Baso Liben. The rock shelter is easily accessible with extensive plain area on both sides of the rock shelter. It also has a small stream nearby. The site seems favorable for occupation. There is, however, no surface material that suggests ancient occupation.

Fig.4.14. Rock shelter in Baso Liben, south of Debre Makos town

Fig.4.15. Stone flake from a site south of Debre Markos town

At the top of the Blue Nile Gorge, some 25 Km east of Dejen town, abundant fragments of sherds with microlithic tools of Chalcedony are found at a village called Teta. South of this site, along the lower edge of the Blue Nile Gorge, there is a small rock shelter with rock arts. The rock art, both in the forms of engravings and paintings, contains different geometric figurines and wide animals. Most of the engravings are circular with features that look like the shape of the sun. However, the base of the rock shelter is quite steep and rocky. Traces of occupation that could be excavated are found on a small plateau above the shelter. Here fragments of ceramics with some grinding stones are abundant, but there are no traces of lithic material at the surface.

Fig. 4.16. Rock arts from the Blue Nile gorge southeast of Dejen town

Fig 4.17. Surface collection from Teta village

Fig.4.18. Partial view of the Blue Nile River and its Gorge near the Rock art site

The brief survey I made in those widely scattered areas and information gathered from local informants is general. The specific details about each site are quite limited. Nevertheless, it still indicates that the region has great potential both in historical and prehistoric archaeology. It also indicates the need for thorough archaeological survey in the future. The information gathered from local informants in Dejene, Finoteselam, Bure and Meshenti is quite impressive. They attribute the wide circular stone structures and rock arts to the Nilotic speaking Gumuz. Tracing oral stories, they argue that the Nilotic speaking people occupied these areas before the Semitic speaking Amhara and Cushitic-speaking Agew displaced them. They have a common oral story: *Shankilla sinekel, Amahra sitekel*. This literary means the *Shankilla* (derogatory term for Gumuz) were displaced when the Amhara began to settle in this area. As I presented in chapter three, such aspects of the region's history are widely cited in the historical literature. However, it is not substantiated with archaeological evidences. The low-lying areas of these districts particularly along the Blue Nile River and its tributaries thus need further study. This would also give valuable information to investigate the extension of the Nilotic speaking people to the highlands in the ancient times. Due to the lack of archaeological research in this part of Ethiopia, we know almost nothing about the prehistory of the region.

4. 2. The Site

Based on the location of the site i.e. its closeness to the lake, information from previous research in this particular area and abundant concentration of both lithic and shreds, I eventually made Kurtiye rock shelter in Gorgora as my first priority for excavation.

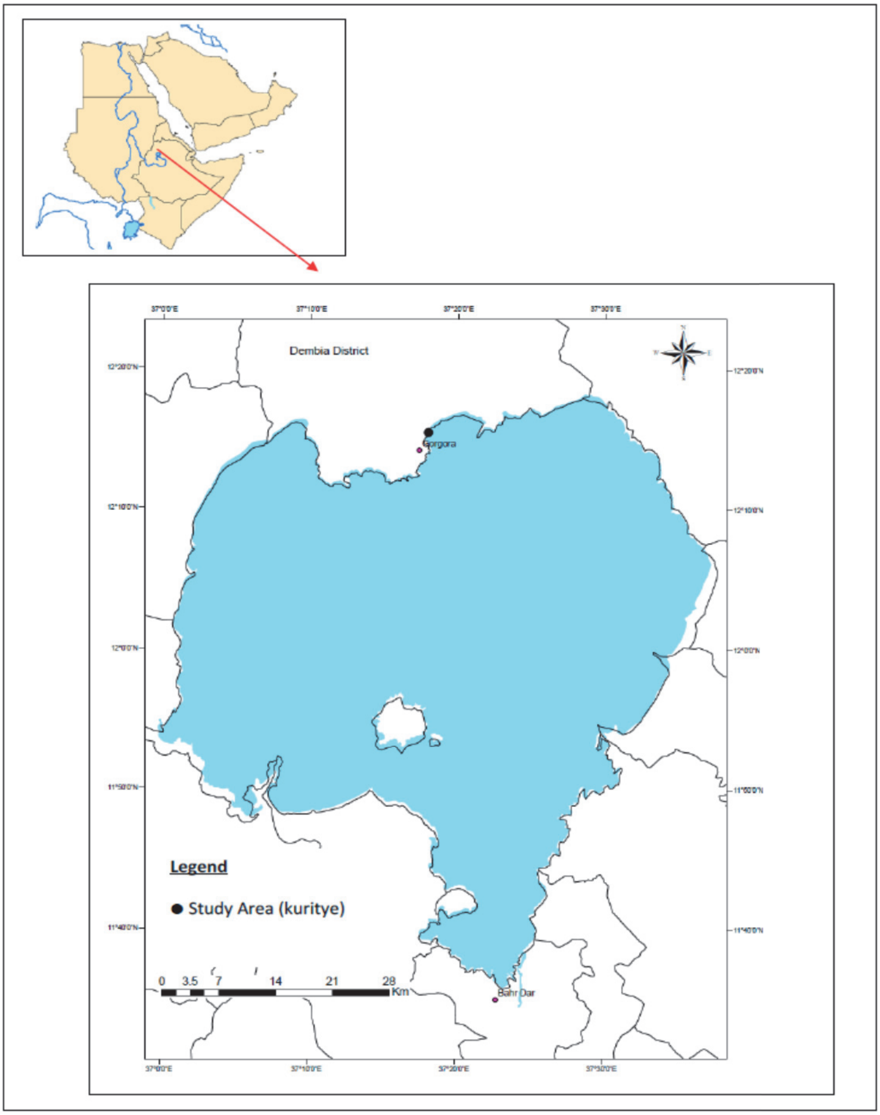


Fig.4.19. Map of Lake Tana and the Site

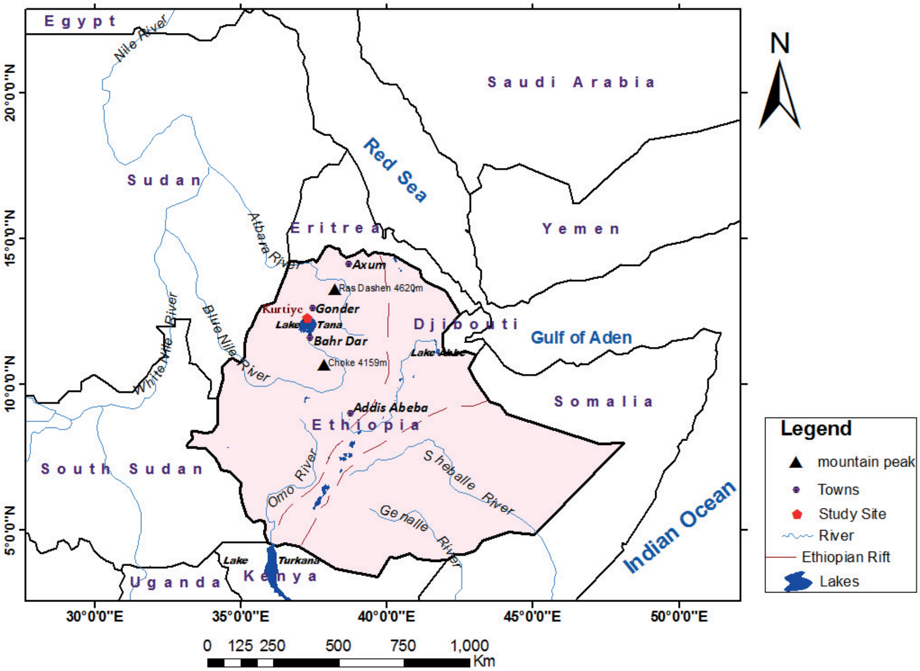


Fig. 4.20. Map of the study area

The rock shelter is located about 4 to 5 Km Northeast of Gorgora Town, and about 60 km south of Gondar Town. It lies at the geographic coordinate of 12^{0} 25' N latitude and 37^{0} 30' E longitude. The site is situated at the base of a small volcanic hill located on the Northern shore of Lake Tana. Except in northwest direction, the hill is almost surrounded by the lake. Elevation at the base of the hill where the rock shelter lies is about 1794 meter a s l

The rock shelter is very close to the edge of the lake. The shore of the lake shows marked variations according to seasons. During the rainy season, the lake level approaches close to the rock shelter. During this time, distance to the edge of the lake may not be more than 15 meters. The wide flat area in front of the rock shelter is flooded with the lake water. On the other hand, during the dry winter season, the water recedes significantly. Consequently, the land in front of the site becomes an open flat area. At this time of the year, the distance between the shore of the lake and the rock shelter may extend more than about 200 meters. Thus, access to the rock shelter is very easy during the dry season.

In addition, during the rainy season, the difference in elevation at the base of the rock shelter and the lakeshore is not more than 10 meters. This may imply that the rock shelter might have been flooded by the lake water during the humid Holocene phases when lake levels in many parts of the tropics had witnessed a general remarkable increase. In Lake Tana, based on Lake Sediments and terrace analysis it is proposed that the level of the lake could be much higher than the present in wet conditions of the Holocene (Brandt 1982:41).

The rock shelter is generally a small shelter with limited space for occupation. The flat area of the rock shelter that could be occupied during the dry period could be 18 meter in length and 3 meter in width. The total surface favorable for habitation during such time may therefore be about 54 square meters. However, the area that lies entirely inside the drip line is not more than 25 square meters. Its entire flat open area is easily accessible and well protected from flood from the hill above the rock shelter, and could therefore be suitable for both temporary and long period occupation. The lake and the surrounding vast plain area might have had wide ranges of resource including games. This landscape could have thus provided attractive condition for prehistoric occupation or habitation.

Fig . 4. 21. Kurtiye rock shelter

Fig. 4.22. The plains north of the site

Fig.4.23. The hill at the back of the rock shelter and the partial view of the edge of Lake Tana

Fig.4.24. The site after the rainy summer season (in October)

4.3. Excavation Strategies

The site was excavated in three different phases in 2011. Due to huge concentration of finds and limited time for the fieldwork, the total area excavated at the site is, however, very small. The part of the rock shelter excavated is seven square meters. In other words, seven grids or squares, each with 1x1m, were excavated. Three of these grids are located outside the drip line. This part of the rock shelter contains huge concentration of surface artifacts. The initial excavation was thus started outside the drip line where there are such dense concentrations of surface finds. It was then decided to excavate inside the rock shelter.

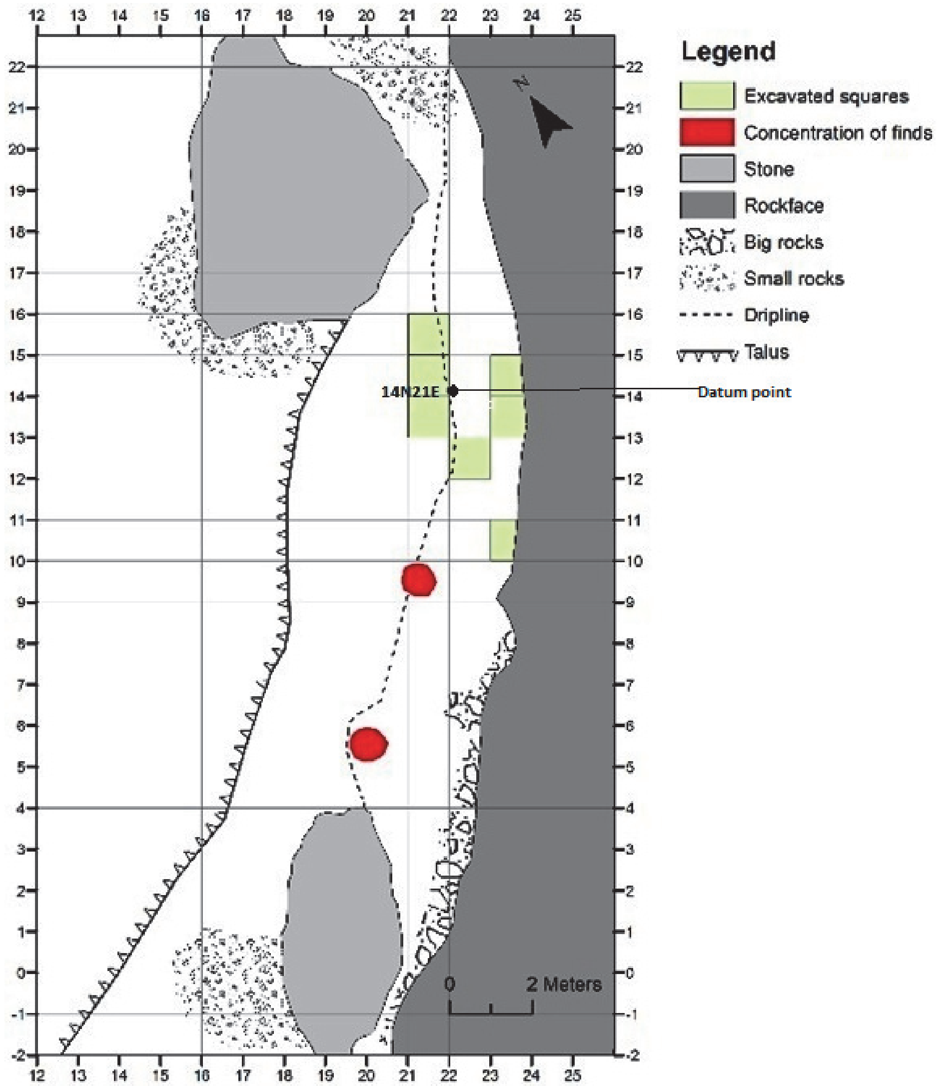


Fig. 4. 25. Plan of the excavation section

The initial test excavation (1x 1 meter) was conducted outside the drip line in early March 2011. First, the excavation team cleared the site and the grid system was stretched over the area that could be excavated. The grid system was set at 1 x1 m interval in north-south axis using the conventional triangulation method of 3-4-5m (Roskms 2001). The base line stretched parallel to the cave wall was assigned as N, which starts at 5N and increases northwards to16N. The line that intersects this line was assigned as E. It starts at 21E and increases eastward to 24E to the rock shelter. This grid system is used to all the excavations conducted at the site later.

Once the grid system was laid, grid point 14N21E is selected for the test excavation. 14N21E is the point at the western corner of the grid where the two lines intersect at a right angle. This square or grid was selected for test excavation due to the dense concentration of surface finds. Before, excavating the grid, the datum point was set and marked at a slightly elevated surface near the grid. It is 30 cm above the ground from where the surface deviation at each corner of the grid and the middle part of the grid were recorded using a wooden meter tape, and water level. In the course of excavation, the depth of each level was checked and controlled using the water level stretched from the datum point. This enabled us to control the vertical excavation.

The grid was excavated by dividing it into four equal quadrants, which were documented as NE, NW, SE and SW quadrants. Since there were no identifiable natural layers, the excavation was undertaken using arbitrary levels. The upper first level, level one, was excavated to a depth of 10 cm. As the finds became denser and there appeared no clear natural stratigraphy, the excavation continued at an interval of 5 cm depth for the other levels. The grid was dug until the bedrock was reached. It was dug to a depth of 65 cm around the northern quadrants while in the southern quadrants the bedrock was reached at around 50-55 cm. The concentration of finds is relatively high in most levels, although the density of finds in some cases decreases as the excavation approaches the bottom.

During the excavation, maximum care was taken to avoid mixing of finds across levels and quadrants. As excavation in one of the quadrants ended, all the necessary documentations were thus conducted before we begin to excavate the next quadrant. In this way, all the finds were sorted, labeled, and bagged according to their grid, level and quadrant. In cases where there appears different feature within the quadrant, it was excavated and documented as separate entity. Excavation was extended until the bedrock was approached or where there is no find or cultural debris. All the finds were screened at the site using a two mm sieve and they were carefully labeled at the site according to their respective grid, quadrant and level. For botanical samples, however, soil samples were taken in situ from different levels, quadrants and grids with proper documentation of their context. This was later screened by simple flotation techniques using 1mm and 0.5 mm sieve. This is made to collect tiny botanical remains such as *teff*. This was processed in the national museum of Ethiopia. The excavation lasted for a week.

In late April and May 2011, another excavation was conducted. The excavation continued from the test pit we dug in March 2011. Two grids or squares, grid 15N21E and 13N21E, each 1x1m were excavated. Although our plan at this time was to open up more grids, the huge concentration of artifacts and the time constraint limited the progress of the excavation. The excavation was therefore limited only to these two grids and we planned another excavation, which was conducted in October 2011. At this time too, the excavation was pursued outside the drip line adjacent to the test pit. This was done due to the abundant surface finds and the preliminary C-14 result from the test pit. We had at this time C-14 date sample from the lower middle level (level six) of the test pit dated to 5560+/-40 BP, Cal BC 4460 to 4340 (Cal BP 6410 to 6290). We therefore expected more useful and old archaeological material from grids adjacent to the test pit. In addition, in this part of the rock shelter, we assumed that there could be different activities especially during the dry season. Since the area within the drip line is very small, which could have limited the different activities to take place inside the rock shelter, this part of the shelter was assumed potentially valuable for excavation.

The excavation continued based on the grid system set for test excavation in early March 2011. Excavation technique and procedure employed during the test excavation were utilized for this excavation too. The surface was cleaned and the test pit was opened and the datum points were set. The datum point for grid 13N21E and grid 15N21E were 23 cm and 44 cm above the surface respectively. The surface deviation from the datum was taken for all the four corners of the grids and the middle part from the respective datum points before starting excavation. The depth of each level was regularly checked from the datum point. We kept in mind that these datum points would be correlated to the datum point already set for the test excavation while establishing the stratigraphy of the site.

The grids were excavated at an arbitrary level of 10 cm because the natural stratigraphy was not clearly identifiable. Each level was excavated by dividing them into four equal quadrants: NE, NW, SE and SW. All the finds in each level and quadrant were carefully catalogued with respect to their grids, levels and quadrants. In all cases, excavation extended to the bedrock. Grid 15N21E revealed deep occupation sequences with a total depth of 80 cm from the surface. The bedrock in grid 13 N21E was approached at an excavation of 70 cm from the surface. In Grid 13N21E, the concentration of artifacts is very shallow in the lower levels. The concentration of finds in grid 15N21E is on the other hand very high towards the lower levels.

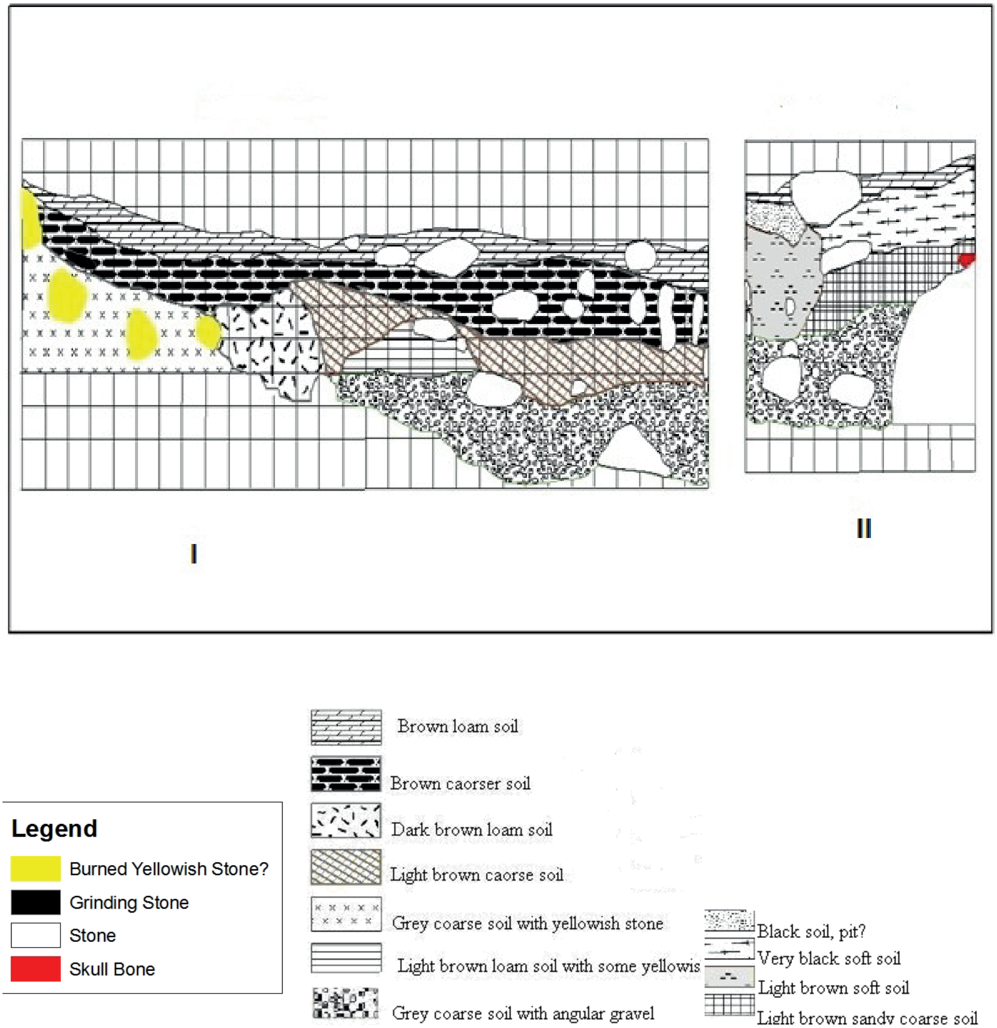


Fig. 4. 26. I. Western profile of grid 13N21E, 14N21E and 15N21E (outside the drip line). Fig. 4. 27. II. Northern profile of grid 15N21E (outside the drip line)

In early October 2011, four grids (each 1x1m) that lie entirely within the drip line were excavated. As indicated in the plan drawing below, the three squares excavated at this time are adjacent to the wall of the rock shelter while the remaining grid is located at the middle of the rock shelter. In the direction to the cave wall, the area adjacent to the grids dug in the previous excavations was deliberately abandoned. This is because there are some indications of intentional disturbance. The area particularly around the previous excavations seems to have been dug and refilled. The local people could have intentionally done it between May and September 2011. We, therefore, concentrated our excavation close to the wall of the rock shelter. A separate grid located at the right part of the rock shelter was also excavated because we observed dense concentration of organic remains. The wall of the rock shelter above it is also very dark probably due to smoking or firing beneath. Based on such traces we assumed that some special human activity might have occurred at this particular area. Because the height of the rock shelter is short, it seems that ordinary daily activity might have been limited at this section of the rock shelter. We therefore presupposed that, instead of some sort of domestic activity, such surface traces could indicate certain intended activity such as ritual practices.

The grids excavated at this phase are grids 13N23E, 14N23E, 10N23E and 12N22E. Excavation at grid 13N23E and 14N23 E was proposed to see what correlations or relations could exist deep inside the rock shelter as compared to the dense concentration of finds from previous excavations in Grid 14N21E and 13N21E. However, grid 15N23E was abandoned because the excavation in the northern quadrants of grid 14N23E revealed many big stones with no significant amount of artifacts. Instead, grid 12N22E was selected for excavation because it is situated close between grids excavated in the inner and outer parts of the rock shelter. In addition, unlike grid 14N22E and 13N22E (intentionally disturbed between May–September 2011), we did not find such surface disturbance in these grids. As it is mentioned above i.e. due to many traces of abundant humus and smoking or firing on the wall, grid 10N23E was finally selected for excavation. It was also proposed to excavate this grid on the assumption that there could be space use differentiations within the site.

For excavating these grids, the grid system utilized in the previous excavations was used. The excavation was conducted by fixing the datum points first. The datum point for grid 13N23E and 12N22E is 18 cm above the surface. The datum point for grid 10N23E is 33 cm while for 14N23E it is 15 cm above the surface. The datum point for grid 14N23E is 30cm less than the datum point of grid 13N23E and 12N22E. But the datum point for grid 10N23E is 15 cm greater than the datum point of 13N23E and 12N22E. This difference is due to variations in surface elevation at these parts of the rock shelter. Similar to the previous excavations, the grids were excavated in quadrants: NW, NE, SE and SW. However, due to shallow concentration of finds, all these grids were excavated using arbitrary levels of 10 cm for each.

All the necessary information such as soil texture, compactness, composition and color were also documented for all the levels and quadrants using field notes and photographs in the course of each excavation. This information is then correlated with the available dates, density and distribution of finds and stratigraphic profile of each grid in order to identify the stratigraphic layer of the occupation.

Furthermore, to protect the site from intentional disturbance from the local population, I hired guards until the whole excavation was completed. The guards have already been working for a private irrigation project located very close to the site. It is unfortunate, however, to find some intentional disturbance on that particular part of the site.

4.4. Stratigraphy

The excavation offered huge amount of archaeological remains, but the straratigraphy of the site is quite complex. Correlation of the radiocarbon dates with profile drawings, distribution of finds and analysis of soil texture, color and compactness could not offer clear stratigraphic layers. Radiocarbon dates indicated significant post depositional disturbances particularly to grids outside the drip line. As indicated in the radiocarbon result presented in the next chapter, some of the dates in the lower levels of these grids are younger than the succeeding upper levels. Besides, two squares of the same grid and level provided different dates. The time range between these two samples is very large. Still in the grids outside the drip line, there are some structures that could be due to post depositional activity. In the middle or lower bottom levels of grid 13N21E, there is for example one wide circular structure. The material remains in these levels are very few, and negligible compared to the top upper levels and the adjacent grid. This may suggest removal of earlier cultural deposits while this structure was made by later activities. In grid 15N21E, there are also traces of burial in the middle upper contexts, which may be due to later occupation. The finds above this context are generally very few. Nevertheless, the amount of archaeological material below it is extremely dense. There is also evidence of dense concentration of microliths towards the bottom levels, but big tools such as points and blades are very dense in levels above these abundant microliths bearing contexts.

This may further indicate post depositional disturbance. The typology of the lithic material and ceramics in the outer grids generally show clear difference from material inside the drip line. But, there are also few sherds with modern looking surface fabrics. Compared to the radiocarbon dates obtained from the outer grids, all the radiocarbon dates from levels inside the drip line are quite late. This may still suggest removal of older material from the inside of the rock shelter more likely by later occupation. I, therefore, found it difficult to discuss the stratigraphic details of the grids outside the drip line. It is also of little practical importance to present the culture history of the archaeological material of these grids. However, the dates and the material from these grids are worth to consider. First, these grids offered the oldest dates of occupation for the site (as old as about 5560 +/-40BP, Cal BC 4460 to 4340 (Cal BP 6410 to 6290). Second, cattle remain dated to 1750 +/- 40 BP, Cal AD 180 to 190 (Cal BP 1770 to 1760) and Cal AD 210 to 390 (Cal BP 1740 to 1560) comes from one of these grids. This is the only available cattle remain at the site. Third, material remains especially the sherds have diverse decoration motifs that could be compared to ceramic traditions from distant areas. In fact, in terms of decoration as well as overall fabrics, most of the sherds from the outer grids are more distinct than sherds in the inner grids. This may suggest that the material culture in the grids outside the drip line might belong to different cultural tradition. Only few decorated sherds from grid 12N22E can be related to some of the sherds from the outer grids. Still these sherds appeared from middle upper level and could therefore be intrusion from previous material.

Stratigraphic correlation and analysis based on different proxies such as profile, radiocarbon dates, distribution of finds and the soil conditions, are thus made for grids only within the drip line. Analysis of these data still indicates that there is significant variation in the temporal dimension of occupation within the drip line. Grids adjacent to the rock shelter contain ceramic material that are entirely modern looking. The concentrations of the finds are very small as well. Besides, the lithostratigraphic layers in these grids are not in conformity with the other grid that lies one meter away from the wall of the rock shelter. The radiocarbon dates from the bottom levels of these two contexts also show marked gap in time. The bottom level of the grids adjacent to the rock shelter is for instance dated to 680+/-30 BP, Cal AD 1270 to 1310 (Cal BP 680 to 640) and Cal AD1360 to 1390 (Cal BP 590 to 560). But the bottom level of the grid 12N 22E (located one meter away the rock shelter) is dated to 2020+/- 30 BP, Cal BC 90 to 70 (Cal BP 2040 to 2020), Cal BC 60 Cal AD 30 (Cal BP 2010 to 1920) and Cal AD 40 to 50 (Cal BP 1920 to 1900). Date on the human tooth sample from this level of the same grid became available recently (in October 2013). It is dated to 5668+/-20 BP, Cal BC 4236 to 4052. This again shows disturbance by later occupations.

Despite such limitations, at a general level, two distinct occupation phases can be inferred for the entire grids within the drip line. One of the occupation phases can be attributed to a more recent period. As indicated by the radiocarbon date, this could be around the early fourteen century AD. The entire occupation phases in the grids adjacent to the rock shelter generally belong to this phase. The upper occupation sequence of grid 12N 22E can also be comparable to this period. The ceramic typology in both cases indicates that the cultural tradition of this phase is comparable to modern day pottery of the surrounding area. The radiocarbon date from the middle context of this grid is dated to about430+/-30 BP, Cal AD 1430 to 1480 (Cal BP 520 to 470).

The older occupation phase within the drip line comes only from the lower bottom level of the grid 12N 22E (1 meter away the wall of the rock shelter). The amount of finds in this level is generally few, but the ceramic material show some significant difference in fabric, color and decoration than the contexts above.

Within these broad cultural phases, some stratigraphic layers can be recognized although they are still complex to discern a clear pattern. At least six layers are broadly identified in most parts of the inner grids, but the layers are yet not clear-cut.

Layer one is the upper most level. It is dominated by light brown loam soil. It is very thin layer with shallow finds. This layer contains only few sherds and lithic.

Layer two is mainly represented by brown silty soil. It is mainly represented by arbitrary level two. It has dense concentration of lithic tools as well as ceramic sherds.

Layer three has dark brown soil with white sandy particles. This layer is absent in Grid 13N23E and 14N23E. Material from the arbitrary level three mainly constitute this layer. The concentration of finds, both sherds and lithic tools are by far dense in this layer.

Layer four is represented by black loam soil. This layer is absent in Grid 13N23E and 14N23E. In grid 10N 21E it is mainly represented by a pit. Therefore, it is a discontinuous layer.

Layer five is dominated by grey course soil with some yellowish stone. Finds from the arbitrary Level four, five and six may constitute this layer. Although lithic tools are dominant in the upper level of this layer, ceramic sherds are generally small in density. The ceramics in this layer of grid 12N22E also show different fabric than the layers that overlie it.

Layer six has dark brown soil. This layer is not continuous. It appears only at SW corner of Grid 13N23E and at the NE corner of grid 12N 22E where traces of burial is found. In grid 13N 23E the soil is coarser.

Three additional stratigraphic layers are also recognized. However, they appear only in grid 14N23E and 13N23E, and even in these grids they appear in discontinuous manner. This may represent different activity area. They exhibit evidence of ash. Besides, the density of ceramic and lithic material in the squares and levels around these layers is limited. They are also found in the middle and upper contexts. Therefore, they might have been firing place. I represented them as layer seven, eight and nine.

Layer seven has light grey ash. It is found at the NW quadrant of grid 13N23E and in grid 14N23E.

Layer eight is represented by dark grey (brown) loam soils. It is small area in the NW quadrant of grid 13N23E.

Layer nine is recognized as grey (light brown) fine soil with a mixture of ash. It is represented around the NE and NW quadrants of Grid 14N23E.

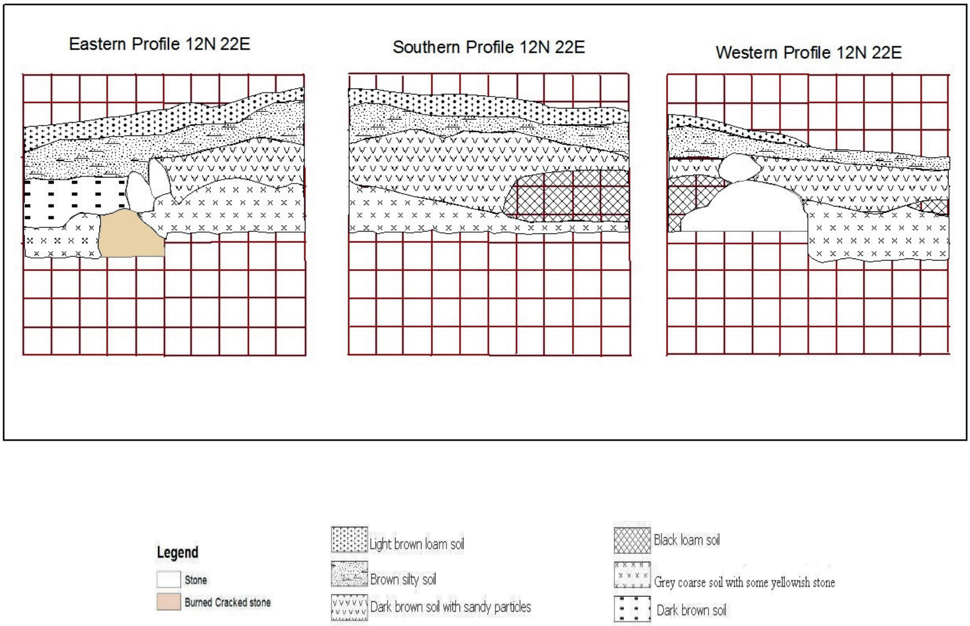


Fig 4.28. EASTERN, southern and western Profile of Grid 12N22E

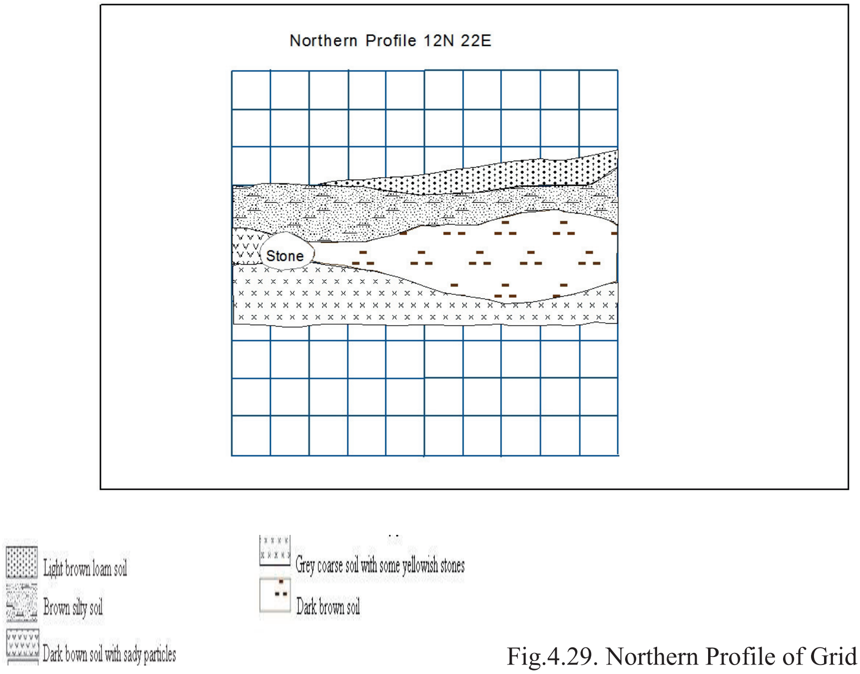


Fig.4.29. Northern Profile of Grid 12N22E

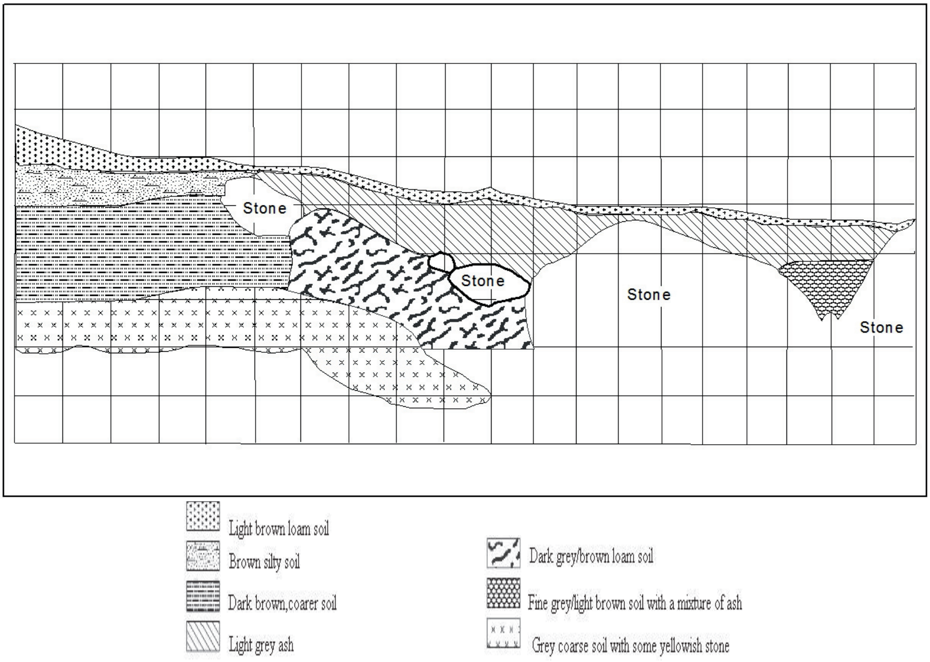


Fig.4.30. Western profile of grid 13N23E and 14N23E

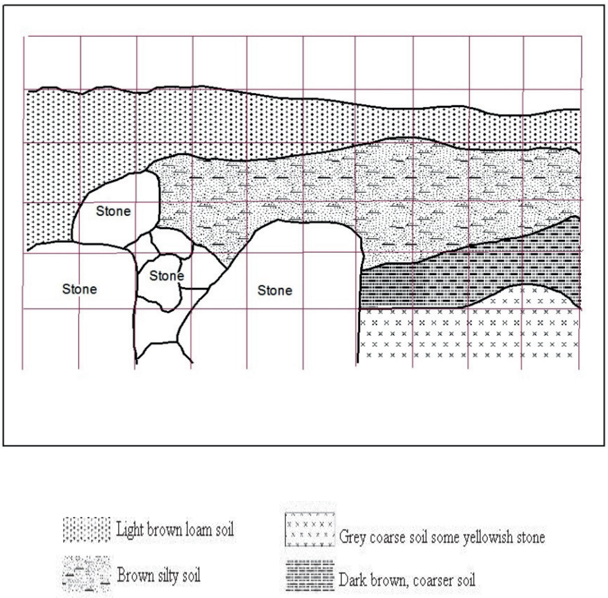


Fig. 4.31. Southern profile of 13N23E

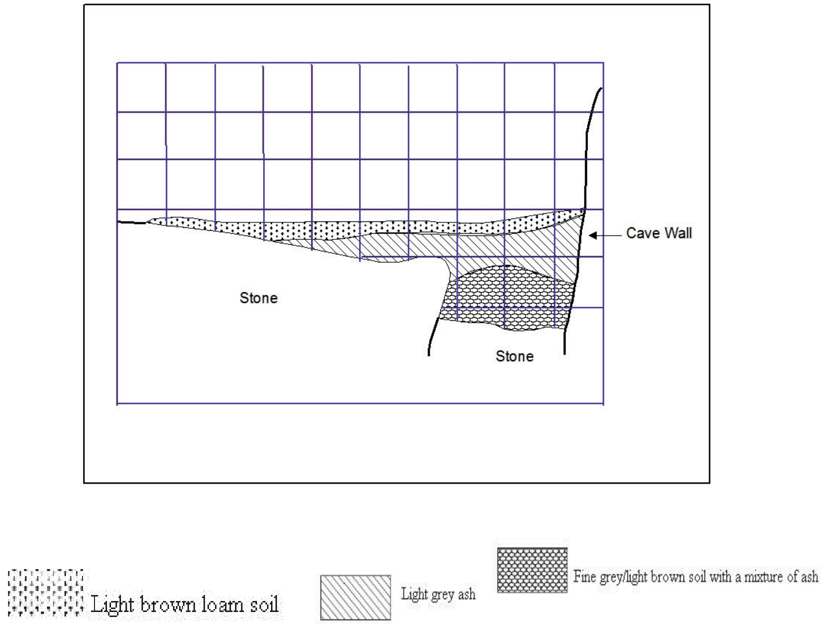


Fig. 4.32. Northern profile of 14N23E

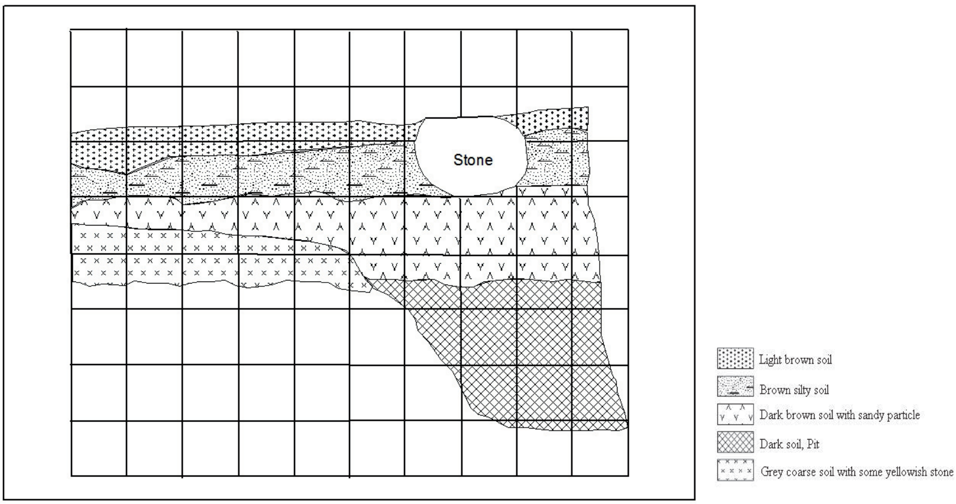


Fig. 4.33. Northern profile 10N23E

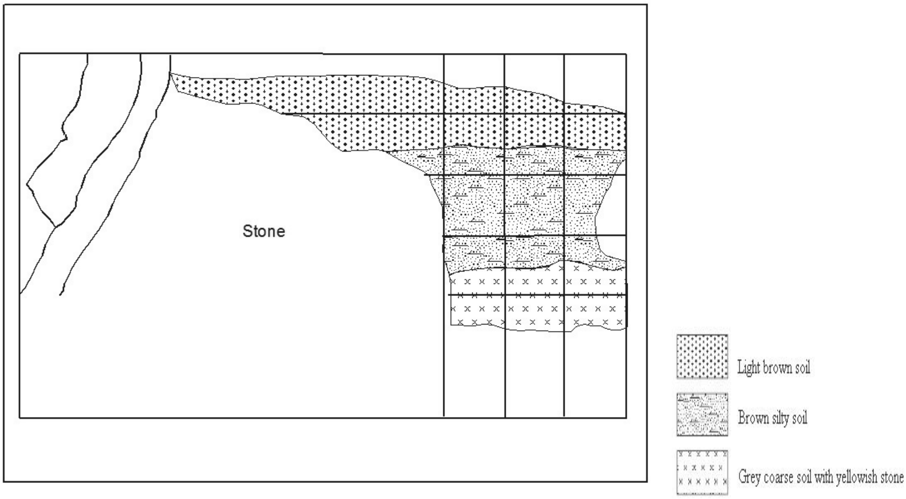


Fig. 4.34. Southern Profile 10N23E

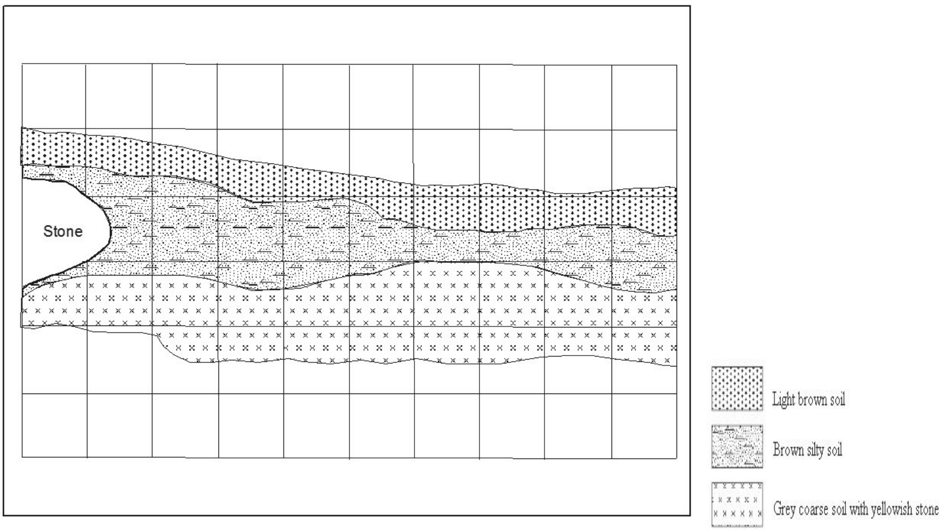


Fig. 4.35. Western profile 10N23E

Chapter Five   Radiocarbon Dates

5.1. Radiocarbon Dates from Kurtiye Rock Shelter

A total of 11 samples were sent to Beta Analytic Inc, MIAMI, FLORIDA, USA. Ten C-14 dating samples were taken from charcoal and one sample was dated on collagen from cattle tooth. As the laboratory report shows pretreatments were taken for all the samples before being dated. Thus, the charcoal samples were pretreated with acid/ alkanie/acid while the tooth sample was pretreated with collagen extraction alkaline. The report also described that each charcoal sample was first gently crushed/ dispersed in deionized water. Hot HCI acid washes were applied to eliminate carbonates, and alkaline wash (NaOH) was used to remove secondary organic acids. This was followed by a final acid rinse to neutralize the solution prior to drying. Chemical concentrations, temperatures, exposures, and number of repetitions, were applied according to the uniqueness of the sample. Each chemical solution was neutralized prior to application of the next. Mechanical contaminants such as associated sediments and rootlets were also eliminated during these serial rinses. For collagen extraction on cattle tooth: with alkaline, the report also indicated that the material was first tested for friability ("softness"). It was then washed in de-ionized water, the surface scraped free of the outer most layers and then gently crushed. Dilute, cold HCI acid was repeatedly applied and replenished until the mineral fraction (bone apatite) was eliminated. The collagen was then dissected and inspected for rootlets. Any rootlets present were removed when replenishing the acid solutions. "With alkaline" refers to additional pretreatment with sodium hydroxide (NaOH) to ensure the absence of secondary organic acids (For details see appendix no "pretreatment and analysis", M.A. Tamers and Hood).

The two additional samples on human teeth were sent to a separate lab, university of British Colombia, for dating and isotope analysis. The result became available late in October 2013 and I could not be able to interpret C13 and N15 isotope results for details. Yet, the dates still confirm old occupation at the site (sample number S-Eva 26868 and S-Eva 26867 below).

Through such methods of dating, the following dates are obtained.

Radiocarbon Dates Outside the Drip line

Lab.ref.no	Context Grid	Level	Depth below surface	Material	Measured Age	Convention Age	2 SIGMA Calibration
Beta-297115	14N21E	3	c.15-20 cm	Charcoal	280+/-30 BP	280+/-30 BP	Cal AD 1520 to 1590
							(Cal BP 430 to 360),
							Cal AD 1620 to 1660
							(Cal BP 330 to 290)
Beta-297116	14N21E	6	C.30-35 cm	Charcoal	5550+/-40 BP	5560+/-40 BP	Cal BC 4460 to 4340
							(Cal BP 6410 to 6290)
Beta-326322	14N21E	6	C.30-35 cm	Charcoal	2130+/-30 BP	2150+/-30 BP	Cal BC 350 to 290
							(Cal BP 2300 to 2240),
							Cal BC 230 to 220
							(Cal BP 2180 to 2170),
							Cal BC 210 to 110
							(Cal BP 2160 to 2060)
Beta-301880	15N21E	11	c.55-60 cm	Charcoal	2210+/-30	2250+/-30 BP	Cal BC 390 to 340
							(Cal BP 2340 to 2290),
							Cal BC 320 to 210

							(Cal BP 2270 to 2160)
Beta-301881	15N21E	9	c.45-50 cm	Charcoal	4060+/-40 BP	4070+/-40 BP	Cal BC 2850 to 2810
							(Cal BP 4800 to 4760),
							Cal BC 2750 to 2720
							(Cal BP 4700 to 4670),
							Cal BC 2700 to 2480
							(Cal BP 4650 to 4430)
Beta-326323	15N21E	12	C.60-65 cm	cattle tooth	1440+/-40 BP	1750+/-40 BP	Cal AD 180 to 190
							(Cal BP 1770 to 1760),
							Cal AD 210 to 390
							(Cal BP 1740 to 1560)
S-Eva 26868	15N21E	7	c.40-50 cm	human tooth		5323+/-20 BP	Cal BC 4236 to 4052

Radiocarbon Dates Inside the Drip Line

Lab.ref.no	**Context**		**Depth below**	**Material**	**Measured**	**Convention**	**2 SIGMA**
	Grid	**Level**	**surface**		**Age**	**Age**	**Calibration**
Beta-314124	14N23E	3	20-30 cm	Charcoal	350+/-30 BP	330+/-30 BP	Cal AD 1460 to 1650
							(Cal BP 490 to 300)
Beta-314125	14N23E	5	40-50 cm	Charcoal	310+/-30 BP	290+/-30	Cal AD 1500 to 1500
							(Cal BP 450 to 450),
							Cal AD 1510 to 1600
							(Cal BP 440 to 350),
							Cal AD 1620 to 1660
							(Cal BP 330 to 290)
Beta-326324	12N22E	3	20-30 cm	Charcoal	440+/-30 BP	430+/-30 BP	Cal AD 1430 to 1480
							(Cal BP 520 to 470)
Beta-326325	12N22E	5	40-50 cm	Charcoal	2000+/-30 BP	2020+/-30	Cal BC 90 to 70
							(Cal BP 2040 to 2020),
							Cal BC 60 to Cal AD 30
							(Cal BP 2010 to 1920),
							Cal AD 40 to 50
							(Cal BP 1920 to 1900)

Beta-326326	13N23E	5	40-50 cm	Charcoal	670+/-30 BP	680+/-30 BP	Cal AD 1270 to 1310
							(Cal BP 680 to 640),
							Cal AD 1360 to 1390
							(Cal BP 590 to 560)
S-Eva 26867	12N22E	5	40-50 cm	human tooth		5668+/-20 BP	Cal BC 4540 to 4458

5.2. Correction of dates

It is indicated in the lab report that all the dates obtained from the samples have been correlated using the available methods and techniques. It is demonstrated that the dates are reported as RCYBP (radiocarbon years before present, "present"=AD1950). The conventional Radiocarbon Age represents the Measured Radiocarbon Age corrected for isotopic fraction, calculated using the delta 13C. The calendar calibrated result is calculated from the Conventional Radiocarbon Age and is listed as the "Two Sigma calibrated" for each sample (for the correction dates see the appendix on "Radiocarbon Dates", M.A. Tamers and Hood 2011, 2012).

5.3. Discussion of the Dates

The above radiocarbon dates indicate a long occupation period in the rock shelter. The radiocarbon dates on charcoal show that the site was occupied since at least Mid Holocene. This period of occupation may be related to a time of severe climatic and environmental changes in the region (discussions will be presented later).

The oldest available date on charcoal is about 5560+/-40 BP or Cal BC 4460 to 4340 (Cal BP 6410 to 6290). The two human teeth samples also offered quite old dates. One sample is dated to 5668+/- 20 BP (Cal BC 4540 to 4458) and the other sample is dated to 5323+-20 BP (cal BC 4236 to 4052). Occupation dated to more recent period is also inferred from the C-14 dates. There are charcoal samples dated to 330±30 BP, Cal AD 1460 to 1650 (Cal BP 490 to 300), and 290±30 BP, Cal AD 1500 to 1500(Cal BP 450 to 450), Cal AD 1510 to 1600 (Cal BP 440 to

350), Cal AD 1620 to 1660 (Cal BP 330 to 290). The site was thus utilized until more recent times. These dates may suggest long human occupation at the site.

Direct dating of the cattle tooth gives an age dated to 1750+/-40 BP, Cal AD 180 to 190 (Cal BP 1770 to 1760), Cal AD 210 to 390 (Cal BP 1740 to 1560). This sample is crucial since it is the only cattle remain found at the site. Yet such young date for the cattle sample is surprising, in view of abundant faunal remains and diverse species composition recovered from the site. Although the sample is limited, the trend that can be inferred from the faunal assemblage may have important implication on the nature of ancient subsistence and introduction of domestic cattle to the area. The C-14 date for the cattle remain from Kurtiye is more or less comparable to C-14 dates from some other sites in the Ethiopian highlands. Therefore, this sample may be important to outline some general pattern regarding prehistoric human adaptation and subsistence in the region (details regarding this issue will be discussed later).

However, the radiocarbon dates show vertical mixing of the archaeological deposits. This is more clearly observed in the samples taken from grids excavated outside the drip line. Samples from the same level within the same grid have different radiocarbon dates, and some of the lower levels are too young compared to samples from upper levels. The dates presented from the lower levels of these grids are much older than dates inside the drip line. The C-14 dates from the inner grids of the rock shelter tend to show more or less normal stratigraphic context. Compared to the dated samples from the outer grids of the site, evidence of occupation within the drip line seems generally late (except the sample from a human tooth).

Such stratigraphic problems are of constraints for addressing the original research goals of the project. As mentioned, vertical mixing of the archaeological deposits as reflected in the C-14 dates make interpretation of the culture history of the site problematic. Using typological classifications archaeologists often correlate their material culture to other known cultures or sites. This is often presented in support of chronometric dating when it is available. It is also presented in the absence of radiometric dates. Cultural sequences of a site are also reconstructed based on typological or stylistic dating. The dates I obtained from Kurtiye rock shelter indicate the limitation of using such an approach particularly in cave and rock shelter sites unless we have sufficient dating samples. Before the radiocarbon dates were made available, I outlined the site occupation based on the typology of the material remains, mainly pottery. Quite distinct pottery styles or traditions can be inferred from the bottom to the upper levels of the site. On a broad general level, the pottery material from the upper levels seems different from the lower levels. This pattern is more clearly observable on pottery excavated from grids outside the drip line. Based on such typological inferences, it thus seems that the site has a normal stratigraphy which could be utilized to present the culture history of the site. The C-14 dating results do not show this trend. Pottery from inside the drip line appears to be from occupation that can generally be attributed to later period. However, the human tooth from the lower level in this part of the rock shelter is dated to c. 5600 BP. This indicates that, in the absence of datable material, interpretation of the material evidence of a site is quite problematic. Since caves and rock shelters might have been reoccupied, this problem could be more pronounced in such sites. Rock shelters and caves offer prehistoric societies a ready-made human habitation or shelter. They are also the main sources of data for archaeologists in the reconstruction of various dimensions of past societies (see Straus 1990; Walthall 1998). Yet, they are often subjected to different post-depositional activities (both natural and human) that significantly affect the archaeological context and the assemblage (see Straus 1990; Walthall 1998). Erosion, decomposition of organic matter, burrowing animals, termites, earthworms, tree roots, and displacement of the archaeological objects due to repeated occupation and trampling effect, water percolation and other factors often cause serious disturbance in rock shelters and caves (ibid, see also Rick 1976; Kos 2003; Karkanas et al. 2000). Chemical processes that are often difficult to discern with naked eye can affect organic remains. Such processes may also lead to differential reduction of sediment volumes that greatly alter the stratigraphy. This in turn "influence the radioactive element distributions, and consequently the dates obtained (Karkanas et al. 2003: 916)."

The disturbance at the site may be attributed to both natural and human activities. The rock shelter is ideally located on the edge of the lake. It also has small area for habitation. Thus, displacement of the earlier material may be expected due to repeated occupation in such small rock shelter. The fact that most of the archaeological material are heavily concentrated outside the drip line may suggest removal of material from the interior of the rock shelter by later occupation. The charcoal samples with very young and older dates within the same level and square may likely be due to this factor. It may alternatively be due to the activity of burrowing animals that might have resulted in down ward percolation of small fragments of charcoal and artifacts. Remains of rodent and huge amount of insect larvae were found in the excavation. Thus, the impact of burrowing animals or other organisms might have contributed to the disturbance. Stratigraphic inversion of radiocarbon dates have been documented in many caves and rock shelters. This problem most commonly occurred due to dating material such as bone splinters and charcoal fragments that might have percolated from their original context as the result of human activity or role of burrowing animals. Technical errors and problems related to excavation and dating can also lead to this situation (see Straus 1990:270). The impact of rain and percolation of sediments and the role of trampling might have contributed to the disturbance at the site. We noticed lithic artifacts vertically or diagonally oriented in their sharp edges in some of the levels particularly in one of the outer grids. This may be due to the effect of rain or water. Besides, microliths were abundant towards the bottom levels in the outer grids suggesting probable displacement from their original context. In the debitage, proximal, distal and medial pieces of shaped tools are abundant. This may be due to the effect of trampling, although breakage at use or at manufacture may account to this problem.

A combination of different factors could have caused the disturbance of the site. The radio metric dates from the site are still important since it both indicated quite an old occupation and a long history of site use. In addition, they revealed problems of cave /rock shelter sites particularly in establishing culture history without sufficient dated samples and available means and methods of taphonomic evaluations. In the absence of sufficient dated material, a number of rock shelters and cave sites in Ethiopia have been interpreted based on typology of the archaeological material. Reconstruction from Quiha and Gorgora rock shelters is a few examples that can be cited (see also chapter two above). The example from Kurtiye rock shelter reminds us to be cautious in an interpretation based on the typology of the material. The radiometric dating from the site is thus relevant in indicating the stratigraphic limitations of such sites and reminds us to be careful in the reconstruction of the culture history from caves and rock shelters.

Chapter Six Lithic Material

Kurtiye rock shelter has provided a huge amount of lithic artifacts that indicate utilization and production of lithic tools at the site ovetime. The total number of lithic tools excavated is 5671. It has also large amount of lithic debitage or waste. This includes flakes, cores and chips.

The debitage excavated from the outer parts of the rock shelter is very numerous compared to the amount recovered from the inner parts. However, due to the stratigraphic problems discussed earlier, I have only treated the debitage excavated inside the rock shelter (within the drip line). The total number of debitage inside the rock shelter is 9102. This includes 6452 chips, 2438 flakes and 212 cores. They totally weighed 14095.28 grams. I have used the term chips to represent small pieces of flakes with length less than 2 cm. The flake debitage refers to flake pieces (both broken and whole) with a length greater than 2 cm. Core debitage includes all cores that do not show use related retouch.

I classified the shaped lithic artifacts that show retouch and traces of modification/macro-wear, possibly due to utilizations, as lithic tools. Artifacts that do not show a standardized tool morphology, retouch and/or traces of modification are labeled as debitage. This group consists of flaked lithic pieces (whole or broken) and core wastes discarded during modification or production of tools. In identifying the retouch, I used the criteria given by Haaland. She argued that lithic artifacts having scars of three or more adjacent chips intentionally struck on an edge could be considered as retouched tools (Haaland 1972). The scars are tiny and often appear in feathered terminations. Such scars occur either on the dorsal or ventral surfaces, or on both faces of the tool (ibid; Andrefsky 2005:171; Marks 1968:393).

6.1. Lithic Tools

The site provided 5671 lithic tools that are identified and catalogued. 4877 (85.99%) of the lithic tools are uncovered from three grids excavated outside the drip line. The remaining 794 (14.01%) lithic tools are excavated from four grids inside the rock shelter.

As shown in the table below, the types of lithic tools present are quite diverse. The major category includes geometric and non-geomtric microliths, curved backed tools, blade tools, points, scrapers, engraving tools, and retouched and utilized tools. Geometric and non-geometric micoliths account for about 41.87% of the tools. This is the largest group of tools at the site. Crescents (15.67%) dominate the microlithic tools. There are large amount of blade tools (26.56%9), most of them do not have pronounced retouch. Scrapers, which appeared in different form account for 15.42% of the lithic tool assemblage. Points and retouched tools also are significant in number. Points represent 7.81% while retouched tools account for about 6.06%. The amounts of curved backed tools, engraving tools and utilized flakes are quite limited, each representing less than 1%.

Tool Types		%
Geometric Microliths	901	15,88
Non-Geometric Microliths	1474	25,99
Curved Backed Tools	56	0,98
Blade tools	1504	26,56
Points	443	7,81
Scrapers	875	15,42
Engravings	38	0,67
Retouched Tools	344	6,06
Utilized Flakes	36	0,63

Table 6.1. Major types of lithic tools at the site

Tool Types	**Sub Types**		%
Geometric Microliths	Crescents	889	15,67
	Triangles	8	0,14
	Trapezoids	4	0,07
Total		**901**	**15,88**
Non-Geometric Microliths	Backed microliths	100	1,76
	Curved backed microliths	721	12,71
	Microblades	653	11,51
Total		**1474**	**25,99**
Curved Backed Tools	Curved backed tools	**56**	**0,98**
Blades	Shaped blades	1277	22,51
	Backed blades	227	4
Total		**1504**	**26,56**
Points	Points	**443**	**7,81**
Scrapers	End scrapers	123	2,16
	Convex scrapers	329	5,8
	Concave scrapers	173	3,05
	Side scrapers	23	0,4

	Circular scrapers	12	0,21
	Core scrapers	30	0,52
	Notches	93	1,63
	Denticulate	92	1,62
Total		**875**	**15,42**
Engravings	Burins	20	0,38
	Borers	14	0,24
	Groovers	4	0,07
Total		**38**	**0,67**
Retouched Tools	Retouched flakes	**344**	**6,06**
Utilized Flakes	Utilized flakes	**36**	**0,63**

Table 6.2. Frequency of specific lithic tools at the site

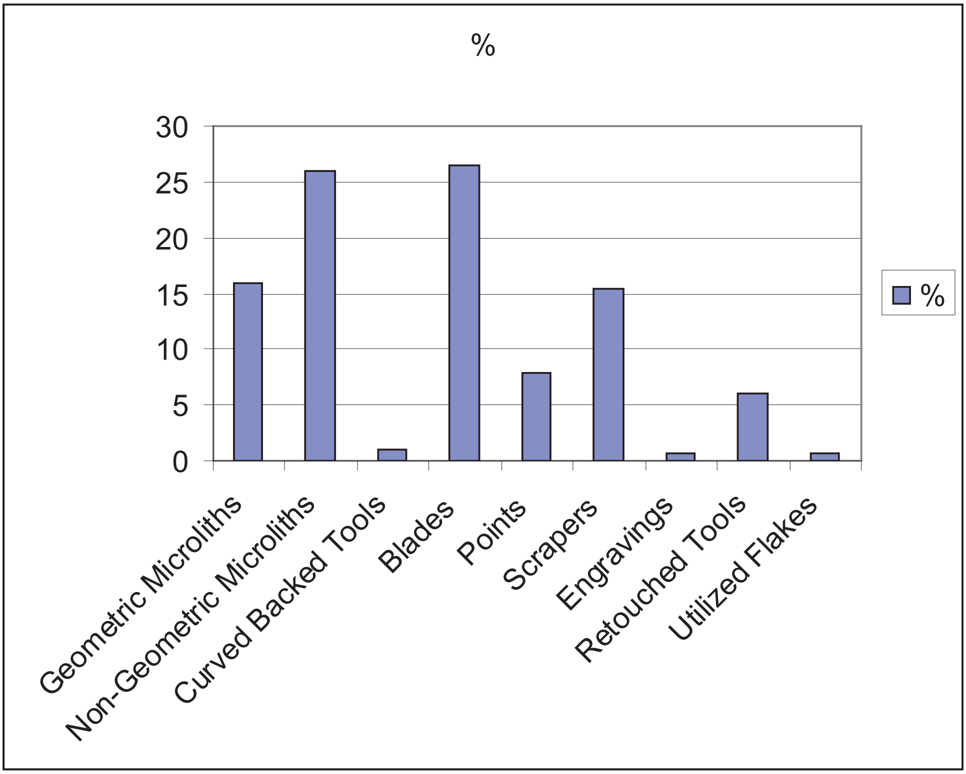


Fig. 6.1 Major types of lithic tools at the site

	10N23E				14N23E				13N23E				12N22E			
Levels	NE	NW	SW	SE	NE	NW	SW	SE	NE	NW	SW	SE	NE	NW	SW	SE
I			2		1	1									1	
II			4	1		3	3	1	1	1	3	1	23	5	19	31
III	5			9	1	1	2	1	1		54	14	95	23	52	73
IV	3			11	2	18	2	3	8	30	76	11	8	59	58	11
V				4			4	1	1	9	5	4	5	4	13	
VI										8		1	1	3		
Total	8		6	25	4	23	11	6	11	48	138	31	132	94	143	115
	39 (0.68%)				43(0.76%)				228 (3.92%)				484 (8.55%)			

Table 6.3. Lithic tools inside the rock shelter (excavated with an arbitrary level of 10 cm INTERVALS). Percentage computed in terms of total number of lithic tools.

	13N21E				**14N21E**				**15N21E**			
Levels	SW	SE	NE	NW	SW	SE	NE	NW	SW	SE	NE	NW
I	1	4			23	32	14		3	8	2	7
II	4	58	2		93	148	18	1			2	3
III	50	64	34	1	46	56	19	7		1	4	
IV	100	41	3	25	40	32	38	13	1	8	2	2
V	32	4	3	96	82	28	69	10	5	28	2	4
VI	14		3	65	78	27	31	9	18	37	27	9
VII	5	1	1	51	46		22	64	20	69	48	2
VIII	2	1	6	14	100		96	118	35	51	52	4
IX	1	4	4	6				124	63	75	90	24
X	1	1	11	4				157	50	124	33	7
XI			4	4					104	112	53	21
XII			3						96	114	58	51
XIII									150	193	113	102
XIV									57	63	45	92
Xv									18	28	53	65
Total	210	178	74	266	508	323	307	503	620	911	584	393
	728 (12,83 %)				1641(28.94 %)				2508(44.23 %)			

Table 6.4. Lithic tools from outside the drip line (level one excavated 10 cm, other levels at 5 cm INTERVALS). Percentage computed in terms of total number of lithic tools.

The retouch is mainly marginal, restricted to the edge of the tool. In some cases, it does not cover the entire part of the edge. The retouch mainly appears on the dorsal face. On a few tools, it is visible on the ventral face and rarely on both faces. Retouch on microblades are more pronounced towards the distal end. Some of the microliths also have pronounced and continuous macro-wear along the sharp working edge. In addition, some microliths such as backed microliths and crescents appeared to be finely retouched opposite to the backed edge. There are some points with retouch or backing, and very few of them have steep retouch around the proximal tip. However, all the points from this site are unificial. Truncation and micro burin retouch techniques seem rare since tools with chiseled edge tips are very limited at the site.

A few of the tools (0.58%) are made using bipolar flaking technique. There are also tools that show pronounced bulb of percussion, which may indicate hard hammer percussion technique. This is common on large tools. A few hammer /pecking stones were discovered at the site.

There are huge amounts of debitage. However, as mentioned earlier, I documented only the debitage excavated within the drip line since the outer grids show stratigraphic disturbance. Different types of raw material were utilized for tool making. Chert is the most widely used raw material. Chalcedony is the second most abundant raw material. Quite a significant amount of tools are made from rhyolite and basalt, but they are used mainly for making big tools. The geometric and non-geometric microliths are dominantly made of chert and chalcedony. Tools from quartz, quartizite, obsidian, and agate are very limited.

As a general observation one can say that the lithic tools unearthed from squares outside the drip line are numerous and diverse. As shown in the tables above, the distribution of lithic tools varies across grids. Two grids, grid 15N21E and Grid 14N21E, alone account for 73.17% of the lithic tools at the site. In addition, there is no clear pattern in the vertical distribution in type and frequency of tools. For example, microliths, long blades and big points are found together in almost all the sequences. In some of the lower levels, the microliths were even more dominant than big points, and long blades or flake tools.

However, compared to the archaeological contexts outside the drip line, the lithic material within the drip line are limited both in number and type. The lower levels here have few finds, big points and retouched flake tools are few. In the upper context, big points are almost none.

Due to the stratigraphic problem discussed in the preceding chapter, I will present the lithic material separately according to their distributions within the drip line and outside the drip line. Due to the stratigraphic problems, issues regarding temporal dimension of material culture are not discussed.

6. 2. Lithic Tools Inside the Rock shelter

Within the drip line, four grids were excavated, but the amounts of lithic tools are few. The total number of tools identified is 794, which is only about 14.01% of all tools at the site. The lithic tools within the drip line are composed of different types of tools. Microliths (geometric and non-geometric), blades and scrapers are the most dominant types of tools. There are also retouched tools and points. But, engraving and utilized tools are absent.

Tools	10N23E	12N22E	13N23E	14N23E	Total	%
Geometric Microliths	4	82	25	2	113	14,24
Non-geometric Microliths	9	137	38	10	194	24,43
Curved backed tools		4	6	1	11	1,39
Blades	10	126	68	9	213	26,82
Points	2	27	17	1	47	5,91
Scrapers	9	91	73	14	139	17,50
Engravings			1		1	0,23
Retouched tools	7	44	17	7	75	9,45
utilized tools						
Total	**39**	**484**	**222**	**43**	**794**	
%	**4,91**	**60,95**	**27,96**	**5,42**		

Table 6.5. Frequency of major tool types inside rock shelter

Geometric and non-geometric microliths account for 36.6% (n=307) of the total tool assemblages from this part of the rock shelter. Crescents (n=113) and curved backed microliths(n=101) are the largest amounts of the microliths. They account for 26.44% of the lithic tools within the drip line. The amount of microblades is significant. Other groups of microliths: backed microliths and trapezoids are few. Blades represent 26.82% of the tools. Scrapers, which account for 17.5% of the tools, vary in types. Convex and end scrapers are more dominant than other scrapers. Retouched flaked tools and points constitute about 9.45% and 5.91% of the tools. The following table shows the frequency and distribution of lithic tools within the drip line.

		10N23E	12N22E	13N23E	14N23E	Total	%
Geometric Microliths	Crescents	4	80	25	2	111	13,97
	Triangles						
	Trapezoids		2			2	0,25
	Total	**4**	**82**	**25**	**2**	**113**	14,24

	Backed microliths	1	15	2		18	2,26
	Microblades	8	47	15	5	75	9,44
Non-Geometric microliths	Curved backed microliths		75	21	5	101	12,72
	Total	**9**	**137**	**38**	**10**	**194**	**24,43**
Curved backed tools	Curved backed tools		**4**	**6**	**1**	**11**	**1,39**
	Shaped blades	7	102	64	8	179	22,54
Blades	Backed Blades	3	24	4	1	32	4,03
	Total	**10**	**126**	**68**	**9**	**213**	**26,82**
Points	Points	**2**	**27**	**17**	**1**	**47**	**5,91**
	End scrapers	1	17	13	4	35	4,44
	Convex scrapers	3	25	13	3	44	5,54
	Concave scrapers		8	12	1	21	2,66
	side scrapers			1	1	2	0,25
	Circular scrapers	1		2		3	0,38
	Core scrapers	1	4	1	1	7	0,88
	Notches	1	9	9	3	21	2,64
Scrapers	Denticulates		1	5		6	0,76
	Total	**9**	**91**	**73**	**14**	**139**	**17,50**
	Burins			1		1	
	Borers						
Engraving tools	Groovers						
	Total					**1**	**0,23**
Retouched tools	Retouched flakes	**7**	**44**	**17**	**7**	**75**	**9,45**
Utilized tools	Utilized flakes						
Total		**39**	**484**	**222**	**43**	**794**	

Table 6. 6. Frequency and types of lithic tools inside the rocks shelter (percentage calculated in terms of the total lithic tools only within the drip line)

As indicated in the table, the distribution of lithic tools varies with grids. Grid 10N23E and 14N23E have very limited amount of lithic tools, while Grid 12N22E has the largest number of lithic tools within the drip line. The amount of lithic tools in Grid 13N23E is relatively large.

Grid 12N22E contains 8.54% and Grid 13N23E has 4%. Grid 10N23E has 0.68% while Grid 14N23E contains 0.76% of the entire lithic tools at the site.

In addition, high concentrations of lithic tools are found in two levels: level three and four. The first and the lower bottom levels have very few lithic tools.

Level	CRESCENTS	TRAPEZOIDS	BACKED MICROLITHS	CURVED BACKED MICROLITHS	MICROBLADE S	CURVED BACKED TOOLS	BLADES	BACKED BLADES	POINTS	END SCRAPERS	CONVEX SCRAPERS	CONCAVE SCRAPERS	SIDS SCRAPERS	CIRCULAR SCRAPERS	CORE SCRAPERS	NOTCHES	DENDTICULATES	BURINS	RETOUCHED FLAKES	TOTAL	%
I	2					1			1		1									5	O,.5
II	12		1	13	14		12	4		6	11	2			2	2	1	1	14	**95**	**12,1**
III	43	2	5	49	26	6	86	16	24	18	10	5	1		1	9	1		29	**331**	**41,9**
IV	45		11	30	18	4	77	12	16	10	18	12	1	2	3	10	4		27	**300**	**37,3**
V	8		1	8	11		4		4	1	4	2		1	1	1			4	**50**	**6,42**
VI	1			1	6		2		2										1	**13**	**1,17**
	111	2	18	101	75	11	181	32	47	35	44	21	2	3	7	22	6	1	75	794	98,9

Table 6.7. Frequency and distribution of tools inside the rock shelter

The lithic tools excavated within the drip line are made of different types of raw material. These include agate, basalt, chert, chalcedony, ryholite, obsidian and few unidentified raw material. However, chert and chalcedony are the most widely utilized raw material. These two raw material represent 86.6% of the lithic tool assemblage. Chert alone accounts 63% of the lithic tools while chalcedony constitutes 23.3% of the lithic tools. Due to their good quality at knapping, agate and obsidian are often regarded as preferred raw material for lithic tool manufacture (see Andrefsky 2005). But tools made of agate and obsidian at Kurtiye rock shelter are very few. This may imply the absence of these raw material around the site. The following table shows the frequency of lithic tools according to their raw material types.

Level	Agate	Basalt	Chalcedony	Chert	Obsidian	Quartz	quartizite	Ryholite	other
I			1	1				3	
II		1	33	50	1			10	5
III	5	10	81	198	2	1		29	
Iv	2	17	56	208	2	1		8	6
V			12	36			1	1	
VI			2	10				1	
	7	28	185	503	5	2	1	52	11
%	0,88	3,52	23,3	63,4	0,63	0,25	0,12	6,55	1,39

Table 6.8. Lithic tool distribution in terms of raw material across levels within the rock shelter

Variations or changes in lithic raw material across levels could be useful to see cultural changes or variations ovetime. As seen in the above table, there are no marked changes in raw material across levels. The highest frequency of all the lithic raw material types appears around the middle section, level three and four. Although their total amount is limited, tools from agate, basalt, obsidian, quartz and quartzite are restricted mainly to the middle levels. Chalcedony, chert and ryholite are found in all levels, though their frequency is high in the middle levels.

Some of the tools have traces of fire treatment. 138 of the tools are fire treated, which forms 17.38% of the lithic tools. 32 of these with traces of fire are made from chalcedony, 104 are from chert. Quatrize and ryholite have one tool each. 57 (7.17%) of the tools have cortical surfaces. They are made mainly from chert (n=38) and chalcedony (n=15) and the remaining are from quartz and ryholite. The cortex, whenever it appears on tools, generally covers limited areas(less than about 25%) of the dorsal surface of the tools.

Tools having traces of fire treatment are relatively high around middle levels of the context. Level three has 63 (45.65%) and level four 46 (33.33%). The number of tools with traces of cortical surface is high around the middle level. Level 3 has 20 (35.08%) and level four 22 (38.59%) of the tools with cortical surfaces. Most of the tools with fire treatment and cortex are mainly found in grid 12N22E and in grid 13N23E as well. Tools with evidence of fire treatment and cortex suggest that tool manufacturing techniques and activities took place at the site. In the following section, I will describe the specific types of tools in detail.

6.2.1. Geometric Microliths

This group of tools is among the largest group of tools available inside the rock shelter. The total number of geometric microlithic tools is 113 (14.24%). Except two of trapezoid shapes, all the geometric mircoliths are crescents. As Phillipson (1977a) and Haaland (1993) described, crescents are microlithic tools characterized by steeply retouched backing with two pointed ends. Backing forms a convex curve. In addition, they do not have bulb of percussion.

The crescents from Kurtiye show evidence of well-executed backing. Some of the crescents also have continuous or discontinuous macro-wears along the working edge. The continuous macro-wears seem to have finely retouched scars. The discontinuous wears are in some cases more pronounced. These traces may be the result of use related impacts.

Most of the crescents are small in length and narrow in width, but there are a few big crescents. Their mean length is 1.89 cm with mean width of 0.8 cm. They are mainly distributed in level three and four. Level three consists of 43 (38.73 %) pieces of the crescents while 45 (40.54 %) of the crescents are from level four. Level two has about 11.71% and level five contains about 7.2% of the crescents. The upper and bottom levels have very few crescents.

The crescents are mostly made of chert and chalcedony. Chert accounts for about 55.85% while chalcedony constitutes 37.83% of the crescents. Few crescents are made of rhyolite (2.7%), agate (0.9%), basalt (0.9%) and obsidian (0.9%).

Trapezoids are geometric microliths having two angles on the backed edge of the tool (Phillipson 1977a). These tools are very few at the site in general. Within rock shelter, there are only two trapezoids. They are made of chalcedony.

Fig. 6.2. Crescents

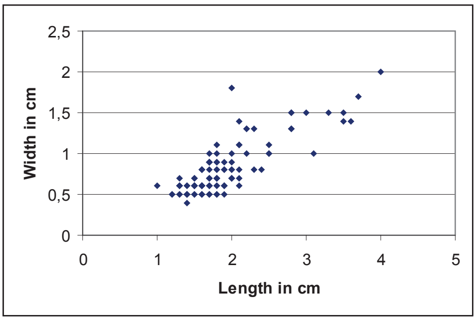


Fig.6.3. Length/width of crescents

6.2.2. Non-geometric Microliths

Ambrose (2002) described non-geometric microliths as tools having different forms such as curved backed, backed microliths and microblades. They could have curved or straight backing, orthogonal, oblique or longitudinal truncations.

Backed microliths, microblades and curved backed microliths from the site are grouped as non-geometric microliths. They are 194 in sum, which accounts for 24.4% of the tools in the drip line. This group of tools represents one of the largest groups of shaped tools. Identifying curved backed microliths from crescents may sometimes be difficult. I thus used morphology of tools and of backing as criteria. In terms of morphology, the backed edge of curved backed microliths is curved. However, unlike crescents, they may not have pointed tips on both ends. Besides, the backing does not always appear along the entire parts of the backed edge. In other words, backing is not so well executed and does not cover the entire parts of the backed edge as it appears on the crescents.

Curved backed microliths are the largest groups of non-geometric microliths inside the rock shelter. Their total number is 101. The second largest non-geometric microliths are microblades. They are 75 in total. Backed microliths are 18.

Curved backed microliths are generally concentrated around level three and four, but they are quite few in the upper and bottom levels. Level three contains 49(48.51%) and level four has 31(30.69%). In terms of raw material, 61 (60.93%) of the curved backed microliths are made of chert. 31(32.67%) are shaped from chalcedony. Few curved backed mircoliths are also made of agate and rhyolite. One curved backed microliths are made of obsidian. The mean length of the curved backed microliths is 1.57 cm and their mean width is 0.75 cm.

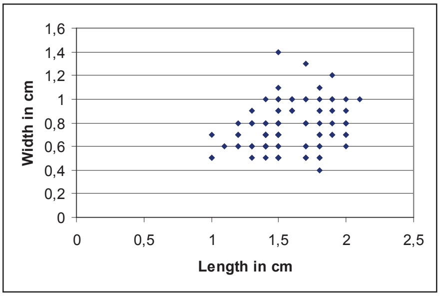


Fig.6.4. Curved backed microliths   Fig.6.5. Length/width of curved back microliths

The backed microliths are 18 in total. These are microliths with steep retouch. The backing may be limited to certain part of the backed edge. Their lateral edges tend to be slightly convex and pointed at the tip. They are wider mostly around the middle section of the tool. Wendrof (1968:801) offered a similar description of to the Nubian microliths.

The backed microliths are mostly concentrated in level four (eleven backed microliths) while level three has five backed microlith. Level two has two backed microliths and level five has only one. They are absent in both the upper and bottom levels. The backed microliths are made of chert and chalcedony. 11 backed microliths are made of chert while 6 of them are from chalcedony. There is one backed microliths made of obsidian. The mean length and width of the backed microliths is 1.57 and 0.67 cm respectively.

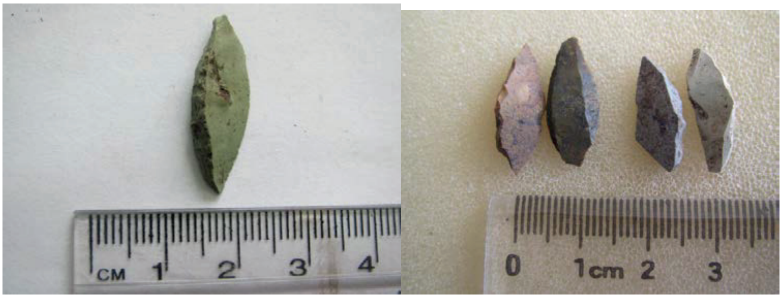


Fig. 6.6. Backed microliths

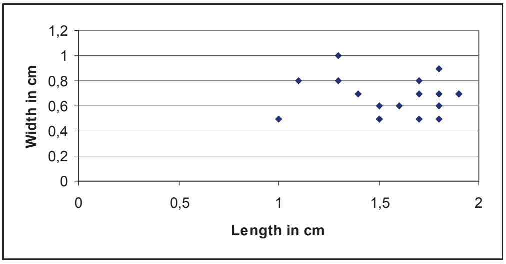


Fig. 6. 7. Length/width of backed microliths

The microblades are the second largest group of non-geomtric microliths. The total number of these tools is 75, and they account 9.61% of the lithic assemblage. They do not have traces of pronounced backing. However, they are retouched often on limited parts of the lateral edges, which is mostly around the distal end. Some of them are pointed at one or both ends. These tools can be described as small blade like tools with fine or marginal retouch. I used length as criteria to differentiate the microblades from blades. I thus labeled such tools with length 2 cm or less as microblades. Ambrose (2002:10) argued that quantitative criteria, such as length/ length-width ratio may reduce subjectivity and ambiguity in the classification between blades and microblades.

Most of these tools are widely distributed across each level, although they are more frequent in level three and four. Five microblades are found in the lower bottom level, which is the highest proportion of tools found in this level.

The microblades are mainly made of chert and chalcedony. 36 microblades are made of chert and 34 are from chalcedony. The remaining few microblades are obsidian, quartz, quartizite and ryholite. Yet, they are represented by 1 tool each. The mean length and width of the microblades is 1.64 and 0.75 cm respectively.

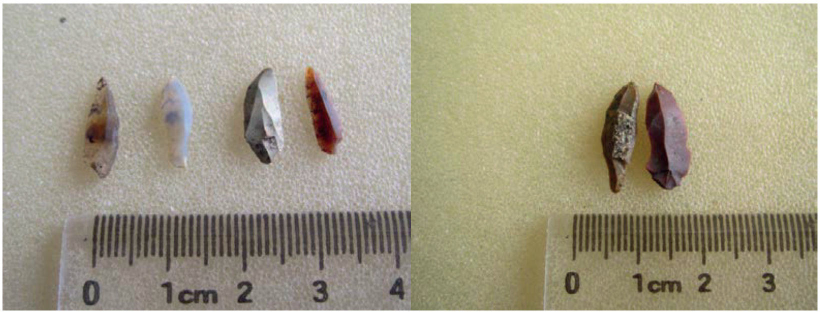


Fig.6.8. Microblades

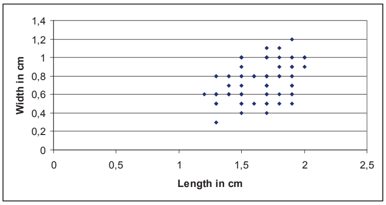


Fig.6.9. Length/width of microblades

6.2.3. Curved Backed Tools

These tools are few in number, 11 in total and account only for 1.39% of the lithic tools. Since most of these tools are long and wide, it is difficult to classify them as microliths. The average length and width of curved backed tools is 2.95 and 1.7 cm respectively. They are mainly found in level three and four and totally absent in the bottom levels. The main raw material utilized is chert (63.6 %), rhyolite (27.27%) and unidentified material (9%). In contrast to the backed microliths and crescents, chalcedony is not used for making curved back tools.

Fig.6.10. Curved backed tools

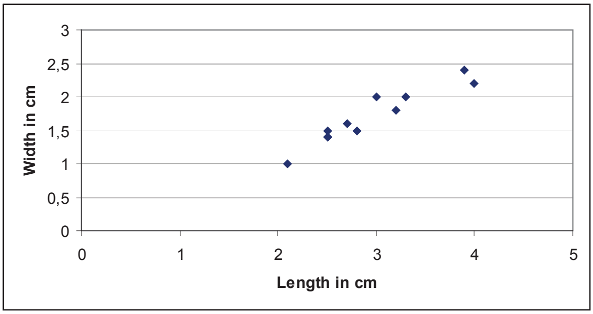


Fig. 6.11. Length/width of curved backed tools

6.2.4. Blades

Blade tools are one of the most abundant types of lithic tools. Under this category, all shaped blades and backed blades are included. All of them have length twice their width, with parallel lateral edges and ridges (see Bordaz 1971:51). There are also some thin elongated blades with pointed end. However, compared to the total blades they are negligible (only 0.1%).

The total number of blades is 213, which accounts for 26.82% of the tools. Backed blades are only 32 (4.03%) of the entire tool assemblages. As Bordaz (1971:57) argued "backed blades are blades with an edge that has purposefully blunted by abrupt percussion retouch." 181 (about 22.6%) of the blades are shaped blades with no pronounced backing or retouch. Blades with retouch are few. On some of the blades, backing is limited to only part of the edge. It is executed on straight as well as on slightly curved edge. 23 of the blades have backing on slightly curved edge and 8 blades have straight backing. 4 of the blades are partially backed or dulled on a limited section of the backed edge; this is mainly near the proximal end.

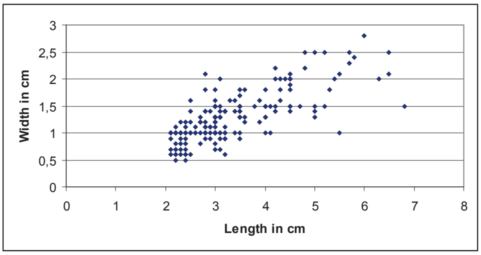
Generally, these tools (both shaped and backed blades) are concentrated around the middle parts of the excavated levels. 191 (89.67%) of the blades are found in level three and four. There are few blades in level two, five and six, but there are no backed blades in the bottom two levels, level five and six.

Most of the blade tools are made on chert. 151 of blades are chert, 71% of the blade tools, 26 (11.86%) of the blades are made of Chalcedony and 19 (9 %) are of rhyolite. There are also 11 blades from basalt and 2 blades from agate.

The mean length of shaped blades is 3.34 cm with mean width of 1.3 cm. The mean length of the backed blades is 2.77 cm and the mean width is 1.01 cm. Thus, backing appears to be executed mostly on smaller blades.

Fig. 6. 12. Blades

Fig. 6.13. Backed blades



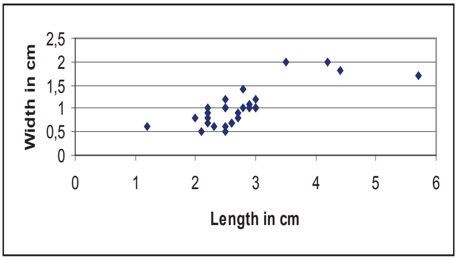


Fig. 6.14. Length/width of Blades Fig. 6.15. Length/Width of Backed blades

6.2.5. Points

A point is a tool with convergent lateral edges that forms a pointed end (Fisher 2010:167). The site provided a significant amount of points. However, the proportion of points is small as compared to their distribution outside the drip line. The total number of points is 47, which is 5.79% of the lithic tools within the drip line. 20 of the points have a thin and elongated shape. The mean length of points is 3.56 cm with mean width of 2.05 cm. Generally, these tools are densely concentrated around level three and four. They are almost absent or rarely available in the upper and lower levels. All the points are made of chert, basalt, rhyolite and chalcedony. Chert is the most dominant raw material, 24 (52.17%). There are some points made on basalt and rhyolite. These two raw material have 9 (19.56 %) points each. The remaining 4 points (13.04%) are made of chalcedony.



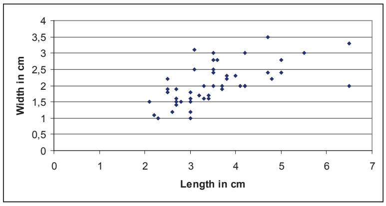


Fig. 6.16. Points Fig.6.17. Length/width of points

6.2.6. Scrapers

This group of tools includes tools with semi-steep or steep retouched working edge (Phillipson 1977a; Whittaker 1994:27). The amount of scrapers excavated is quite large, 139 in total that is 17.5% of the tools inside the drip line. They also appear in different types such as concave, convex, end, side, core and circular scrapers, notches and denticulate. Convex and end scrapers are more abundant than other type of scrapers.

End Scrapers: These tools are relatively dominant among the scrapers. They are 35 in total and forms for 25.17% of the scrapers. Haaland (1972) argued that end scrapers are tools with retouched edge perpendicular to the longitudinal axis of the tool. The morphology of the retouched edge is curved. The retouched edge, I identified as end scrapers, are mainly retouched at the distal end. However, in some cases, the retouch may extend to the later edges adjoining the distal end. The mean length and width of end scrapers are 2.41 and 1.26 cm respectively.

Most of these tools are distributed in level three and four. Level three has 18 end scrapers and level four has 10. Level two has 6 end scrapers, and level 5 has 1 end scraper. The upper and lower bottom levels do not have end scrapers.

The majority of the end scrapers are shaped from chert, 21 (60%) and 12(34.28%) of them are made of chalcedony. Basalt and agate has one end scraper each. There are six end scrapers with traces of fire treatment. They are all from chert. Three end scrapers have cortical surfaces, two of them are made of chert and the other is from chalcedony. Some of them are made on big flakes while others on small pieces.

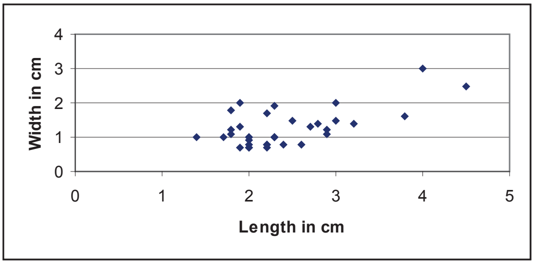


Fig. 6. 18. End scrapers

Fig. 6.19. Length/width of end scrapers

Convex Scrapers: these are tools in which the retouched edge forms a convex shape (Haaland 1972). This is the largest group of scrapers. There are 44 convex scrapers, which represent 31.65% of the scrapers. They appear in different sizes, yet their mean length is 2.52 with mean width of 1.99 cm. Most of these tools are distributed in level four. This level contains 18 convex scrapers. Level two has 11 and level three has 10 convex scrapers. Level five 5 has 4 convex scrapers and level 1 has 1 convex scraper. It is totally absent in the lower bottom level. Most of the convex scrapers seemed to have steep retouch.

The convex scrapers are made of chert, chalcedony, basalt, obsidian and ryholite. 28 Chert, 10 chalcedony, 4 basalt, 1 rhyolite and 1 obsidian.

Fig. 6. 20. Convex scrapers

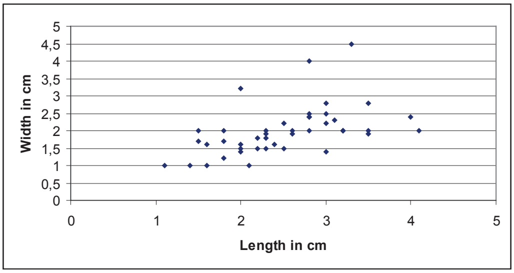


Fig. 6. 21. Length /width of convex scrapers

Concave Scrapers: these are tools with retouched edge forming a concave shape (Haaland 1972). The total number of concave scrapers is 21, which is 15.1% of the scrapers. They are found mainly in level 4 which contains 12 concave scrapers. Level three has 3, level 2 and 5 each contains 2 concave scrapers. Most of the concave scrapers are made of chert, 14 of them are made of chert, 3 rhyolite and 3 chalcedony. These tools have a mean length and width of 3.15 and 2.25 cm respectively.

Fig. 6. 22. Concave scrapers

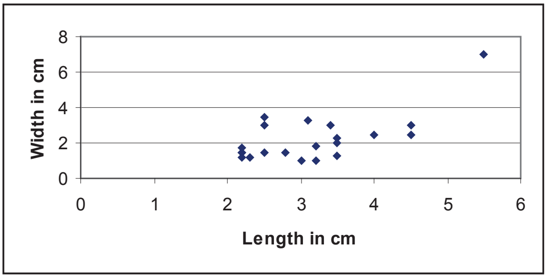


Fig. 6. 23. Length/width of concave scrapers

Side Scrapers: these are scrapers with retouch along the later edges. The retouch is parallel to the longitudinal axis (see Haaland 1972; Odell 1981). Most of the side scrapers on the site are single side scrapers. However, the total amount of this tool inside rock shelter is very few. They are only 2 and constitute about 1.43% of the scrapers. Their mean length and width is 1.75 and 1.7 cm. They are found only in level 3 and 4, and they are made of chert.

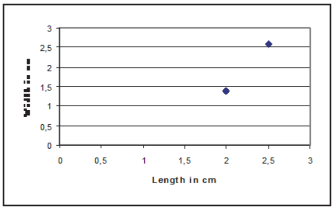


Fig. 6. 24. Side scrapers

Fig. 6. 25. Length/width of side scraper

Circular scrapers: these tools are circular shape whose entire edge is retouched in a convex manner (Haaland 1972). The total number of this tool type is generally very few, 3 which is 2.15% of the scrapers. Both the mean length and width is 2.6 cm. They are found in the lower middle levels, level 4 and 5. Chert is the only raw material utilized for making these tools.

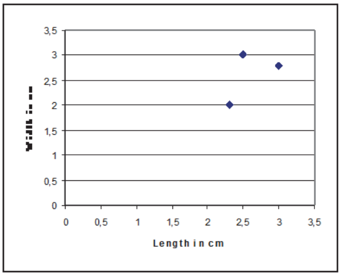
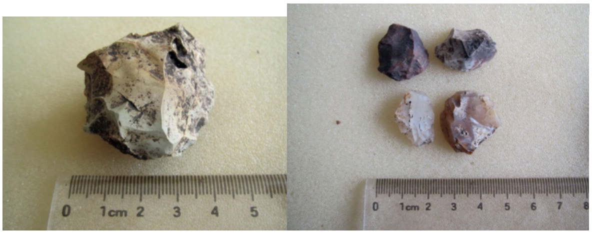


Fig. 6. 26. Circular scraper

Fig. 6. 27. Length /width of circular scrapers

Core scrapers: These are scrapers made on cores. There are 7 core scrapers in total. This is 5.05% of the scrapers. These tools are more or less uniformly distributed across most levels. However, the bottom level is devoid of core scrapers. 4 core scrapers are from chert, 2 from chalcedony and 1 from rhyolite. The mean length of these tools is 2.47 cm with mean width of 2.08 cm. I considered the maximum length on such tools as length and the width is taken mid way parallel to it. But measuring the length and width of this kind of tools is difficult (see Andrefsky 2005:45).



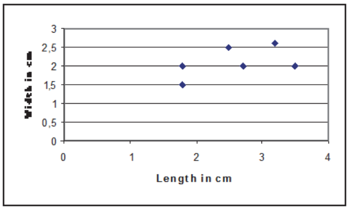


Fig. 6. 28. Core scrapers

Fig. 6. 29. Length/width of core scrapers

Notches: the total number of notches is 22, which is 15.82% of the scrapers. Notches are tools with retouch that are concave in morphology. To differentiate notches from concave scrapers, I used the extent of retouch as criteria. On notches, the retouched part is often shorter in length than on concave scrapers. Shiner (1968:536) used as a criteria that the concavely retouched part of a tool should be less than 1.5 cm in length, to be classified as a notch. The notches I identified from this site are mainly side notches. Few of the notched parts are on the distal ends. These tools have a mean length 2.58 cm and mean width of 2.2 cm. They are mostly concentrated in level three and four. The two levels contain 19 of the notches. Level two has 2 notches and five has 1 notch. The lower and upper levels are devoid of notches. The majority of the notches are made of chert, which represents 16 of the notches. There are also 3 notches made of chalcedony and 1 from rhyolite.

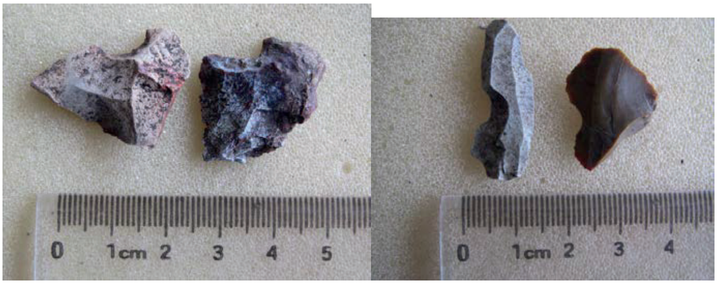


Fig. 6. 30. Notches

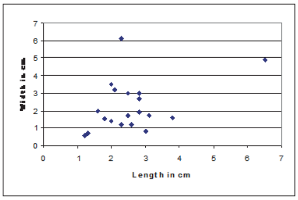


Fig. 6.31. Length/width of notches

Denticulate: In these tools, the retouch creates three or more adjacent teeth or a serrated edge (Shiner 1968: 536; see also Haaland 1972). Only 6 tools are identified as denticulates which constitute 4.31% of the scrapers, 4 of them are distributed in level four, level two and three contain only one denticulate each. The other levels do not contain this tool. Five of them are made of chert and one denticulate is made from chalcedony. The mean length and width of the denticulate is 3.31 and 2.13 respectively.

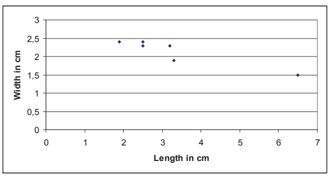


Fig. 6. 32. Denticulate

Fig. 6. 33. Length/width of Denticulates

6.2.7 Engravings

Burin is defined as “a tool with a sharp edge at a striking platform from which a burin spall has been struck (Haaland 1972:99).” In the inner grid of the rock shelter, there is one burin. It is made of chert and found in the upper context i.e. level two.

Fig. 6. 34. Burin

6.2.8. Flake Tools

Under this category of tools, I included all larger detached pieces of lithic artifacts with retouch on flakes. As Haaland (1993:63) described, “these artifacts cannot be assigned to any of the standard type.” The retouch on this kind of tools is often marginal and irregular. This group of tools accounts for 9.44 % (75 in total number) of the lithic tools inside the drip line. The mean length of retouched tools is 3.43 cm and the mean width is 2.3 cm.

The vast majority of the flake tools are found in the upper and middle levels of the context. They are mainly concentrated in level 2, 3 and 4. Level two has 14, level three 29, and level four has 27 flake tools. The lower bottoms, level 5 and 6, have few flake tools. They are represented by 5 and 1 flake tools respectively. Chert is the main raw material. 58 of the flake tools are made of chert. Rhyolite has 8 flake tools. 4 of the flake tools are made of chalcedony. 3 of the flake tool are from basalt and 1 flake tool is from quartz.

Fig. 6. 35. Flake tools

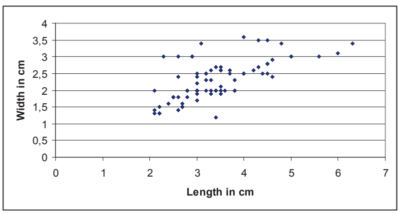


Fig. 6. 36. Length / width of flake tools

6.3. Lithic Tools outside the Rock Shelter

The total area excavated outside the drip line is very small (3 squares meter), but it provided large amount of lithic artifacts. The total number of tools is 4877. This is 86% of the lithic tools excavated at the site. Similar to grids excavated inside drip line, microliths (geometric and non-geometric) and blades dominate the lithic tool assemblages outside the drip line. This suggests that the site is mostly dominated by microliths and blade tool tradition. Microliths, mainly backed microliths, and blades characterize the late Stone Age tradition in Africa (Brandt 1982:8).

The microliths consist of 2074 (42.52%) of all the tools, while blades constitute 1285 (26.37%). However, backed blades and blades with retouch are still limited. Among the microliths, the non-geometrics are by far the most dominant. The number of the non-geometric microliths is 1286. Geometric microliths are 788 in total. These two groups of microliths respectively represent 26.37% and 16.15% of the tools from this part of the rock shelter.

There are also significant amount of points, scrapers, curved backed tools, engraving tools, retouched and utilized flakes. The total number of points is 396 (8.11%) while scrapers are 735 (15.07%). Retouched tools (flakes) are 269(5.51%). The proportion of curved back tools, engravings and utilized tools is quite limited. Curved backed tools are 45 in total, which is 0.92%. Total number of engraving tools is 38 and utilized tools are 36. These tools respectively represent 0.78 % and 0.74 % of the lithic tools unearthed along drip line.

Tools	**13N21E**	**14N21E**	**15N21E**	**Total**	**%**
Geometric microliths	143	252	393	788	16,15
Non-geometric microliths	250	435	601	1286	26,37
Curved backed tools	1	8	36	45	0,92
Blades	201	535	549	1285	26,37
Points	50	152	194	396	8,11
Scrapers	49	171	515	735	15,09
Engravings	1	5	31	37	0,77
Retouched tools	30	66	173	269	5,51
utilized tools	3	17	16	36	0,74
Total	**728**	**1641**	**2508**	**4877**	
	14,93	**33,64**	**51, 43**		

Table 6.9. Frequency of major tool types outside the drip line

As seen in the table below, crescents are the most dominant among the geometric microliths. They are also the most dominant tools compared to other types of microliths. Among the non geometric microliths, curved backed microliths and microblades are the most abundant. Convex scrapers constitute the largest number among the scrapers. Concave scrapers are the second largest group of scrapers. There are also significant amount of end scrapers, denticulate and notches. Other varieties of scrapers have limited frequency.

	Tools	**13N21E**	**14N21E**	**15N21E**	**Total**	**%**
Geometric Microliths	Crescents	142	248	388	778	15,93
	Triangles	1	2	5	8	0,16
	Trapezes		2		2	0,04
	Total	**143**	**252**	**393**	**788**	**16,15**
Non-Geometric Microliths	Backed microliths	12	26	44	82	1,68
	Microblades/Bladelets	107	213	264	584	11, 97
	Curved backed microliths	131	196	293	620	12,71
	Total	**250**	**435**	**601**	**1286**	**26,37**
Curved backed tools	**Curved backed tools**	**1**	**8**	**36**	**45**	**0,92**
Blades	Shaped blades	176	482	432	1090	**22,35**
	Backed Blades	25	53	117	195	**4**
	Total	**201**	**535**	**549**	**1285**	**26,37**
Points	**Points**	**50**	**152**	**194**	**396**	**8,11**
Scrapers	End scrapers	11	27	50	88	1,8
	Convex scrapers	26	84	175	285	5,84

	Concave scrapers	4	21	127	152	3,11
	side scrapers	2	6	13	21	0,43
	Circular scrapers	1	4	4	9	0,18
	Core scrapers		3	20	23	0, 47
	Notches	3	12	56	71	1,47
	Denticulates	2	14	70	86	1,76
	Total	**49**	**171**	**515**	**735**	**15,09**
Engraving tools	Burins		1	18	19	0,4
	Borers	1	4	9	14	0, 29
	Groovers			4	4	0, 08
	Total	**1**	**5**	**31**	**37**	**0,77**
Retouched tools	**retouched flakes**	**30**	**66**	**173**	**269**	**5,51**
Utilized tools	**Utilized flakes**	**3**	**17**	**16**	**36**	**0,74**
		728	**1641**	**2508**	**4877**	

Table 6.10. Distribution of lithic tools outside the drip line

The distribution of tools excavated outside the drip line varies across grids. Grid 15N21E contains the largest density of tools, which represents 51, 43% of the tools from this part of the rock shelter. Grid 14N21E has also dense concentration of tools that forms about 33, 64% of the lithic tools. Grid 13N21E has the lowest number of lithic tools. It represents only 14, 93 % of the lithic tools.

There is also great variation in the vertical distribution of tools across grids. For example, grid 13N21E and 14N21 E have more concentration of tools around level 2,3,4,5 and 6. Except the NW quadrants of Grid 14N21E, the bottom levels of these two grids (levels 10, 11 and 12) have small proportion of tools. While the upper six levels of grid 15N21E have few lithic tools with high concentration in the middle and bottom levels. Level 11, 12 and 13 have very huge number of tools. Such variation in the distribution of finds across these adjacent grids, as noticed from the few C-14 dating, could be due to vertical mixing. The table below may give a highlight about the distribution of tools along drip line.

13N21E					14N21E				15N21E						
	Quadrants				Quadrants				Quadrants						
Levels	NW	SW	SE	SW	SE	NE	NW	SW	SE	NE	NW	SW	SE	NE	NW
I		1		1	4			23	32	14		7	8	2	3
II	5	19	31	4	58	2		93	148	18	1			2	3
III	23	52	73	50	64	34	1	46	56	19	7		1	4	
IV	59	58	11	100	41	3	25	40	32	38	13	1	8	2	2
V	4	13		32	3	3	96	82	28	69	10	5	28	2	4
VI	3			14		3	65	78	27	31	9	18	37	27	9
VII				5	1	1	51	46		22	64	20	69	48	2
VIII				2	1	6	14	100		96	118	35	51	52	4
IX				1	4	4	6				124	63	75	90	24
X				1	1	11	4				157	50	124	33	7
XI						4	4					104	112	53	21
XII						3						96	114	58	51
XIII												150	193	113	102
XIV												57	63	45	92
XV												18	28	53	65

Table 6.11. Distribution of lithic tools by grid, level and quadrants outside the drip line

Level	CRESCENTS	TRAPEZOIDS	TRIANGULAR MICROLITHS	BACKED MICROLITHS	CURVED BACKED MICROLITHIS	MICRO BLADES	CURVED BACKED TOOLS	BLADES	BACKED BLADES	POINTS	END SCRAPERS	CONVEX SCRAPERS	CONCAVE SCRAPERS	SIDS SCRAPERS	CIRCULAR SCRAPERS	CORE SCRAPERS	NOTCHES	DENDTICULATES	BURINS	BORERS	GROOVERS	RETOUCHED FLAKES	UTILIZED TOOLS
I	4				23	16		15	2	4	4	8	1	2			1	1				10	3
II	47	1		24	29	60	2	68	11	21	8	27	7		1	3	1	6		1		12	1
III	50				47	41		60	8	17	4	21	1	1	1		4	1		4		20	2
IV	72			2	51	42	3	70	13	30	1	3	2	1			1	3				10	1
V	88			2	50	45	1	111	7	29	4	9	3				3			1		9	
VI	42	1	2	4	47	57	5	80	7	22	5	17	8		2		4	5				7	3
VII	41			8	40	25	18	79	18	20	10	26	11			1	2	8	2	1		18	1
VIII	63			3	55	53	11	129	16	52	5	29	16	4			6	1		1		29	6
IX	57			5	41	42	2	94	9	26	10	25	12			1	13	10	3	4		31	6
X	58			4	45	46		81	16	37	6	24	19	1	1	2	8	8	3	1		21	7
XI	65		2	4	59	38		44	12	24	1	13	7			7	2	8			1	10	
XII	64		4	1	35	25		45	23	31	5	23	17	3	2	2	7	9	1			16	3
XIII	65			13	61	46	1	124	27	39	19	37	34	7		3	11	18	7		3	46	1
XIV	33			6	19	39	2	60	12	25	5	14	14	2	2	1	6	6	3			13	2
XV	29			6	18	9		30	14	19	1	9				3	2	2		1		17	
TOTAL	**778**	**2**	**8**	**82**	**620**	**574**	**45**	**1090**	**195**	**396**	**88**	**285**	**152**	**21**	**9**	**23**	**71**	**86**	**19**	**14**	**4**	**269**	**36**

Table 6.12. Frequency of tools by levels outside the drip line

The different types of lithic raw material include chert, chalcedony, basalt, rhyolite, agate, quartz, quartizite, and obsidian. Chert, chalcedony and rhyolite are the three dominant types of raw material. More than half of the tools are made of chert (see table 6.13 for frequency of raw material).

Level	Agate	Basalt	Chalcedony	Chert	Obsidian	Quartz	Quartzite	Rhyolite	other
I		7	34	41	1			11	
II	1	11	95	183				40	
III	2	16	88	150				26	
IV	3	16	80	166			1	38	1
V	4	16	115	170	1		1	55	
VI	4	11	93	144		3		61	2
VII	5	9	82	155	1	1		76	
VIII	6	23	101	247		2	6	94	
IX	7	8	90	211		1	9	65	
X	11	27	61	223		2		64	
XI	6	5	107	143			1	35	1

XII	2	23	77	177			1	42	
XIII	5	38	92	325	1	2		95	
XIV	3	27	44	144	1	1		41	
XV		6	30	98				26	
Total	**59**	**243**	**1189**	**2577**	**5**	**12**	**19**	**769**	**4**
%	**1.2%**	**4.98%**	**20.3%**	**52.77 %**	**0.1%**	**0.24%**	**0.39%**	**15.8%**	

Table 6.13. Frequency of lithic tools by raw material (tools outside drip line)

871(17.85%) of the tools have traces of fire treatment, these are mainly made of chert and chalcedony. They represent 627 (71.98%) and 238 (27.32%) respectively of the tools with traces of fire treatment, of these only 4 tools are of agate and 2 of rhyolite

414 tools have cortical surfaces, which is about 8.48% of all the tools along drip line. 253 of the tools with cortex are from chert while 126 are chalcedony, rhyolite constitutes 23. The remaining tools with cortical surfaces are made of agate (n=6), basalt (n=4) and quartz (n=2).

In the following section, I will present the specific types of tools in more detail.

6.3.1. Geomertic Microliths

This group of tools represents one of the largest groups. It includes crescents, triangles and trapezes. There are 778 crescents, which are 15.95% of the lithic tools. The number of triangles and trapezoids are few, only 8 triangles and 2 trapezoids, these are made of chert and chalcedony.

The frequency of crescents is the largest among the microliths collected. They constitute about 25.3 % of the microliths. Most of the crescents are quite small with mean length of 1.79 cm and width of 0.77 cm. Most of the crescents are made on chert and chalcedony. 434 (55.78%) of the crescents are shaped from chert. 276 (35.47%) of the crescents are made of chalcedony. 59 crescents are shaped from ryholite. Crescents from agate and basalt are 6 and 3 respectively. 135 of the crescents have traces fire treated. 95 of such crescents are made of chert and the rest is from chalcedony. 24 of the crescents have cortical surfaces. Except one basalt and rhyolite crescents, others are made from chert and chalcedony.

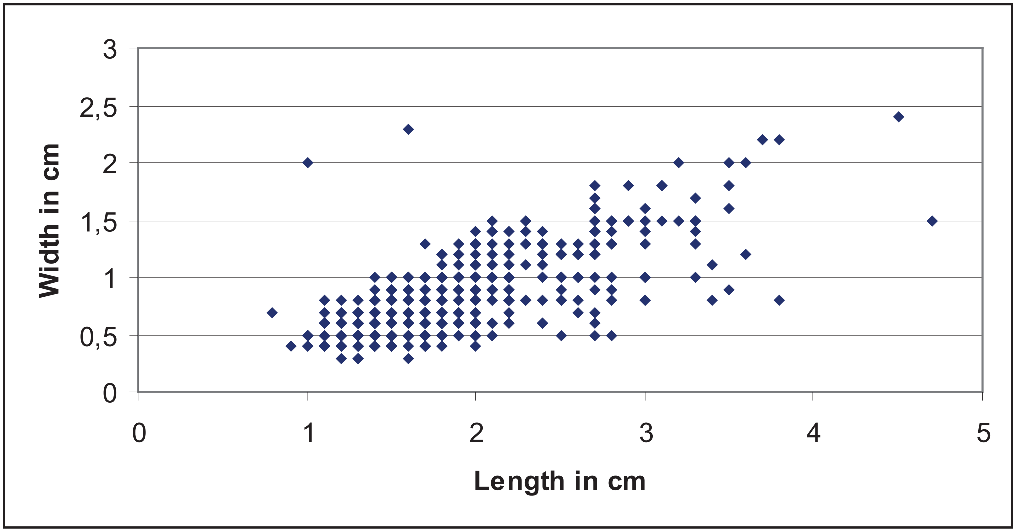


Fig. 6.37. Length /width of crescents

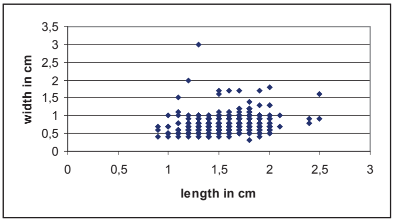
6.3.2. Non-geometric Microliths

This group of tools constitutes one of the most abundant types. It includes backed microliths, curved backed microliths and microblades which do not have geometric shape.

Curved backed microliths is the most dominant of non-geometric microliths, 620 in sum, which is 48, 43% of the non-geometric microliths. It also represents 12.71 % of the lithic tool assemblage outside the drip line. The mean length of these tools is 1.54 cm with an average width of 0.75 cm. The majority of these tools are shaped from chert and chalcedony. 369 curved backed microliths made of chert. Chalcedony includes 182 of the curved backed microliths. Quite limited numbers of tools are shaped from agate, rhyolite, basalt, quartz and obsidian. Agate constitutes 16 and rhyolite 10 of curved backed microliths. Basalt and quartz have 2 curved backed microliths each. There is one curved backed microliths from obsidian. 116 of the curved backed microliths are fire treated, and 3 curved backed microliths have cortical surfaces.

Microblades are 584 in total, which is about 45.63% of the non-geometric microliths and 11.97 % of the tools excavated from outer grids of the rock shelter. Some of these tools have pointed end. Their average length and width is 1.57 cm and 0.75 cm respectively. The microblades are made dominantly from chert and chalcedony. 281 of them are made of chert, and 261 are made of chalcedony. There are also few microblades made of rhyolite (n=19), basalt (n=10) and agate (n=6), obsidian(n=1) and quartz (n=1). 103 0f the microblades show traces of fire treatment. Microblades with this evidence are shaped from chert and chalcedony. 54 of them are from chert while 49 are made of chalcedony. 38 of the microblades have cortical surfaces. Of which 21 are of chalcedony and 17 chert.

Backed microliths are quite few 82, which is 6.37% of the non-geometric microliths. This is 1.62 % of the lithic tools excavated along drip line. These tools are very small with 1.56 cm mean length and 0.73 cm mean width. They are mainly made of chert and chalcedony. 45 (54.87%) of them are made of chert. Chalcedony constitutes 36 (42.68%) of the backed microliths. The remaining backed microlith belong to rhyolite. 24 of the backed microliths appear to be treated with heat, but the total number of backed microliths with cortical surfaces is quite limited. There are only 4 tools with remains of cortex.



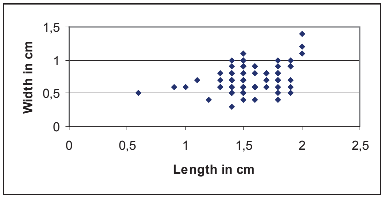


Fig. 6.38. Length /width of curved backed microliths   Fig.6.39. Length /width of backed microliths

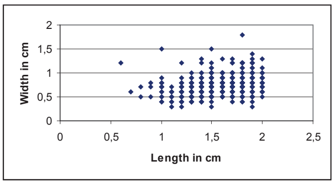


Fig.6.40. Length/width of microliths

6.3.3. Curved Backed Tools

The total number of curved backed tools from grids outside the drip line is very limited. Their total number is 45, which is only 0.92% of the all the tools. Some of these tools are quite long and broad. The mean length and width of these tools are 2.87 cm and 1.62 cm respectively. They are mostly shaped from ryhiolite, 28 and 17 are made of chert. There is 1 from chalcedony and 1 unidentified raw material.

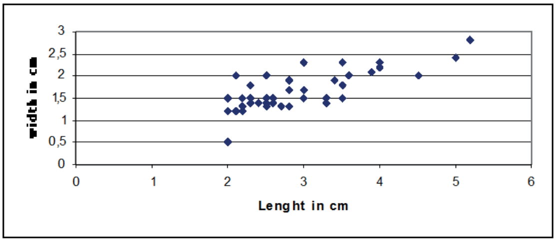


Fig. 6.41. Length/width of curved backed tools

6.3.4. Blades

Blades are the most dominant compared to the specific types of tools excavated in the grids outside of the drip line. Their total number is 1285. They constitute 26.35% of the lithic tools outside the drip line. However, blades with backing and retouch are limited. The total number of blades with backing is 195. The backing is executed either along entire edge of the backed edge or applied to certain parts. Some of the backed edges are slightly curved. The retouch often appears on limited parts of the blades. In addition, some of the blades are thin elongated with pointed end. Their total number is 16.

The main raw material used to make the blades are chert, rhyolite and chalcedony. 650 (50.5%) of the blade tools are shaped from chert. 256 (19.92%) are made of rhyolite and 236 (18.36%) are from chalcedony. Basalt constitutes 113(8, 79%) of the blades. Very few of the blades are also shaped from agate (n=15), quartzite (n=10), quartz (n=3) and obsidian (n=1).

212 of the blades have traces of heat treatment. Except 3 blades shaped from agate, all are made of chert and chalcedony. 52 of the blades with evidence of heat treatment are chalcedony and 157 from chert. Furthermore, 149 of the blade tools have cortical surfaces. This is about 14.99% of all blades. Most of these tools belong to chert and chalcedony. Chert accounts for 98 and chalcedony represents 47 of the blades with cortex. Blades from agate, basalt, rhyolite and quartz have cortical surfaces, but these are few. Mean length of the blade tools is 3.24 cm with mean width of 1.25 cm. The mean length and width of the backed blades are 2.57 cm and 0.91 cm.

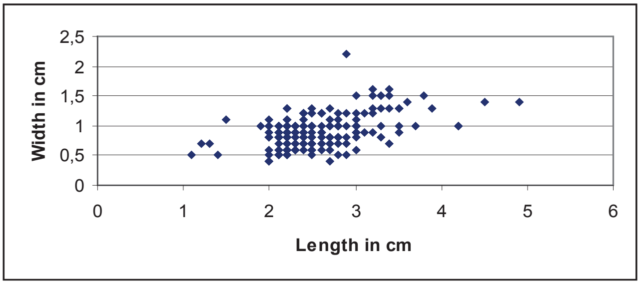


Fig. 6.42. Length/width of backed blades

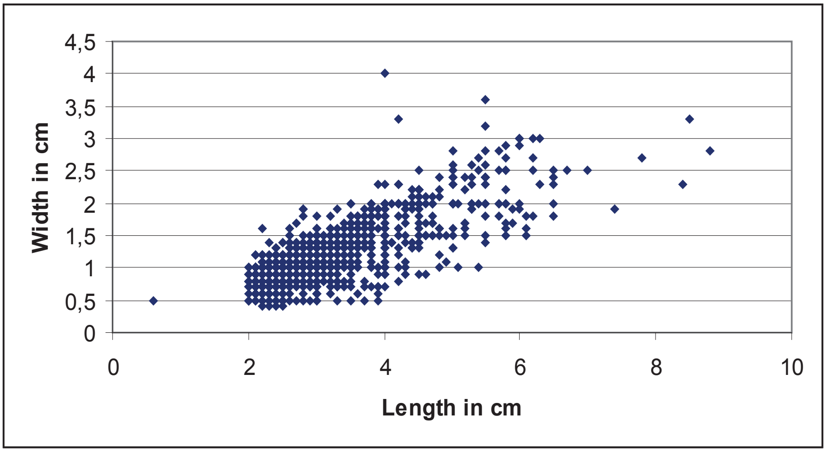


Fig.6.43. Length /width of blades

6.3.5. Points

Their total number is 396. This is 8.11 % of all tools excavated from outside the rock shelter. Most of these points are longer and wider compared to points from inside of the rock shelter. Some of them are well shaped with retouch along the proximal end. There are deep scars (butt) at the proximal end, which might be related to hafting. The mean length of these tools is 3.49 cm while their average width is 2.09 cm.

Most of the points are made of rhyolite, 196 (49.5%), chert 97 (24.49%), and basalt 86 (21.71%). However, unlike the microliths and blades, points made of chalcedony are few. Only 15 (3.78%) of the points are shaped from chalcedony. The number of points with traces of heat treatment is very limited. They are 28, which is only 6.8% of the points. Except for one point from chalcedony, all fire treated points are made of chert. Quite few have cortical surfaces. These are 16. The raw material used is chert, chalcedony, basalt and rhyolite, and chert. Most of the points with cortex are made of chert.

Fig. 6.44. Points

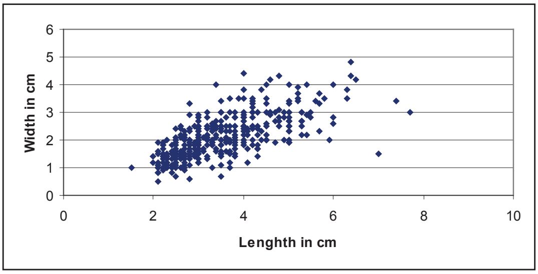


Fig.6.45. Length/width of points

6.3.6. Scrapers

Scrapers appear in different forms which include concave, convex, end, side, core and circular scrapers, notches and denticulate. The total number of scrapers is 735(15.09%) of which convex and concave scrapers are the most dominant.

Convex scrapers: This is the most abundant type of scrapers excavated from grids in the outer parts of the rock shelter. This is 285 (49.3 %) of all scrapers. The mean length and width of these tools are 2.37 and 1.8 cm respectively. Chert is the most dominant raw material followed by chalcedony and rhyolite. 199 (69.82%) are of chert, 59 (20.7 %) chalcedony and 17(5.96 %) rhyolite. Agate represents 5 while quartz and quartzite contains only 2 convex scrapers each.

97 of the convex scrapers are fire treated. These tools are all from chert and chalcedony. 79 are chert while the rest belong to chalcedony. 54 of the convex scrapers show cortical surfaces. 39 are made of chert and 12 from chalcedony. The remaining tools are from rhyolite, agate and quartz.

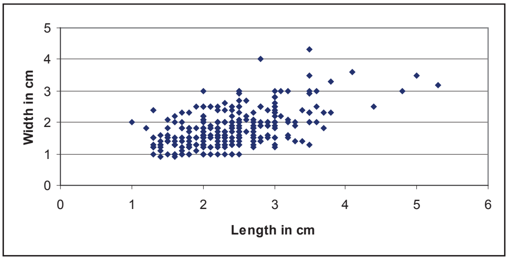


Fig. 6.46. Length /width of convex scrapers

Concave scrapers: it is the second most dominant types of scrapers. The total number of the concave scrapers is 152. This is 20.68% of all the scrapers. The mean length and width of the concave scrapers is 3 cm and 3.02 cm respectively. These tools are mainly shaped from rhyolite and chert. 68 (44.73%) chert, rhyolite 58 (38.15%), a few are made of chalcedony (n=14), basalt (n=7), agate (n=5) and obsidian (n=1).

20 concave scrapers show traces of heat treatment. 17 are from chert while the rest is from chalcedony. 20 concave scrapers have cortical surfaces, most of these scrapers from chert. 4 are made from chalcedony and 2 from rhyolite.

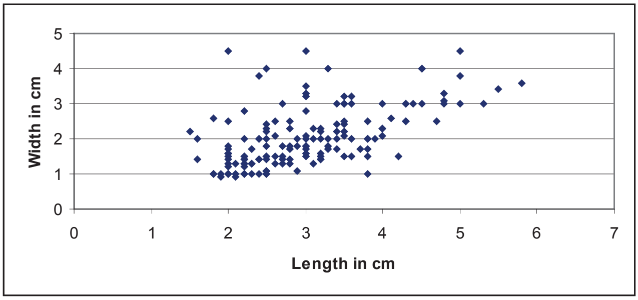


Fig. 6.47. Length /width of concave scrapers

End Scrapers: The number of end scrapers excavated from the outer grids is few, 88, which is 14.83% of all the scrapers, and 1.8% of the total number of tools along drip line. Most tools are from chert and chalcedony, 55 (62.5%) chert and 24(27.27%) chalcedony. There are 7 end scrapers made of rhyolite and 2 from agate. 13 have traces of heat treatment. 10 of them are made from chert and the remaining from chalcedony. 12 of the tools have cortex. They are made from chert, chalcedony and agate. The mean length and width of these tools is 2.34 cm and 1.26 cm respectively.

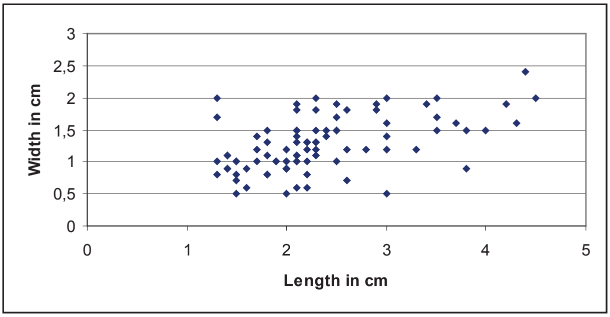


Fig. 6.48. Length /width of end scrapers

Side scrapers: The frequency of these tools is few, only 21, which is 0.43% of all the lithic tools from the outer parts of the rock shelter. It is 2.8% of the scrapers. 14 (70%) of the side scrapers are shaped from chert and 4 (20%) chalcedony. The remaining side scrapers are from rhyoilite and agate. 3 have traces of fire treatment and 2 of which are from chert while the other is made from chalcedony. 5 have cortical surfaces. They are made of chert (n=4) and chalcedony (n=1). The mean length and width of the side scrapers is 3.04 cm and 1.86 cm respectively.

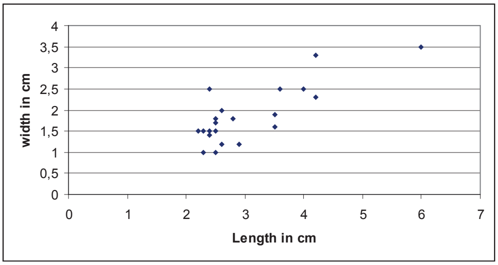


Fig. 6. 49. Length /width of side scrapers

Circular Scrapers: there are only 9 tools which is 0.18% of the tools. Except one rhyolite, the remaining are made from chert. Two of these tools are fire treated and one of them has cortical surfaces. Both of them are made of chert. The mean length and width of these tools is 3.28 cm and 2.65 cm.

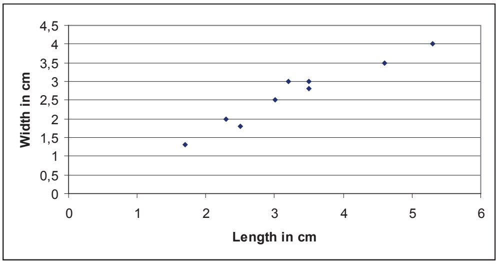


Fig. 6.50. Length /width of circular scrapers

Core Scrapers: The number of these tools is few, 23, this is 3.12 % of the scrapers. As can be seen from the mean length and width ration, most of these tools are quite wide. The mean width is 2.62 cm, but the mean length is 2.94 cm. They are made from three types of raw material, but chert is the most dominant. 14 (66.66%) chert, 6 (28.57%) from chalcedony and 1 of rhyolite. 9 core scrapers have traces of fire treatment, and these are from chert. 8 have cortical material and are from chert and chalcedony.

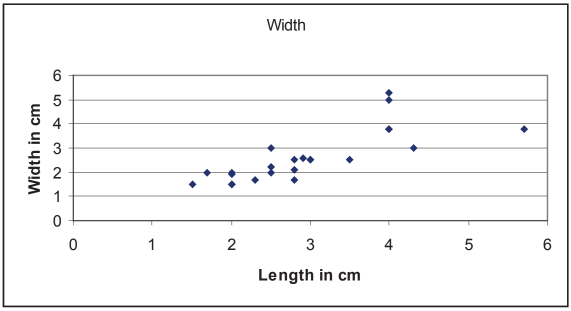


Fig. 6.51. Length/Width of core scrapers

Notches: the total number of these tools is 71 and represents 1.47 % lithic tools and 9.65% of the scrapers in this part of the rock shelter. They are predominantly made from chert (n=39) and rhyolite (n=21) that form 54.92% and 29.57% respectively. Basalt and chalcedony constitute the remaining. The number of notches with traces of heat treatment is 12. 10 of them are shaped from chert and 2 from chalcedony. Seven notches have cortical material and three of them are made of chert, but the other are made of chalcedony and rhyolite. The mean length and width of the notch is 2.69 cm and 1.83 cm respectively.

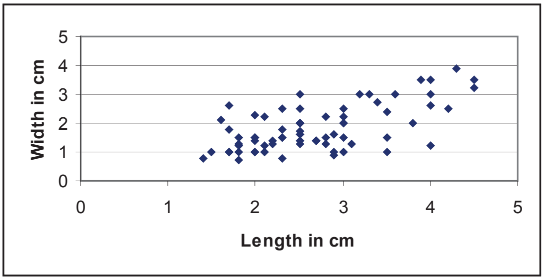


Fig. 6.52. Length/width of notches

Denticulates: There are 87 denticulate, which is 1.78% of the lithic tools excavated from the outer parts of the rock shelter. It forms 11.83% of the scrapers. The mean length and width of the denticulate is about 2.72 cm and 2.18 cm respectively. The main raw material is chert. 55 (64.36%) are from chert,19 (21.83%) rhyolite and 8 (9.19%) from chalcedony. The remaining 4 denticulates are made of basalt and quartz. There are 29 denticulates with evidence of heat treatment. Except for 2 denticulates from chalcedony and 1 from rhyolite, all the fire treated denticulates are of chert. Five tools from chalcedony, seven from chert and one from rhyolite have cortex.

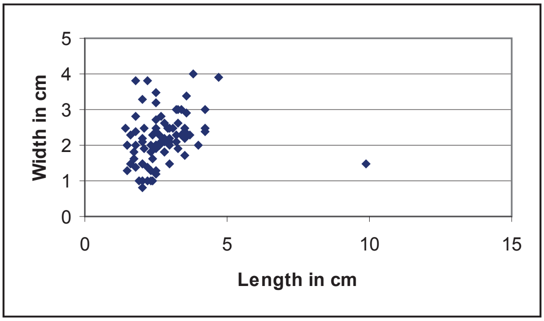


Fig. 6.53. Length/width of denticulates

6.3.7. Engraving Tools

This type of tools are few at the site in general. There are only 37 of engraving tools. This includes borers, burin and groovers. Relatively burin and borers are better represented than groovers.

Borers: these are tools with edges converging at a point with retouched from both the dorsal and ventral sides of the pointed end (Haaland 1972). These tools were excavated only from grids located. However, their total number is very few. They are 14 in sum, which account around 0.287% of the entire lithic tools unearthed from the outer grids of the rock shelter. These tools have mean length of 2.5 cm and the mean width is 1.8 cm. Almost half of the borers are from chert. The rest is made of chalcedony, basalt and rhyolite. Two borers shaped from chert show traces of heat treatment. Still two borers, one shaped from chert and the other from chalcedony have cortex.

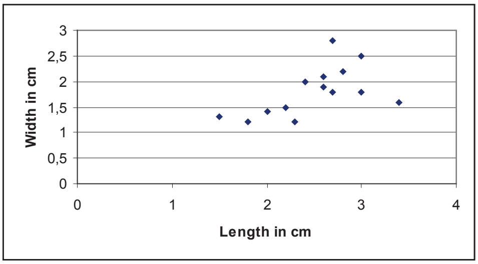


Fig. 6.54. Borers

Fig. 6.55. Length/width of borers

Burins: They are only 19 in number, 0.41% of the all lithic tools. These tools are made of chert, chalcedony and rhyolite almost in equal numbers. There is one burin made of obsidian. Two burins made from chert and chalcedony show traces of fire treatment. Only one burin shaped from chert har cortex. The mean length of these tools is 2.72 cm with mean with of 1.74 cm.

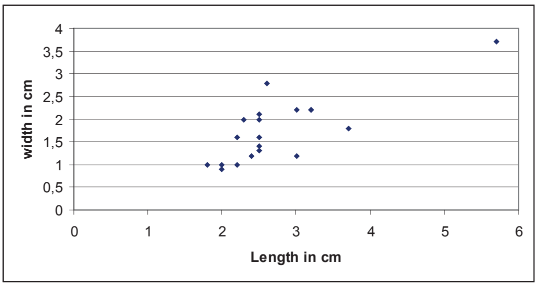


Fig. 6.56. Length/width of burins

Groovers: these are point like tools with retouch from only one face (Haaland 1993:64). They are few, only 4, which is 0.08% of all the lithic tools. Three of them are made from chert and one from rhyolite. None of these tools has traces of either heat treatment or cortical surfaces. The mean length and width of the groovers is 2.67 cm and 1.5 cm respectively.

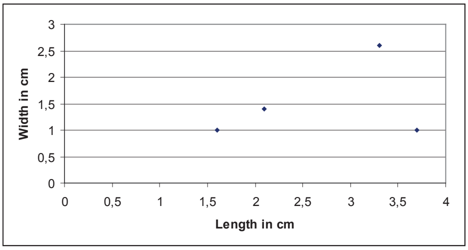


Fig. 6.57. Groover

Fig. 6.58. Length/width of groovers

6.3.8. Flake Tools

The total number of retouched flakes is 269, which is 5.51% of the whole lithic tools. Most of the flake tools are quite small in size. The mean length is about 3.07 cm with mean width of 2.13 cm. They are shaped from different types of lithic raw material such as basalt, chert, ryholite, agate, quartz, quartzite, and chalcedony. Chert represents 166 (61.94%) of the retouched flakes. Rhyolite is the second dominant raw material used which is 51(18.95%) of the retouched flakes. Chalcedony 31(11.52%), 12 tools (4.4%) made of basalt. Very limited numbers are made from quartz, quartzite and agate. 41 tools have traces of fire treatment, these are from chert (n=23) and chalcedony (n=8). 34 retouched flakes have cortical material. Most of them are made of chert (n=21). Others are shaped from chalcedony (n=9), rhyolite (n=3) and agate (n=1).

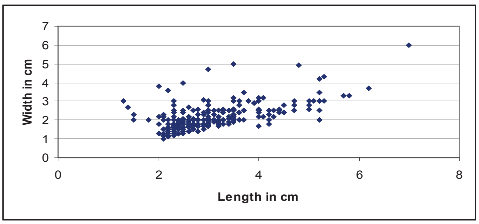


Fig. 6.59. Length/width of flake tools (retouched tools)

6.3.9. Utilized Tools: These are flakes with pronounced macro-wear along the cutting edge apparently due to utilization. These tools are listed as utilized flakes. Without actual examination of residue or trace analysis, we are not sure whether these were tools in strict sense. But experimental studies showed flake tools without clear worked edge are effective tools for butchering tasks (Walker 1978). Walker argues “if cutting effectiveness were the only criterion used by prehistoric hunters in tool selection, flakes with unmodified working edges would have been the preferred tool for many butchering tasks(ibid: 714).” Based on such insight, the tools identified as utilized flakes could have had similar or possibly other functions.

Some of these tools are very big, compared to other types of tools discussed above. The mean length and width of these tools is 3.9 cm and 2.71 cm respectively. These tools are 36 in number and form around 0.74 % of the total lithic tools outside the drip line. Most of the utilized flakes are shaped from rhyolite (n=14), chert (n=12) and chalcedony (n=6). There are few utilized flakes from basalt and quartzite. 5 utilized tools have evidence of heat treatment and 3 utilized flakes have cortical surfaces. All of them are made of chert and chalcedony.

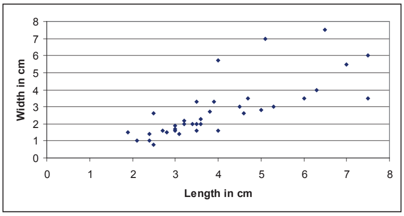


Fig. 6.60. Length/width of Utilized flake tools

6.4. Hammer Stones

The hammer stones uncovered from the site are very few. There are about seven circular or oval shaped stones. They are made from rhyolite. These tools might have been used for shaping lithic tools, processing ocher and/ or pounding vegetables and root plants. They might have also used for reshaping grinding stones. Some of the small oval shaped pebbles could be used for shaping and smoothing pottery objects. Ethnographic data suggests such stones are used for reshaping grinding stones and shaping and smoothing clay objects. In the study area, women currently utilize small circular pebbles for reshaping blunted grinding stones. Contemporary potters in the area also use small oval pebbles for shaping and smoothing ceramics (see the next chapter). Similarly, data from Fur potters in Sudan indicated the use of small hammer stones (usually water rolled) for burnishing pottery (Haaland 1981:187). Therefore, the oval shaped small pebbles found at the site might have been used for this purpose. The bigger circular stones might have functions related to pecking grinding stones or used as hummer stones. The dark oval shaped stones do also have ritual roles. Among the local people of the study area this kinds of stones are used for ritual purposes today. Generally, most of the hammer stones excavated from the site do not show traces of crushing or pecked surfaces. This may suggest that their use for pounding or processing plant foods. There are only one big and one small circular shaped stones with pecked surfaces. Such traces may suggest their use as hummer stone. It should also be noted, however, that these traces might be formed due to reshaping of grinding stones.

Fig. 6.61. Hummer/pecking stones

Fig. 6.62. Small Pebbles which could have been used for shaping and burnishing pottery

1.1.1 6.5. Lithic Raw Material

As discussed under the different category of tools, the lithic artifacts from Kuriye are made from different types of raw material. Chert and chalcedony are the most dominant lithic raw material used of which 54% is chert. It is followed by chalcedony that consists of 24% of the artifacts. Chert appears in different colors. Black, red, red brown, whitish and pinkish chert is available. Striped chert is also found. Red and red brown chert is, however, the most abundant. Cracked pinkish chert may indicate use of heat treatment. Some of the chalcedony also indicates trace of fire treatment. Rhyolite and basalt represent 14.5% and 4.8% of lithic tools respectively. Quartz, quartizite and obsidian tools are available but they are few.

Such composition of lithic tools may imply preference for certain types of raw material and/ or the availability and scarcity of raw material for tool production. The fact that most of the lithic tools are shaped from chert and chalcedony, which is fine grained and hard may suggest preference for better quality lithic raw material. As Whittaker (1994) and Andrefsky (2005) argued these types of lithic material are often considered the most preferred raw material for tool making. Artifacts from obsidian are rare. Few microlithic tools are made of obsidian, but there is no obsidian debitage. This indicates the lack of obsidian source in the surrounding region.

As I discussed in chapter three, studies on the geology and rock formation of the study area in specific details is not available so far. Therefore, it will be difficult to trace the source of the raw material precisely. During the preliminarily site survey, I observed chunks of chert, chalcedony, basalt, quartz and rhyolite near the rock shelter. The area around Gorgora has some isolated volcanic hills with wide plains traversed by small streams and gullies. Basalt and rhyoilite are available in the hills and plains around the site while chert and chalcedony are found along the edges of the lake and the streams.

Despite the abundance of rhyoilite and basalt near the site, the proportion of lithic tools from these types of raw material is limited. They are used mostly for production of large tools such as points, blade, retouched flake tools and big curved backed tools. Similarly, quartz is widely available in the eroded valley bottom some five to six km from the site. However, the amount of lithic tools made from quartz is very limited. This may likely be due to the poor quality of quartz for flaking into desired tool. Quartz and quartizite artifacts are very rare inside the drip line.

Raw Material	Total number of lithic tools	%
Agate	66	1.16
Basalt	271	4.78
Chalcedony	1374	24.23
Chert	3080	54.31
Obsidian	9	0.51
Quartz	15	0.26
Quartzite	20	0.35
Rhyolite	821	14.477
other	15	0.26

Table 6.14. Proportion of lithic tools in terms of raw material

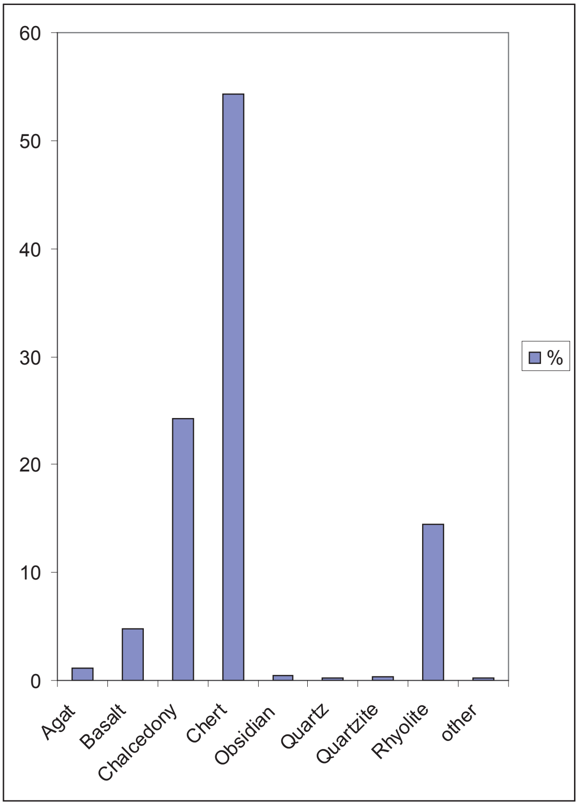


Fig. 6.63. Frequency of lithic artifacts by raw material

6.6. Debitage

As discussed earlier, the debitage excavated from the outer parts of the rock shelter are not included. However, they are very numerous than the amount excavated from the inner parts of the rock shelter.

6.6.1. Core Debitage

Cores excavated from the four grids inside rock shelter are generally small. Big cores are almost absent. Based on their relative size, I divided all the cores into two main groups: core fragments and cores. Core fragments are smaller, these are 104 and the larger ones are 108.

Two types of lithic raw material dominate the cores at the site. This is chert and chalcedony, which account 112 and 87 respectively. The remaining cores belong to rhyolite, agate, basalt and quartz. However, these are few; rhyolite 6 cores, agate 3 cores only, basalt and quartz have 2 cores each.

The core fragments or the smaller cores are also dominated by chert and chalcedony. Core fragments from rhyolite and basalt are absent. 45 of the core fragments are chert while 57 are chalcedony. Quartz and agate are represented only by one core fragment each. The bigger cores 67 are from chert, while chalcedony is 30, rhyolite 6 and basalt and agate have 2 cores each. There is only one quartz core.

Some of the cores have traces of firing or fire treatment, 95 of the cores show such traces. This may be related to heat treatment for more efficient utilization of the raw material for tool production. 49 of them are large cores while the remaining 46 are core fragments, 34 chert and 15 chalcedony cores show evidence of fire treatment. From the core fragments, 27 chert and 19 chalcedony show traces of fire treatment.

114 of the cores have cortical surfaces. 49 of them are core fragments while 65 are larger cores. From the core fragments 29 chalcedony and 20 chert have cortex. From the larger cores, 23 chalcedony, 37 chert, 2 ryholite, 1 basalt, quartz and agate have cortical surfaces.

The presence of cortex may indicate that the lithic raw material could have been brought and shaped into tools on the site, primary lithic tool flaking activities might have probably take place on the site. This may also indicate that the source of the lithic raw material may be close to the site. The absence of big cores, the lack of large amount of core debitage and the absence of cortex on some of the cores may suggest exhaustive utilization of lithic raw material. This may occur if the sources of raw material are far from the site or that types of raw material were not available in abundance (see Anderfsky 2005).

Fig. 6. 64. Core fragments

As described above, the core material excavated from the site consists of small pieces. It is thus a problem to describe their attributes and infer associated tool production techniques. However, the following brief descriptions can be outlined. 16 core fragments can be classified as microblade type, 11 are from chalcedony and 12 are from chert. There is one bipolar core fragment made of chert. Three of the big cores are identified as blade cores, two of these are of chert, and the other of agate. In addition to this, the following core attributes are inferred.

Core types	Total number
Double striking platform cores	20
Blade Cores	3
Multifacial cores	58
Opposed striking platform	8
Single striking platform cores	2
Bipolar cores	3

Table 6.15. Type and frequency of cores

In a summery, the total amount of cores at the site is very limited. Most of the cores available are from chert, chalcedony, and a few agate. Cores from other types of raw material are very rare or absent. Although there are significant amount of tools and debtiage from basalt and rhyolite, cores from these raw material are very few. In addition, most of the cores are very small in size. This indicates exhaustive utilization of lithic raw material. The highly reduced cores are mainly from chert, chalcedony, and agate. Cores with cortical surfaces are also limited. Surprisingly, there is no obsidian debitage, although there are a few obsidian microlithic tools (10 in number). This implies that there is no close obsidian source. They might also imply possible interaction or contact.

6.6.2. Chips

This includes small pieces of lithic wastes. Here I presented only the chips excavated from the inner parts of the rock shelter. The chips are dominated mainly by chert that represents 70 %, followed by chalcedony that accounts 19%. These two types of raw material account about 89% of the chips excavated from the inner grids of the rock shelter.

As indicated above and will be discussed later in more detail, the amount of chips and lithic tool frequency from chert and chalcedony is quite high. This consolidates the idea that the lithic tools excavated from the site might have been manufactured on the site. Evidence of chips with heat treatment and cortical surface is still high for these two raw material types, although the percentage of chips with such attributes is relatively small. Few chips have crushing at proximal or distal ends on the ventral face. This may imply the use of bipolar techniques of tool production. Almost all of the chips with such attribute are from the fine grained lithic raw material, chert and chalcedony. However, some of the chips mainly from chalcedony and possibly chert are on water rolled pieces. However, they account less than 1% of the total chips. This could have implication on the role of erosion or lake water regression into the site.

Fig. 6.65. Bipolar flaked pieces

Although the amount of chips from rhyolite and basalt is relatively high, chips from other raw material such as quartz, quartizite, agate and obsidian are almost none. The following table shows the frequency of chips in terms of raw material types and other attributes.

Raw Material	amount	%	Fire treated	%	Cortex	%	Water	%	Weathered	Rejuvenated flake	Bipolar	%	Pieces from cave wall
Rhyolite	559	8.66			4	0.06							12
Chert	4445	69.06	638	9.88	506	7.84	33	0.51	1		59	0.91	
Chalcedony	1236	19.15	202	3.11	270	4.18	44	0.68		1	68	1.05	
Basalt	206	3.19							2				
Agate	3	0.04	2	0.03									
unidentified	3	0.04											
TOTAL	6452		739	11.44	980	15.12	77	1.19	3	1	127	1.96	12

Table 6.16. Chips excavated inside rock shelter

6.6.3. Flake Debitage

As discussed earlier, lithic wastes with a length greater than about 2 cm are classified as flake debitage. This category includes both broken and whole pieces of flaked artifacts that do not show observable retouch and traces of utilization such as macro wear. But, it is only flake debitage excavated from the inner parts of the rock shelter is presented here.

Similar to chips, the highest proportion of flake debitage are from chert, this is 67% of the flake wastes. Unlike the chips, the second largest part belongs to rhyolite which represents 16% of the flake debitage. Chalcedony and basalt consist of 10 and 5 % of flake debitage respectively. The other types of raw material, quartz, quartizite and agate are less 1 % of the flake waste.

Some of the flakes indicate traces of fire treatment. These flakes are 403 in total, all are from chert and chalcedony. 341 of the heat treated flakes are chert while 72 of them are from chalcedony. In addition, 549 flakes have cortex. 409 are from chert and 117 chalcedony. 5 basalt, 15 rhyolite and 1 agate flakes also have some cortex.

A few rejuvenated and bipolar flakes suggest the techniques of platform preparation and the bipolar technique in lithic tool production was practiced. The amount of weathered and water rolled flakes are very limited. Some rocks possibly from the wall of the rock shelter are observed. However, they are available in the upper levels only.

The following table shows the frequency flake debitage in terms of raw material type and other attributes.

Raw Material	amount	%	Fire treated	%	Cortex	%	Water Rolled	weathered	Rejuvenated flake	Bipolar flake	%	Pieces from cave wall
Rhyolite	401	16.45			17	0.69			1			85
Chert	1637	67.14	341	13.98	409	16.8	2	2	13	49	2	
Chalcedony	262	10.75	72	2.95	117	4.79	4		1	21	0.83	
Basalt	132	5.41			5	0.20		5				
Quartz	1	0.04			1	0.04						
Quartzite	1	0.04										
Agatee	1	0.04										
other	2	0.08										
TOTAL	2438		413	16.94	549	22.5	6	7		60		

Table 6.17. Flake debitage excavated from the inner parts of the rock shelter

In conclusion, the huge amount of lithic wastes suggests lithic tool production might have taken place at the site. Significant proportions of the lithic wastes show cortical surfaces. Traces of fire treatment both on the flakes and on the cores indicate heat treatment for tool manufacturing. This further supports the assumption that lithic tool productions were perhaps employed at the site. In addition, all of the lithic wastes with marks of firing are from cryptocrystalline rocks. The fire treatment may also imply that better quality raw material might have been limited around the site. The presence of chips indicates primary or secondary lithic tool production activities at the site. The exhaustively utilized small fragments of cores may also suggest long reduction sequences in the tool production. In addition, the small core fragments may signify lithic production at the site.

	10N23E				14N23E				13N23E				12N22E				Total
	NW	SW	SE	NE	NW	SW	SE	NE	NW	SW	SE	NE	NW	SW	SE	NE	
Level																	
I						1		1									2
II		3			1		1			1	2		3	3	10	3	27
III				2	2			1		19	10		15	10	15	31	105
IV			6	2				2	2	11	3	2	9	15	6	3	61
V			3	4		1	1			2			1		1		13
VI										1		1	2				4
		3	9	8	3	2	2	4	2	34	15	3	30	28	32	37	
Total		20			11				54				127				212

Table 6.18. Distribution of the entire core assemblages from inner grids by level and quadrant

	10N23E				14N23E				13N23E				12N22E				Total
	NW	SW	SE	NE	NW	SW	SE	NE	NW	SW	SE	NE	NW	SW	SE	NE	
Level																	
I		2				4	3			1				1	10		21
II		8	3	11	9	8	1	1	2	7	5	1	8	55	116	33	268
III			12	5	5	3	2	3	3	168	58	9	95	163	179	317	1022
IV			20	10	52	7	6	4	82	234	36	41	171	157	24	51	895
V			7	10		14	9		57	29	8	4	13	5	7	8	170
VI									44	1	3	8	3			2	61
		10	42	36	66	36	21	8	188	440	110	63	290	381	336	411	2438
Total		88			131				801				1418				

Table 6.19. Distribution of flake debitages from inner grids by level and quadrant

	10N23E				14N23E				13N23E				12N22E				Total
	NW	SW	SE	NE	NW	SW	SE	NE	NW	SW	SE	NE	NW	SW	SE	NE	
Level																	
I		15			6	12	27	13		8				1	30		112
II		16	1	14	39	32	1	29	7	25	14	5	31	107	263	180	753
III		3	13	12	6	11		16	14	415	138	18	162	304	389	1032	2533
IV			21	85	97	24	14	10	116	278	57	26	575	661	115	84	2163
V			59	24		71	19		60	77	106	12	95	145	16	57	741
VI									81	14	21	1	13	9			139
		34	94	135	148	150	61	68	278	817	336	62	876	1227	813	1353	
Total		263			427				1493				4269				6452

Table 6.20. Distribution of chips from inner grids by level and quadrant

The above tables show that the distribution of the lithic debitage is generally dense in the middle part of the occupation levels. Specifically, level three and four have most finds. In terms of the horizontal distribution of the lithic debitage, two of the grids (grid 12N22E and 13N23E) have much concentration of finds. The largest share comes from grid 12N22E. Grid 14N23E and grid 10N23E generally have a limited amount of debitage. The two grids that have relatively little lithic debitage contain traces of ash and charcoal dominated soils. This may suggest that they could possibly be firing or cooking places. The presence of pits particularly in the eastern quadrants of grid 10N23E supports this claim. Although firing structures are not observed in Grid 14N23E, the dense ash layers mainly in the northern or north central parts of the grid suggest that this grid might have been cooking spot. The middle levels have highest amount of debitage. The concentration of the debitage in the lower and upper layers of the inner grids is generally sparse.

6.7. Grinding Stones

The total number of grinding stones excavated from the site is only 8 and 3 of them are broken pieces; two of them are more likely lower grinders. In addition, three of the other grinding stones, apparently upper grinders, are small. They also tend to have a more circular shape and slight depression in the center. This along with traces of pecking may suggest that they might have been used for pounding and processing vegetable foods and fruits. However, both the upper and lower grinders are very smooth. This may imply that their use for grinding small seeds such as *teff*, perhaps finger millet as well. The slight depression of such grinding stones may also imply their intensive and long utilization.

The availability of grinding stones at a particular site is often used to indicate utilization of plant foods. The type and nature of grinding stones may imply what types of crops were specifically utilized at the site. This is because different crops need appropriate coarseness, form and size of grinding stones to grind them into powder effectively. Selection of the appropriate types of grinding technology is thus very essential in dictating the amount of seeds that can be ground at a time, and to reduce time and effort as well as grain loss at grinding (Bright et al. 2002). In the region different types of crops, both large and small grain crops are available. However, the type of grinding stones used for processing these crops varies depending on the size of the grain. Thus identifying the specific types of grinding stones for each crop may be useful to trace the types of crops utilized by ancient inhabitants of a site. In this regard, useful insight may be obtained from ethnographic data.

The ethnographic data I collected in the study area and different districts in Gojjam province indicated large grains such as barley, wheat, maize and pulses are usually ground using large, heavy, and a bit porous and rough surface grinding stones. On the other hand, grinding stones (lower and upper grinders) that are very smooth, small and light are used for grinding small grains *teff* / finger millet. Therefore, in the region, the availability and frequency of grinding stones in a particular area vary according to the dominant types of crops cultivated or utilized. The first type of grinding stone is dominant in wheat and barley cultivating areas, but small and smooth surfaced grinding stones are widely available in *teff* and finger millet producing areas. In some areas where both small and large grain crops are commonly cultivated, both types of grinding stones are found even within a household. In the barley/wheat growing areas, grinding stone used for grinding small grains are absent. In areas where *teff*, finger millet, sorghum and maize are cultivated, similar type of grinding stone is used, but for *teff*, the upper grinding stone is smooth and smaller. Moreover, compared to *teff*, the upper grinding stone used for other cereals is pecked roughly. Pecking for *teff* grinding stone should be slight, otherwise, the tiny *teff* grain escapes without being ground into powder. Generally, more than other cereals, *teff* grinding stones are very smooth and slightly pecked. The main reason behind such differentiation is related primarily to the size of the grain and efficiency at grinding. In addition, *teff*, finger millet and sorghum do not need pounding material like wooden mortar and pestle (see also Abawa 2009).

Based on this ethnographic information, it is possible to suggest that the grinding stones available at Kurtiye rock shelter seemed to have been used for grinding small grain cereals(wild or domestic), such as *teff,* and possibly finger millet or sorghum. The absence of large and course grinding stones may indicate the absence of large grain cereals at least around the site. However, the very small number of grinding stones may imply limited intensity of plant food exploitation at the site. This is because the abundance of grinding stones often used to indicated intensive exploitation of plants that have implications on sedentism, increased population growth and the emergence of agriculture (see Haaland 1992). The implication of such limited number of grinding stones at Kurtiye rock shelter on the subsistence pattern and social organization of the ancient inhabitants will be discussed later.

Fig. 6.66. Grinding stones

6.8. Function of Tools

Here I shall describe the possible uses of lithic tools excavated from the site. This is inferred based on the morphology/typology of tools. However, understanding the actual function of lithic tools based on such criteria alone is difficult and our interpretation often reflects the assumed functions of tools. A single tool or tools that are typologically identical may have had multiple purposes (see Phillipson 1977c:24; Odell 1981; Andresfky 2005:201-10). Therefore, “the conventional tool typology can give only a very approximate indication of function (Phillipson 1977c:24).”

The geometric microliths might have been as tips hafted as arrow shafts. Archaeological, ethnographic, experimental studies and historical sources indicated that such types of tools were hafted as arrow tips (Haaland 1981:113-20; Clark and Prince 1978:104; Marks 1968:463). Based on experimental and archaeological studies, Yaroshevich et al. (2010) argued that geometric microliths such as crescents were used as arrow tips hafted either in transversal or oblique manner, or possibly as barbs. When they are hafted obliquely, two crescents are inserted, they then form a pointed arrow tip. Transversal arrowheads are, however, considered more efficient hunting strategy since these create wide wound and heavy blood loss on the game. Clark (1977:146) explained both the oblique and transverse styles of hafting are equally efficient and could have the same effect on the game.

The crescents collected from Kuryite might have been used as hafted arrow tips for hunting purposes. In fact, Clark and Prince (1978:103-4) proposed that geometric microliths might be utilized for processing hides, cutting fish skins, meat, or grass. In order to test whether crescents were used for harvesting plant foods, Magid (1995:63) conducted Stereo-light microscopic and Scanning electron microscope examination and use wear analysis of crescents from Sudanese archaeological sites. His study did not support such assumptions. He then suggested that crescents could have functions related to hunting. Based on the abundance of wide varieties of faunal remains at Kurtiye rock shelter, I suggest that crescents could have served as arrow tips for hunting terrestrial and aquatic games such as hippopotamus. They might have been used for processing flesh and skin of terrestrial games and aquatic animals as well. Since the site is situated in an aquatic environment, crescents could also be used for activities related to fishing. Traces of macro-wear and edge damage visible on some of the crescents may also imply that the crescents had other functions. But this has to be confirmed by thorough microscopic examination and analysis of use wear and residues.

The different varieties of non-geometric microliths, like geometric microliths, might have been used as arrow tips or barbs for game hunting. Some of the non-geometric microliths have macro-wear on the cutting edge. Such marks and finely retouched like scars on some of the microliths may also suggest use other than hunting, such as for cutting grass, shaping wooden tools or processing meat. This needs to be confirmed using micro wear and residue analysis.

Archaeological and experimental studies on fracture of microliths indicated that microliths were hafted as arrow tips or as lateral blades or as barbs (Yaroshevich et al. 2010, see also Clark 1977; Phillipson 1977c:45). Yaroshevich et al. (2010) argued that crescents and non-geometric microliths were often used as arrow tips and spears inserted in different manner. They were more efficient to utilize more intensively previously unused resources particularly within restricted areas. A growing body of evidence generally suggest the use of microlithic and microblades as projectile tips, barbs and lateral insets for hunting, but they could also have other functions such as harvesting plants(Andresfky 2005:207).

Lack of plant remains and the abundance of the faunal remains at the site may imply that both the crescents and non-geometric microliths from Kurtiye could be hunting tools suggesting a foraging and fishing ways of life. The abundance of fish remain, in the absence of bone harpoon, may suggest the use of microliths for fishing. Brandt (1982:302) proposed a similar function for geometric microliths of Lake Besaka, although he did not indicate how they were used for fishing. Similarly, Fernandez (2007) argued that in addition to hunting, narrow crescents were used for fishing. He also indicated that the narrow bi-pointed microblades might have served as fishhooks

Generally, since most of the geometric and non-geometric microliths from the site are very small in size, they would have been inserted into a shaft using adhering substance or bound with fiber. They could also be speared with poison when used for hunting. The application of poison might have made the microliths effective particularly while hunting big games. Ethnographic and historic sources about the hippopotamus hunting Woyto of Lake Tana showed that Iron tips of spears were poisoned to hunt hippopotamus (see Chapter 10). The use of poisoned metal and microlithic arrows for hunting was common in many parts of Africa until recent times. This may suggest similar practices in prehistoric times (Clark 1977; see Haaland 1993:64).

Curved backed tools could have been hafted and used for hunting, more probably big games. Tools somewhat similar to these were found from the Blue Nile and Atbara area of eastern Sudan (Fernandez 2003; Marks 1987). Large curved backed pieces on flakes and blades were also discovered from Rose Cottage Cave, South Africa (Soriano, et al. 2007). In addition to hunting, these tools might have been inserted in wooden haft and used for different domestic activities (ibid: 700). Although Marks did not specifically indicate the function of such tools, hunting mainly big games was the main activity of the Blue Nile and Atbara sites. Fernandez (2007), on the other hand, suggested that this type of tools might have been used for hunting small games.

The function of blades may be for cutting/ harvesting plant foods. This interpretation is, however, made based on evidences such as silica gloss and sheen (see Magid 1995:61; Connar 1984:183). In the absence of microscopic examination and macro plant residue analysis, it is difficult to associate blades from Kurtiye with such functions. Limited extent of retouch, few backed blades, lack of sickle blades, absence of plant remains and abundance of faunal remains at the site may imply for functions related to hunting and butchering activities. The fact that some of the blades are pointed and have backing around the proximal basis may support this assertion. Studies in southern Africa indicated that both poorly retouched and unretouched blades could have been used for hunting activities (Lambards and Parsons 2008). Blades might also have been used for skinning the games. The backed edge could serve for handling while performing such tasks or, as indicated above, could be haft area as a spear or arrow tips (see also Bordez 1971:57-65).

The function of points may be attributed to projectile tools inserted as a spears, or bows and arrows for game hunting. However, some of the elongated sharp edged, retouched and backed points might have used as cutting knives. Fisher (2010:167) described that determining the use of points may be problematic because it is likely that points may also be used as knives, drills or other sorts of implements. Similarly, Odell (1981:330) suggested that trace analysis on points indicates functions related to cutting and slicing (see also Andrefsky 2005:204 for the different functions of projectile points).

End scarpers might have been used for scraping hides or for shaping hunting tools. The conventional interpretation on the use of end scrapers is attributed to hide working or scrapping. Nevertheless, recent studies suggest that these tools could have other functions as well. They might be used for cutting and shaping wood, bone and antler as well as for boring, graving, chopping and slicing (Andrefsky 2005:205-6).

The convex scrapers might have been used for hide working. Such function of these tools is indicated in the archaeological literature as well as ethnographic sources (See Haaland 1981:81-93, Gallagher 1977).

The concave scrapers might have been used for shaping arrow shafts. Citing ethnographic examples from New Guinea, Haaland (1981:122) suggested that concave scrapers could have used for shaping tips of an arrow shaft. Since the microlithic tools, which might have been hafted, were abundant at the site, I propose a similar function of concave scrapers.

Side scrapers, as Andrefsky (2005:208) reviewed, might have used for scraping and graving. Yet, they could also be used for cutting, chopping and other purposes (ibid).

Notches could have different functions. Haaland (1981:122) and Magid (1995:77) indicated that the function of notches is unknown. Like concave scrapers, notches might have been used to shape arrow shafts. Recent study using edge-wear damage suggest that notches and denticulates could have been used for working wood, skin, antler, meat and bone (Holdaway, et al. 1996). Wadley (2005) described notches as multi-purpose tools.

Denticulates might have been used for cutting wood and reeds, or for scraping hide (Marks 1968:390), or may be multipurpose tools (Wadley 2005).

The function of burin and other engraving tools is mainly attributed to chiseling or drilling hard material, wood, bone or antler (Andresfky 2005:161). Similarly, based on trace analysis, Odell (1981) indicated that burins are engraving tools. Cited in Haaland (1981:97, 112) Wendrof et al. (1968) suggested that groovers might have been used for fishing. However, at Kurtiye rock shelter, groovers as well as other engraving tools are quite few. In view of the abundance of fish remain; their use in fishing might have been unknown at the site.

At the site, tools such as sickle blades, mortar/pestle and grinding stones indicating intensive utilization of plant foods are absent or rare. There are, however, large amount of wild fauna and fish remains. Thus, the lithic tools discussed above might have been used mainly for activities related to hunting and fishing.

Chapter Seven Pottery Material

In this chapter, I shall present the pottery material focusing on decoration, rim, and surface treatment. Ethnographic data is used to get an insight on an understanding in the interpretation of the archaeological material. The pottery material will be discussed in terms of comparative material to get an idea about regional contact and interaction. The comparison is made based on decorations.

7.1. Potsherds

Pottery is the main cultural material from the site in addition to lithic material. The rock shelter yielded 4442 fragments of pottery that weigh 34104.62 grams. 480 of the potsherds are found from grids excavated inside the drip line whereas the remaining potsherd, which accounts around 88.56% of the pot fragments are found in the outer grids of the site.

	10N23E		13N23		14N23E		12N22E	
Levels	No. of potsherds	Weight in gram	No. of potsherds	Weight in gram	No. of potsherds	Weight in gram	No. of potsherds	Weight in gram
I			2	11,41	12	126,42	15	113,92
II	9	236,1	39	544,25	61	1038,9	123	2792,28
III	6	425,5	50	626,52	14	170,03	91	986,05
IV	1	16,1	13	218,13	7	22	52	412,93
V			9	379,6	1	2	2	37,14
VI			1	11,2				
	16	**677,7**	**114**	**1791,11**	**95**	**1359,35**	**283**	**4342,32**

Table 7.1. Frequency of pottery fragments from grids inside the drip line

	13N21E		14N21E		15N21E	
Levels	No. of potsherds	Weight in gram	No. of potsherds	Weight in gram	No. of potsherds	Weight in gram
I	39	328,15	216	1953,18	129	933,1
II	85	834,15	109	794,13	99	550,07
III	55	603,2	135	751,81	105	806,28
IV	66	531	229	702,75	59	444,51
V	62	793,2	93	529,52	104	662,33
VI	31	498,61	111	471,11	182	1083,08
VII	25	93,52	63	440,73	385	2003,37
VIII	9	70,78	71	585,81	186	946,81

IX	13	135,7	35	732,45	251	1484,21
X	14	82,37			231	1211,69
XI	2	13,6			254	1592,22
XII	2	11,65			157	1195,45
XIII					204	1386,98
XIV					81	463,24
XV					42	219,23
	403	**3995,93**	**1062**	**6961,49**	**2469**	**14982,57**

Table 7.2. Frequency of pottery fragments from grids outside the drip lines

Most of the ceramic material are fragments that are undecorated or plain with few diagnostic features. Sherds with decoration are only about 257 in number, which is 5.78% of all the pottery fragments. None of the sherd fragment seems to be from the base of a pot. There is only one identifiable sherd with handle. There are few sherds that can be identified as a spout, possibly from a coffee pot, but they are found in a context near to the surface. The surface finish and color of these sherds resemble modern coffee pots. The frequency of rim sherds is also low. Their total number is 103, which is 2.31% of all the sherds.

For some of eroded sherds, it is difficult to see the decoration. Reconstructing of the type of decoration and their type is difficult because most of the potsherds are highly fragmented and material that could have been used for shaping and decorating the sherds were not found on the site. Identification and understanding of changes ovetime through examination of the attributes of ceramic material is equally challenging due to the difficulty of the stratigraphy of the site.

Despite such limitations, I tried to examine the potsherds based on decoration, rim types and shape, surface finish and temper.

7.2. Decoration

The number of decorated sherds is quite few. As stated above, they are 257. These fragments weigh 3010.76 grams. Impression is the most widely used decoration technique. 238 of potsherds have impressed decoration motifs executed in different styles. However, the most dominant types of decorations are impressed lines and rocker stamp impressions. There are other impressed motifs such as fingernail, comp impression, woven mat, and a combination of different types of impressed motifs. Sherds with fingernail impressions and woven mat impression are few while sherds with dotted impression of wavy line pattern are extremely limited. Only two small fragments of sherds apparently with wavy line motif are inferred.

In addition, there are sherds with incision, scraping and punctuation. However, only eight sherds appear to have been decorated with a scraping or scratch that seemed to be executed over most parts of the pot. There are five potsherds with incised lines. Incised decorations are executed as either simple lines or deeply incised closely spaced lines. The wavy line incised decoration motifs that are observed on two small pieces of sherds are closely spaced lines. Since these sherds are small fragment, it is very difficult to clearly attribute to wavy line motif. These sherds are, however, found from the bottom levels of the outer grids of the rock shelter. The other incised decorations form a band of straight parallel lines. Four sherds are decorated with punctuates (vees). They are made on well burnished / smoothed sherds that are found from upper levels.

Generally, mat impressions, fingernail impressions, dotted impression, perhaps dotted wavy line impression??, cord impressed and rocker stamp impressions, punctuate, simple incised and deeply incised lines, and scraped/scratched are decoration types identified on the sherd excavated from the site. There are also few crisscrossed and knobbed decoration motifs. Knobbed decoration is found only on a single sherd. Thus the three dominant types of decoration techniques are

1. Impression,

2. Incised

3. Scraped/scratched

Most of these decoration motifs show similarities to ceramic material to different areas. Such similarity in decoration motifs of the potsherds from this rock shelter to material from other areas may imply regional contact and interaction. At the end of this chapter, I will discuss this issue in a comparative perspective.

Questions related to how such decorative motifs were performed are difficult to reconstruct since tools which could have been used for such purposes are not found at the site. Nevertheless, the use of fingernail, twisted rope and mat impression can clearly be identified from the decoration motifs themselves. Furthermore, as the following pictures indicate, most of the decorations are well done.

Fig. 7.1. Dotted impressed lines

Fig. 7.2. Eroded dotted impressed lines

Fig. 7.3. Impressed lines

Fig. 7.4. A combination of dotted impressed and impressed lines, impressed lines and rocker stamp

Fig.7.5. Eroded dotted wavy line impression

Fig. 7.6. Incised lines

Fig.7.7. Deeply incised lines

Fig. 7.8. Wavy line incision and impression??

Fig. 7.9. Deep incised lines executed by combing

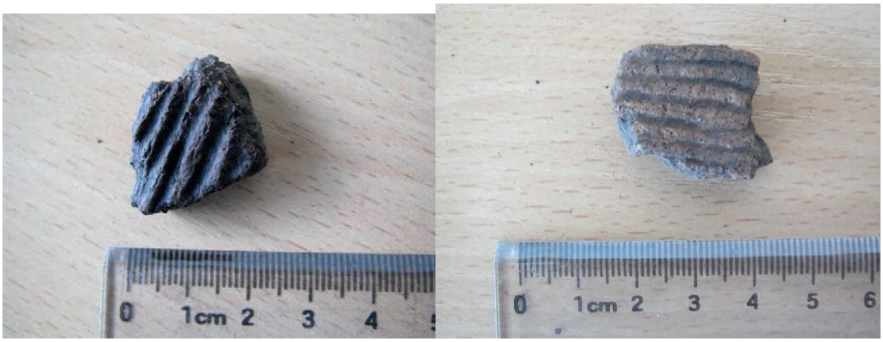


Fig. 7.10. Deep incision

Fig. 7.11. Mat impression

Fig. 7.12. Simple scraped lines

Fig.7.13. Deeply scraped/ scratched decorations

Fig. 7.14. Twist impressed

Fig. 7.15. Fingernail impression

Fig. 7.16. Rocker stamp impression

Fig. 7.17.   Rocker stamp (zigzag)

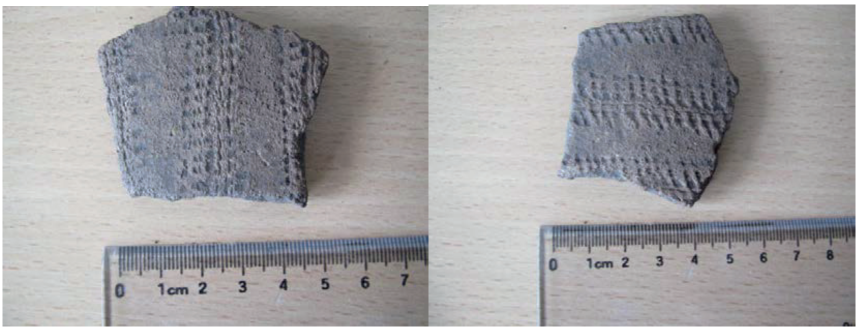


Fig. 7.18. Rocker stamp impression (zigzag impressed motif)

Fig. 7.19. Closely spaced impressed decoration

Fig. 7.20. Impressions forming different patterns (V and Square or diamond)

Fig. 7.21. Knobbed (interior) and impressed lines (exterior) Fig. 7.22. Impressed lines

Fig. 7.23. The various types of impressed decorations

Fig. 7.24. Crisscross Fig. 7.25. Vees on unburnished sherd

Fig. 7. 26. Vees on well burnished potsherds (from upper levels)

Most of the decorated sherds are found from grids located outside the drip line. Almost none of the decorative motifs identified from these parts of the rock shelter resemble any of the decorative motifs that are locally available in the contemporary ceramic tradition in the region. A striking aspect of such decoration motifs is that they are often made on sherds that are light red, red brown, yellow orange or light grey sherds. These sherds are hard, burnished or unburnished. As inferred from the small pieces of sherds, most of the decorative patterns appear as if it were executed across large parts of the pot. On a few sherds, the decoration seems to be extended to the rim. Yet, except one knobbed sherd none of them are decorated on the interior surface.

	10N23E		13N23		14N23E		12N22E	
Levels	No. of decorated	Weight	No. of decorated	Weight	No. of decorated	Weight	No. of decorated	Weight
	sherds	in gram	sherds	in gram	sherds	in gram	sherds	in gram
I								
II								
III			1	18,3			9	127,033
IV			2	44,71	1	3,61	1	5
V								
VI								
			3	**63,01**	**1**	**3,61**	**10**	**132,033**

Table 7.3. Frequency of decorated sherds inside the drip line

	13N21E		14N21E		15N21E	
Levels	No. of decorated sherds	Weight in gram	No. of decorated sherds	Weight in gram	No. of decorated sherds	Weight in gram
I			4	56,3		
II			8	67,1		
III	6	71,03	6	97,5		
IV	6	54,2	17	99,9		
V	6	333,3	14	45,52		
VI	3	25,93	15	193,32		
VII			14	192	4	45,92
VIII	1	9	28	291,8		
IX	3	18,3	17	255,6	8	68,73
X	1	3,41			22	290,4
XI	1	6,31			20	157
XII					15	137,9
XIII					25	230
XIV					4	22,77
XV					5	38,6
	27	**521,48**	**123**	**1299,04**	**103**	**991,32**

Table 7.4. Frequency of decorated sherds outside the drip line

7.3. Rim

Sherds with rims may give a clue to the types of pots available at the site. The total number of rim fragments is few. They are 103 sherds that weigh about 2987.9 grams.

	10N23E		13N23		14N23E		12N22E	
Levels	No. of Rim sherds	Weight in gram	No. of Rim sherds	Weight in gram	No. of Rim sherds	Weight in gram	No. of Rim sherds	Weight in gram
I							1	18,51
II	1	153,6	6	243,77	5	221,12	1	7,61
III	2	326	1	43,1			5	28,11
IV			4	144,3			2	10,31
V			3	315				
VI								
	3	**479,6**	**14**	**746,17**	**5**	**221,12**	**9**	**64,54**

Table 7.5. Frequency of rim sherds from grids inside the drip line

	13N21E		14N21E		15N21E	
Levels	No. of Rim sherds	Weight in gram	No. of Rim sherds	Weight in gram	No. of Rim sherds	Weight in gram
I	1	6,91	15	589,7	1	6,6
II	7	182,1	3	96	3	13,28
III	4	115,6	2	13,41	4	75,3
IV	2	40,2	3	9,8	1	63,8
V	2	29,2	4	13,46	2	51,6
VI			3	6,92	1	26,3
VII			2	12	3	13,9
VIII			1	4,7		
IX			1	2,3		
X					3	29,91
XI					2	62,5
XII					1	7,41
XIII					1	2,62
XIV						
XV						
	16	**374,01**	**34**	**748,29**	**22**	**353,22**

Table 7.6. Frequency of rims herds from grids outside the drip line

Based on their thickness, three types of rim sherds can be identified. These are sherds with very thin, medium and thick rims. Some of the rim sherds are well burnished while others are unburnished. Burnishing is visible on the three types of rim shreds. Some rim sherds are very smooth. Smoothing appears to be common to inverted thick rims. This type of rim sherds is found in the upper contexts of the site.

Similarly, in terms of shape, three types of rims can also be identified. These are everted, inverted (inturned) and straight/vertical rims. Most of the thin well burnished rim sherds are vertical or straight in shape. Some of the thin rim sherds also have slightly inverted or everted rims. Sherds with thin rims are almost all from the outer grids of the rock shelter. They are more abundant in the lower contexts. Except one grid (grid 12N 22E), they are absent in the inner grids of the rock shelter. Since the rims are very thin, slightly inverted or everted rim sherds could be fragments of small vessels.

Some of the rim sherds are decorated, in some cases; the decoration is visible along the entire fragments of the rim sherds. This is common on sherds with thin rims. This may further support the interpretation that sherds with this type of rim might have been fragments of a small serving vessel.

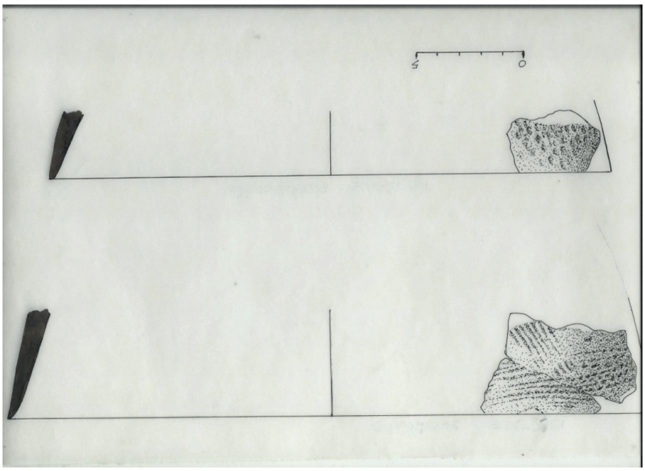
On the other hand, the medium thick rims are widely distributed and have an everted shape. Such rim sherds may belong to a cooking vessel/ water storing pots. The thick rim sherds are limited in number, and quite rare in the lower levels. The thick rim sherds that are slightly inverted may be part of a griddle. They are also very smooth, which further suggests that these are fragments of a griddle. The diameter of the rim sherd may help to suggest whether such potsherds were pots or griddles. As indicated in the drawing below, this type of sherds has a wide rim diameter. Ethnographic parallels also suggest that potsherds with thick and wide rim diameter might be part of a griddle. Rim sherds with medium diameter and thickness, on the other hand, may be from small cooking vessels or open bowls. Rim sherds with small diameter could be small pots or cup used for drinking. In the ethnographic context, the rim diameter of water storing/ small boiling pots is smaller although they are not as small as drinking cups.

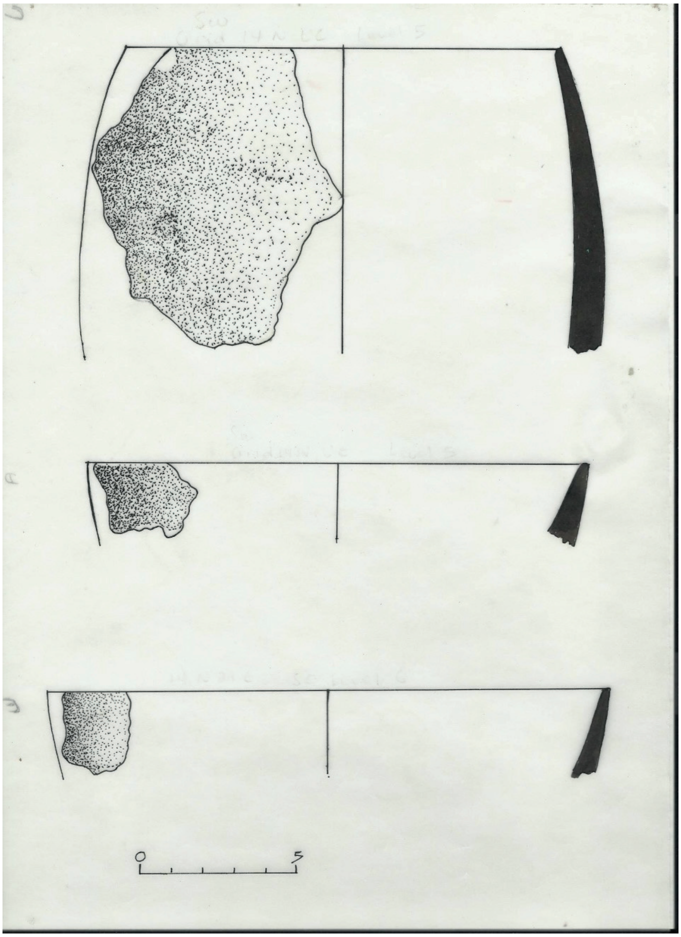
Based on inference from the rim thickness, pots with thin vertical rims might have been small serving pots while sherds with medium thick rim mainly belong to cooking /storing pots. A very thick rim belongs to griddle. Rims of a griddle are also identified based on the thickness and shape of the rim. The inverted thick rim sherds with straight flat body adjoining the rim may be identified as griddle sherds. The straight flat body of such fragments is very smooth or slipped with shiny red paint (see Fig. 7.29). Such sherds often appear in the upper levels and in grids within the drip line. Their absence in the lower levels may indicate the late emergence of the griddle technology. This is, however, very tentative explanation because the site show stratigraphic disturbance.

Based on the rims, it may be possible to suggest that the sherds from the site represent small serving vessels, cooking pots, and griddles. The absence of potsherds with handle or ear at the site supports this assertion since bigger pots may usually have handles or ears. Yet, as mentioned above, it is difficult to fully reconstruct their shape because the size of the sherds is small. Only some of the big sherds that have rims were reconstructed. This reconstruction indicates that they are from big pots and griddles (see below). However, all these are found from the upper levels and grids inside the shelter or within the drip line. Some of the pots reconstructed based on rim sherds also indicate open mouthed vessels and bowls. The drawing below shows some of the rim pattern and possible shapes of the pot.

Fig.7.27. Thin vertical/straight rims with decorations

Fig. 7.28. Slightly everted rim Fig. 7.29. Inverted thick rim, possibly griddle

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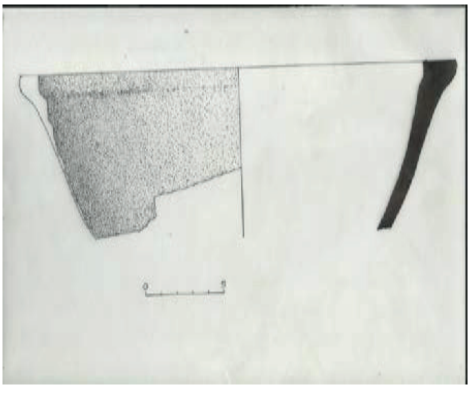

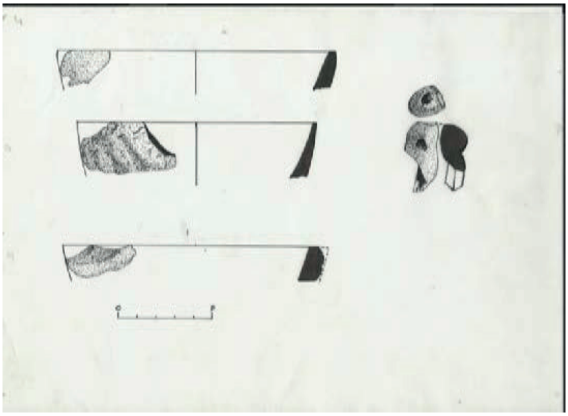

Fig. 7.30. Open mouthed Vessels/bowls

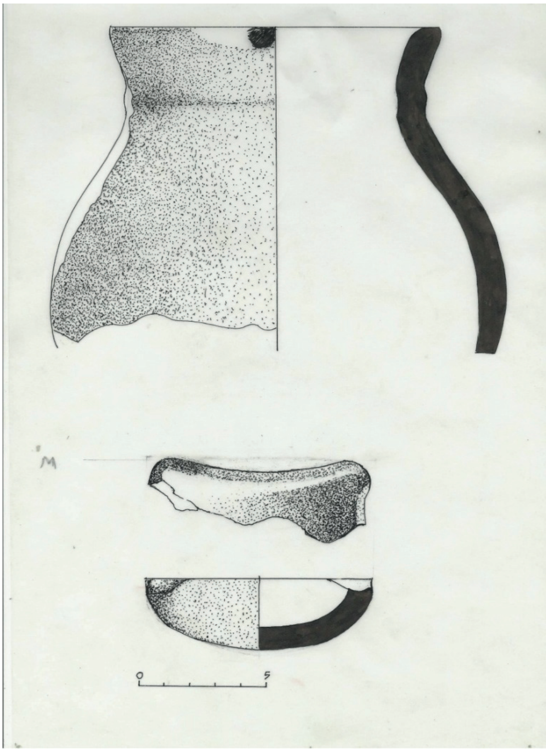

Fig. 7.31. A big pot and bowl

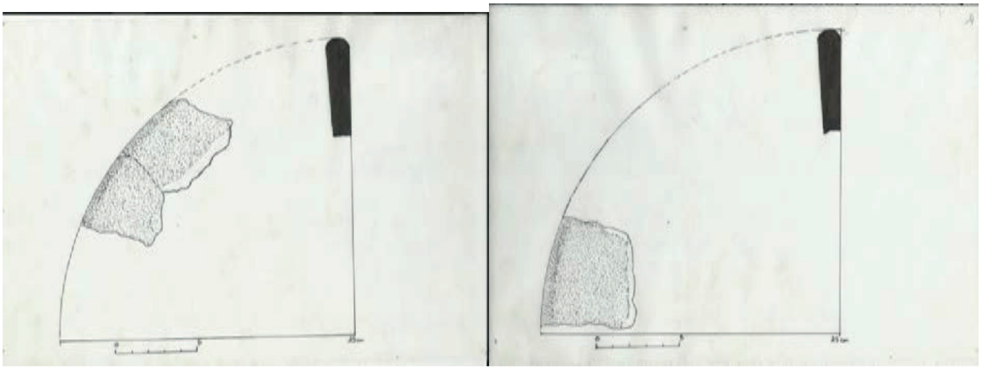

Fig. 7.32. Fragments of a griddle

The above drawings indicate open bowls/vessels, necked pot and griddles. The necked pot and griddles are very typical to contemporary pots and griddles.

7.4. Surface Finish, Color and Temper

Based on color, surface finish and overall fabric, two major ceramic traditions can be indentified from the site.

1. One major category is light red, light brown, light grey and /or reddish orange sherds with predominant inclusion of fragments of sand, quartz and mica temper. This category of sherds is mostly very hard (probably well fired) and they are often thin. Some of them are burnished while others are unburnished rough/ coarse sherds. Both the sand and quartz tempers are also clearly visible on the surfaces of such sherds. There are also dark tempered potsherds. This may be due to the use of organic matter as temper.

2. The other type of sherds is mainly red in color. They are mostly well burnished and smoothed, in some cases with red slip or paint. The interior surface is often painted and well polished. Most of these sherds are undecorated. They are also thick but fragile. Sand and mica are used as tempering material. Yet, compared to the above type of potsherds, the prevalence of sand and mica is not dominant. Some of these sherds also appear as to have a black and smooth surface while some of them have a red slip. Even some of the black or dark brown sherds, appear dominantly red in color along the broken edge of the potsherd. Such surface darkening might be due to post firing treatment. This is commonly practiced even these days. In order to make the pots smooth and to avoid percolation of water, women usually perform post firing

treatment such as burnishing and polishing on pots. Polishing is often done with oily substances. In the contemporary ceramic making tradition, the inside and upper parts of the pot or the vessel are usually treated in this way. Post firing heat treatment is applied to all pots, yet more elaborate polishing is mostly made on griddles, vessels and small pots. The potsherds excavated from the grids located along the drip line all seem to be attributed to a red pot, which probably is quite recent.

Fig.7.33. Red sherds Fig. 7.34. Spout

Thick and undecorated modern looking sherds also dominate sherds from some of the upper levels of the outer grids. However, the sherds from the lower or middle levels of the outer grids are mainly light red or light brown, grayish and reddish orange. Most of these shreds are hard and thin. Thus, they can be classified under the first category of sherds. As indicated above, these sherds have different types of decoration motifs that differ significantly from decoration types available on contemporary pots. In terms of decoration, surface finish, and color, the potsherds from the lower bottom levels of grid 12N22E (inner part of the rock shelter) are more or less similar to most of the sherds excavated from the grids outside the drip line.

Although most of the sherds from the upper levels may belong to the modern ceramic tradition, sherds from lower levels of these grids generally indicate quite different cultural traditions. Their decoration motifs are very distinct. However, some sherds that are similar to contemporary sherds appear in the lower levels of the outer grids, but they are few. Potsherds that do not resemble modern sherds are also found in the upper levels of these grids, however these are few. This distribution pattern may be due to the vertical mix up of the deposit.

Fig 7.35. Smoothed sherds from upper levels

Fig. 7. 36. Coarse sherds from lower levels

Fragments of sand, quartz, mica and possibly burnt organic substances were used as temper. Sand is the dominant temper as it is clearly visible on most of the potsherds.

The dominance of sand and mica as temper in most of the sherds may suggest local source of the tempering material which indicates that the pots might have been locally made. The soil near the site is rich with clay as well as sand and silt full of mica. The presence of red-burnt clay balls found in the excavation may give support to the production of pots around the site. The mica dominated silt might have also been deliberately included. The inclusion of these substances as temper might have contributed to the light brown/light grayish color of the potsherds excavated from the site.

All the sherds are handmade. However, since most are small fragments, it is difficult to infer types of manufacturing techniques. Fragment of a single sherd, part of the base of a pot, indicates that a coiling technique might have been used. Furthermore, burnishing or smoothing of the pot surfaces might have been executed using pebbles since a few of these are excavated at the site.

Fig. 7. 37. Fragments of fired clay

7.5. Ethnographic Parallel

To get an insight on the interpretation of the pottery material, I conducted a brief ethnographic observation and interview on contemporary potters among Amhara and Gumuz women. The use of temper and the techniques of surface finish could be relevant to be described here.

The common temper used are sand, silt and plants. Silt is widely used by the Gumuz potters as temper. They brought it from a stream or riverside, and they then sieved and mixed it with the clay. They also added pounded grassy plants or straw as temper. Pots from these types of temper mostly appear light brown/light grayish in color. The Amhara potters near Gorgora, on the other hand, use soft reddish sand as temper. They pounded and ground and mixed it with the clay. They also cleaned any fragments of sand and plant fiber from the temper. Otherwise, as they argued, this will create cracks during firing. The pots from this type of temper often appeared as reddish in color.

Fig. 7.38. Mixture of clay and silt (from Gumuz potters)


Fig. 7.39. Slit used for temper Fig. 7. 40. Pounded plant remains used as temper

Fig. 7.41. Ground red sand temper

Among all potters, burnishing/smoothing the shaped pottery is common. It is performed at leather dry stage of the shaped pottery. Smoothing or burnishing is mostly done by pebbles. After the pots are burnished and dried, they will be fired. In order to make the pots smooth and to avoid percolation of water, women usually perform post-firing treatment such as burnishing and polishing on pots. Polishing, as mentioned above, is often done with oily substances. The inside and upper parts of the pot or the vessel are usually treated in this way. Post- firing heat treatment is applied to all pots, but more elaborate polishing is mostly made on griddles, vessels and small pots.

The potters I met were making griddles. Making of pots is declining these days as they are substituted by plastic and metal utensils. As I noted from pots still available in the house, decoration on pots are, however, limited in type. Among the Amhara potters I visited, decorations are often made round the neck of the pot using two or three incised lines. The Gumuz potters too execute decoration on limited parts of the pot. Incised or dotted wavy lines decorations are often made on pots below the neck. There is interesting story among the Gumuz potter regarding pottery decoration and potters' identity. In the past, it was common to display bodily decorations of the potter on the pot she used to make. The Gumuz women used to decorate their body by making different types of scarifications mainly on their arms and face. These bodily scarifications were displayed on the pot they made. The practice of making bodily scarifications is now almost abandoned due to the influence of protestant missionary operating in the region. However, the scarifications are commonly observable among elderly women. The implication of the connection between pottery decorations with human bodily decoration may signify the symbolic association of pottery decoration with people's or group's identity. This could be useful insight in understanding symbolic meaning of such decoration motifs among past society. It may also have implications as to why certain decoration motifs are similar widely across regions.

Fig 7.42. Pebbles used for shaping and polishing

Fig. 7.43. Incised and impressed line decoration of pot of the Gumuz

Fig. 7. 44. Gumuz woman body decoration

7.6. Comparative Perspective on Pottery Decoration

As indicated, the pottery material of Kurtiye rock shelter have different types of decorations that have strong similarity with pottery from other regions. In this section, I shall discuss the decoration motifs of Kurtiye pottery comparative to other regions in order to see interregional interactions/contacts the occupants of the site might have maintained.

The types of pottery decoration used have limited similarity with pottery found on sites near to the site, such as Gorgora rock shelter of Lake Tana. Only horizontal incision and fingernail impression decoration motifs of Kurtiye pottery are similar to pottery from Gorgora rock shelter. Based on relative dating, the pottery from Gorgora is attributed to around fifth to third millennium BP (see Barnett 1999b:112). On the other hand, pottery decorations from Kurtiye rock shelter indicate strong similarity with Benishangul material of western Ethiopia. Dotted impressed motifs, rocker stamp decorations, alternate pivoting stamp and cord impressed motifs identified from Benishangul sites in particular bear strong similarity with decoration motifs of Kurtiye pottery. At Benishangul sites, the context with pottery similar to Kurtiye material was dated to 5000-4500 bp. They also appeared in a context dated to around the third millennium bp (see Fernandez et al. 2007:113,120).

Some of the decoration motifs of the Kurtiye pottery still show similarities with pottery excavated from sites in northern Ethiopia. For instance, mat impressed, comb impressed, fingernail impressions and deeply incised straight-line motifs, simple incisions and incised hatches of the Kurtiye pottery have parallels from Temben, Quiha, Gobedra and Baahti Nebait in Tigray, Agordat in Eritrea, and Lake Besaka eastern Ethiopia. The pottery from Ethiopian sites is less known. However, the earliest pottery with these decorations from Besaka was attributed to the seventh to fifth millennium BP, Temben (c.2500-1500 BC), Gobedra and Baahti Nebait (c. mid fifth millennium BC), and Agordat around 2300 BC (see Barnett 1999b:113-5; Negash 2001: 213; Finneran 2007:59-64).

Pottery decoration motifs from Kurtiye rock shelter also have strong similarities with pottery from other regions, particularly with the Sudan and Saharan material. Mat impressed, comb impressed, fingernail impressions and deeply incised straight-line motifs, simple incisions and incised hatches of the Kurtiye pottery are typical to pottery of the Soraba (5000-4000 bc) and Kassala phases (mid. 4th to end of 2nd millennium bc, and the Jebel Moran sherds (2nd millennium bc) of the Butana-Gash area of Sudan (Fattovich, et al. 1984), Rabak site south of Khartoum (c. 6000-4500 BP), and further north Shaqudad area (c.4800+/-180 to 4430+/-180 bc) (Haaland 1989, 1992, 1993; Mohammed-Ali and Khabir 2003).

As mentioned, dotted impressions or impressed lines and rocker stamp decoration motifs are the most diagnostic and abundant decoration motifs of the Kurtiye pottery. Pottery with these types of decorations also show strong similarity with pottery found at sites in central Nile Valley, Libyan Sahara, Wadi Howar (eastern Sahara/Sudan) and lake Turkana and Lowasera from east

Africa (see Haaland 1992, 1993:76; Keding 2000: Fernandez 2003, 2007; Garcea 2004:131-2). Fragments of pottery with these types of decorations were excavated at Benishangul sites of western Ethiopia. Quartz tempered rocker impressed pottery similar to central Sudanese material was also recorded at Lokabulo rock shelter of eastern equatorial region (Fernandez 2007). The temporal dimension of the appearance of pottery with these types of decorations varies across sites or regions. However, the dates generally lie between the 9th and 5th millennia BP (see Haaland 1992, 1993: Keding 2000: Fernandez 2003; Garcea 2004; Fernandez et al. 2003; Fernandez 2007). For instance, in the middle Nile/ Khartoum area, pottery with dotted impressed lines and rocker stamp impressions appeared even before c. 7000bp (Haaland 1992, 1993:72-3, see also Mohammed-Ali and Khabir 2003), in Libyan Sahara between 8870+/-100BP to 6745+/-175BP (Garcea 2004), in Wadi Howar 5000 to 4000BC (Keding 2000), and in the Blue Nile central Sudan between 8th to 5th millennia bp. The earliest evidence from Benishangul, as discussed above, seemed to be as old as 5000-4500bp (see Fernandez 2003; Fernandez et al. 2007).

Despite such wide regional similarities, pottery with incised wavy line decoration motif are absent at Kurtiye rock shelter. Pottery with this type of decoration motif had few geographic distributions in the continent. It was restricted mainly around Khartoum/central Nile Valley where its earliest evidence was found (Haaland 1989, 1992, 1995b:113-5; Mohammed-Ali and Khabir 2003; Edwards 2004:33, 2007). The very few eroded sherds apparently with dot impressed wavy line decoration (fig.7.5) of Kurtiye may be compared to dot impressed wavy line pottery recovered from other areas. Pottery with this type of decoration was discovered from sites in northeast Niger, Libyan Saharan, Khartoum and Atbara area, and Turkana in east Africa. The earliest evidence of this type of decoration from central Sahara was dated around 9500 to 9300 bp. Its occurrence in some Sudanese sites may be comparable to these sites. In east Africa, it appeared after about 8500bp (Haaland 1992; 1995b:113-5; Mohammed-Ali and Khabir 2003; Edwards 2007 see also Stewart 1989:44).

In general, except the incised wavy and dotted wavy line decoration motifs, the pottery material of Kurtiye rock shelter shows remarkable similarities with pottery recovered from different sites in the Nile Valley, Sahara, and east Africa, and in other parts of Ethiopia. The implications and importance of such similarities will be discussed later.

Chapter Eight Faunal Remains

Large amount of faunal assemblages were collected from the site. The total number of the bone fragments is 5506. These were submitted to Dr. Josephine Lesur for identification and analysis. She conducted the analysis in the national Museum of Ethiopia in February 2012. As indicated in the report, the fragments were analyzed using the comparative anatomy collection of the National Museum of Ethiopia and bibliographic references such as Boessneck (1969), Halstead et al.(2002), Walker (1985), Gentry(1978), Peters (1988), Peters et al.(1997).

Nevertheless, only about 28.37% were identified to particular species or taxa. This is due to poor preservation and the various post-depositional processes that have caused severe damage to the bone material. The acidity of the sediment caused heavy corrosion of the bone surface and acute fragmentation that resulted in a high percentage of splinters. This is evident in the size of the assemblage. More than 86% of the assemblage is less than 2 cm long indicating a very high fragmentation process. This is also due partly to the remains of small animals such as fish.

According to Lesur's report, the post-depositional processes have therefore made possible only limited bone identification, and the possibility of identifying anthropic traces, such as cut marks, being preserved. However, more than 20% of the bones show burning marks, suggesting the use of fire in the cooking processes and a quarter of the long bone fragments did present spiral-shaped fractures, characteristic of fresh bone breakages, which could be evidence of intentional breakage for marrow use. The following table and graph show the characteristics or traces of the faunal remains.

Number of Remains	5376
% unidentified	73.7
% Splinters	62.8
% Corresion	54.1
% Charred bones	22.9
% Cut marks	0
% spiral-shaped fractures	24.3

Table 8.1. Taphonomic profile for Kurtiye faunal collection: corrosion marks, cuts marks and spiral fractures (by J. Lesur)

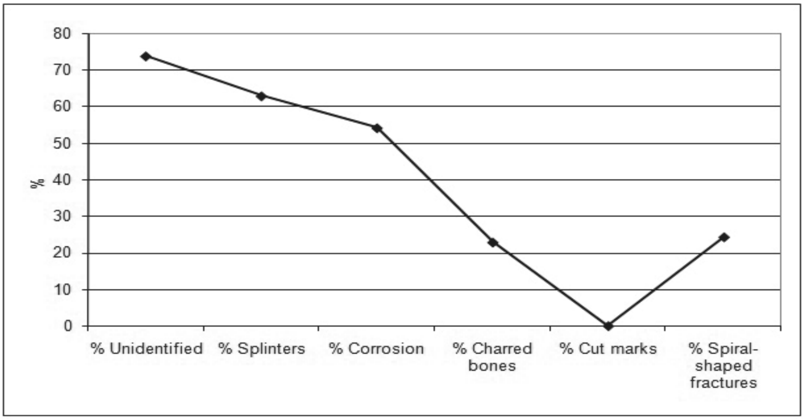

Fig. 8.1. graphic representation of the Taphonomic profile for Kurtiye faunal collection: corrosion marks, cuts marks and spiral fractures (by J. Lesur)

The faunal spectrum shows a clear predominance of fish, such as catfish and tilapia. It also includes several taxa of wild bovids such as Alcelaphine, Grant's gazelle as well as other bovids that could not be identified specifically (Redunca sp., Tragelaphus sp.). There are reptiles (crocodile and snake), hippopotamus, hare, small carnivores, rodents and birds. The last three taxa could not be specifically identified due to the lack of differential criteria from the bone fragments. Remains of livestock are scarce. There are only one fragment of cattle and one caprine. The table below indicates the amount and type of faunal assemblage recovered from the site.

Type	Inside dripline		Outside dripline		Entire Grids	
	Amount	%	Amount	%	Amount	%
Human	70	1.913	59	3.192	129	2.342
Hippopotamus	21	0. 574	1	0. 054	22	0. 399
Cattle			1	0. 054	1	0. 018
Large bovid	2	0. 054	32	1. 731	34	0. 617
Alcelaphine	7	0. 191			7	0. 127
Redunca Sp.	1	0. 027			1	0. 018
Tragelaphus sp.	1	0. 027			1	0. 018
Grant's gazelle	5	0. 136			5	0. 090
Sheep / goat	1	0. 027			1	0. 018
Medium-sized bovid	25	0. 683	1	0. 054	26	0. 472
Dorcas gazelle	18	0. 492			18	0. 326
Small-sized bovid	9	0. 246			9	0. 163
Bovid Unidentified	32	0. 874	147	7. 594	179	3. 250
Small carnivore	2	0. 054	6		8	0. 145
Hare	11	0. 300	1	0. 054	12	0. 217
Rodent	61	1. 667			61	1.107

Bird	36	0. 984			36	0. 653
Crocodile	1	0. 027	1	0. 054	2	0. 036
snake			1	0. 054	1	0. 018
Catfish	705	19. 27	31	1. 677	736	13. 37
Tilapia	136	3. 717	3	0. 162	139	2. 524
Fish Unidentified	107	2. 925	2	0. 108	109	1. 979
Shell	6	0. 164			6	0. 108
Unidentified	2401	65. 636	1562	84.52	3963	71. 97
Total	**3658**		**1848**		**5506**	

Table 8.2. Total faunal assemblage at the site

As the following table indicates, catfish is the dominant faunal remains identified to specific taxa. There are also large amount of tilapia and unidentified bovid remains. They represent 47.67%, 11.06% and 9.0 % respectively. There are significant proportions of human skeletal remains (8.36%) and unidentified fish (7.0%) as well.

Type	Inside rock shelter		Along rockshelter		Total	
	Amount	%	Amount		Amount	%
Human	70	5.568	59	20.629	129	8. 360
Hippopotamus	21	1.670	1	0. 349	22	1. 425
Cattle			1	0. 349	1	0. 064
Large Bovid	2	0. 159	32	11.188	34	2. 203
Alcelaphine	7	0. 556			7	0. 453
Redunca Sp.	1	0. 079			1	0. 064
Tragelaphus sp.	1	0. 079			1	0. 064
Grant's gazelle	5	0. 397			5	0.324
Sheep / goat	1	0. 079			1	0. 064
Medium-sized bovid	25	1. 988	1	0. 349	26	1. 685
Dorcas gazelle	18	1. 431			18	1.166
Small-sized bovid	9	0. 715			9	0. 582
Bovid Unidentified	32	2. 545	147	51.398	179	11.600
Small carnivore	2	0. 159	6	2. 097	8	0. 518
Hare	11	0. 875	1	0. 349	12	0. 777
Rodent	61	4. 852			61	3. 953
Bird	36	2. 863			36	2. 333
Crocodile	1	0. 079	1	0. 349	2	0. 29
snake			1	0. 349	1	0. 064
Catfish	705	56.085	31	10.839	736	47.67
Tilapia	136	10.819	3	1. 048	139	9. 008
Fish unidentified	107	8. 512	2	0. 699	109	7. 064
Shell	6	0. 477			6	0. 388
Total	**1257**		**286**			1543

Table 8.3. Amount of faunal assemblage identified to specific species or taxa

Such pattern in the frequency and type of the faunal remains has important implication for understanding the subsistence base of the people inhabiting the rock shelter. The above table suggests the main sources of diet were obtained from fish. Excluding the human remains, fish generally accounts more than about 69.5 % of the fauna. Bovid (identified and unidentified) which is about 17.5% seem to have been another sources of diet. Other wild fauna identified by species are generally represented by limited amount. However, it suggests that different types of wild animals, both aquatic and terrestrial, and fish were the main subsistence. Generally, remains of the aquatic fauna are by far dominant. Compared to terrestrial animal, the aquatic fauna represent more than 71% of the faunal remains, which clearly implies the dominancy of the aquatic resources in the diet. The high percentage of fish remains indicates that fishing was the main resource exploited. Remains of crocodile and hippopotamus recovered at the site, though they are few in amount, can still imply the importance of aquatic resources in the subsistence of the inhabitants of the site. The rest of the identified wild species (Alcelaphini, Dorcas gazelle, Hare) as Lesur suggests are characteristic of grassy savannah that must have developed near the site. Low percentage of the terrestrial animals, compared to the aquatic animal remains, may imply that their subsistence role could probably be minor.

As Lesur writes in the report, the sparse rodent remains can be considered intrusive. The absence of any marks or breakages and the “fresh” aspect of their bone suggest subsequent intrusion. There are also significant amount of rodents in the faunal assemblage, which may also consolidates the assumption that burrowing activity might have been one of the factors that caused the stratigraphic disturbance at the site.

Furthermore, as the above tables show, inside the rock shelter there are relatively large amounts of faunal assemblages as well as more variety of species. However, this may be due to post depositional and preservation process, as this part of the grid tends to show occupation to the more recent times. This is evident in the radiocarbon dates from this part of the rock shelter, which is generally young as compared to radiocarbon dates from grids outside the drip line.

As mentioned, domestic animals, cattle and caprine, are represented only by a single tooth sample from each. They also appear to be relatively recent. The cattle tooth is recovered from the lower level while caprine was found in the middle lower context of the grid within the drip line. The cattle tooth is dated to Cal AD 180 to 190(Cal BP 1770 to 1760) and Cal AD 210 to 390 (Cal BP 1740 to 1560) (sample number Beta-326333). The context containing the caprine tooth is dated to the middle of the second millennium AD. It seems that the inhabitants of

Kurtiye rock shelter would have acquired domestic animals quiet late. The absence or the very limited amount of domestic fauna at the site is thus striking. This is intriguing particularly in view of evidence indicating older occupations at the site. Lesur commented that some sites in northern Ethiopian highlands indicate the presence of cattle at the beginning of the second millennium BC. Thus, the inhabitants of Kurtiye might probably have adopted domestic stock probably earlier than the first millennium AD (see Appendix I). The nature of the site, being a rock shelter, may account for the absence of domestic species at Kurtiye because occupations in such sites tend to be more seasonal. Other open sites in the region may offer evidence of domestic animal probably older than the evidence at Kurtiye in the future. Yet, with available data it seems difficult to attribute the absence of domestic stock at the site to taphonomic or preservation problems or the nature of the site. Abundant remains of wild animals including smaller ones such as fish and evidence of older occupation at the site may still signify the importance of subsistence based on wild resources, primarily aquatic species.

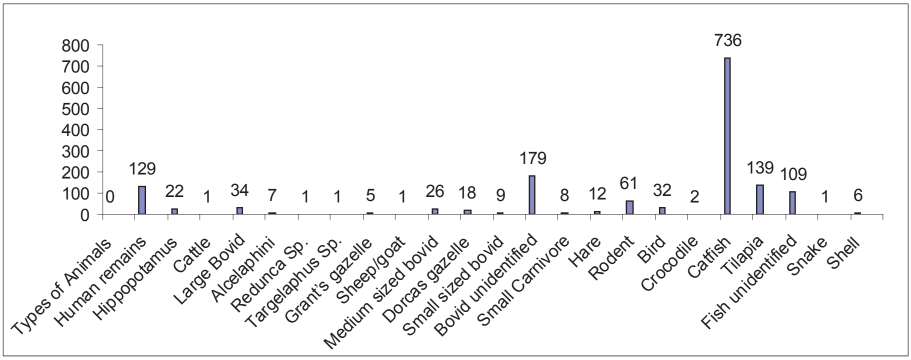

Fig. 8.2. Graphic representation of faunal remains identified to specific type or taxa.

Due to the stratigraphic problems, analyzing the faunal remains and the nature of subsistence and changing pattern in the exploitation of faunal resources overtime is quite difficult. Although such identification is problematic, I have presented the distribution of the finds according to their arbitrary levels in each grid, and their context outside and inside the drip line (see fig 8.2 and 8.3). In the inner grids of the rock shelter (which seems less disturbed), level by level analysis suggests that fish tends to be the dominant faunal remains across all levels. This implies the importance of fish in the subsistence of inhabitants of the site even in later times. The variety of species and concentration of the faunal remains also seemed higher in the middle parts of the occupation sequences. On the other hand, both the species composition and amount of faunal remains in the outer parts of the rock shelter seem relatively limited. This may be due to preservation problems and post depositional activities. Its location outside the drip line could have significantly affected the preservation of the faunal remains. The use of separate space such as for cooking and consumption or other domestic activities may also contribute to these discrepancies.

Inside dripline	Level	*Human*	*Hippopotamus*	*Large Bovid*	*Alcelaphini*	*Sheep/goat*	*Redicuna sp.*	*Tragelaphus sp.*	*Grant's gazelle*	*bovid*	*Dorcas gazelle*	*bovid*	*Unidentified*	*Rodent*	*Small carnivore*	*Hare*	*Bird*	*Crocodile*	*Catfish*	*Tilapia*	*shell*	*Unidentified*	*Unidentified*	Total	%
	1		*1*											19					*2*		*1*		*93*	116	3,16
	2		*6*		*3*					*2*			*8*	33			*22*		*51*	*17*	*5*	*17*	*375*	539	14,7
	3		*11*	*2*	*3*		*1*		*5*	*11*	*17*	*9*	*11*	6	*1*	*11*	*10*	*1*	*361*	*38*		*32*	*1274*	1804	49,2
	4		2			1		5	1	5	1		8	3				2	183	58		48	446	763	20,8
	5	70			1			1		2			4		1		1		79	14		25	144	342	9,32
	6		1														1		21	9		2	68	102	2,78
Total		70	21	2	7	1	1	6	6	20	18	9	31	61	2	11	34	3	697	136	6	124	2400	3666	

Table 8.4. Distribution of the faunal remains within the drip line in the arbitrary levels

Grid	Level	Quadrant	Human	Hippopotamus	Large Bovid	Alcelaphini	Redunca sp.	Tragelaphus sp.	Grant's gazelle	Sheep / goat	Medium-sized bovid	Dorcas gazelle	Small-sized bovid	Bovid Unidentified	Small carnivore	Hare	Rodent	Bird	Crocodile	Catfish	Tilapia	Fish Unidentified	Shell	Unidentified	Total
10N 23E	1	SW		1																					1
	2	NE				3												5						7	15
		SW																3						24	27
		SE																3		2				12	17
	3	NW		1																					1
		NE																3						12	15

		SW																		2				2	4
	4	NE									1							2						2	5
	5	SE																		1					1
12N 22E	1	SW																						1	1
		SE																						33	33
	2	NW		2																1				10	13
		NE									1			1						8				43	53
		SW		2										3						2				54	61
		SE		2							1			4				1		17	1			145	171
	3	NW												1										7	8
		NE		4					5		4	16		7		11		2		203		15		636	903
		SW		2	1						2									8				104	117
		SE		2	1	1					3	1	9		1			3	1	29				297	348
	4	NW									2			5						4				60	71
		NE		1							2									12				83	98
		SW												3						1				74	78
		SE									1	1								3				16	21
	5	NW	20																					6	26
		NE	40					1							1					5				20	67
		SW												3										18	21
		SE	10								1									3				8	22
13N 23E	1	SW															1			2				15	18
		SE																						8	8
	2	NW																						5	5
		NE																						5	5
		SW															1								1
		SE																						4	4
	3	NW									1						2	1		2				17	23
		NE		1										3						4				12	20
		SW		1			1											1		38	10	7		60	118
		SE																		6				44	50
	4	NW									2									31	16	10		49	108
		NE									1			1						3	1			18	24
		SW		1																10				16	27
		SE																		3				13	16
	5	NW				1								1				1		24	14	6		44	91
		NE																						7	7
		SW																		2				5	7
		SE																						9	9
	6	NW		1														1		21	9	2		59	93
		SW																						5	5
		SE																						4	4
14N 23E	1	NW																		1					1
		NE															4							4	8
		SW															7			3			1	15	26
		SE															7			2				16	25
	2	NW															11			7	5			15	38
		NE															15	3		5	2		2	27	54
		SW															6	3		5	5		2	13	34
		SE																4		4	4		1	11	24
	3	NW				2					1						4			42	27	6		52	134
		NE																		14	1	4		22	41
		SE																		15				11	26
	4	NW																		51	19	9		28	107

		NE																		10		2		5	17
		SW								1	1						3			46	22	16		73	162
		SE																		9		11		9	29
	5	SW																		30		8		16	54
		SE									1									14		11		11	37
Total			70	21	2	7	1	1	5	1	25	18	9	32	2	11	61	36	1	705	136	107	6	2401	3658

Table 8.5. Distribution of faunal remains inside rock shelter by grids, squares and levels

Grid	Level	Quadrant	Human	Hippopotamus	Cattle	Large Bovid	Medium-sized bovid	Bovid Unidentified	Small carnivore	Hare	Crocodile	Snake	Catfish	Tilapia	Fish Unidentified	***Unidentified***	**Total**
13N21E	1	SE				2		8				1				*4*	**15**
	2	NE						2								*2*	**4**
		SE						13								*9*	**22**
	3	NW						2								*5*	**7**
		SW						19								*21*	**40**
		SE														*13*	**13**
	4	NW														*4*	**4**
		NE														*5*	**5**
		SW	8					12					2			*30*	**52**
		SE														*13*	**13**
	5	NW														*18*	**18**
		SW						8					4			*30*	**42**
		SE														*4*	**4**
	6	NW											1			*10*	**11**
		SW											1			*12*	**13**
	7	NW											1			*19*	**20**
		SW														*15*	**15**
	8	NW														*8*	**8**
		NE														*2*	**2**
	9	NW				4										*5*	**9**
		NE														*1*	**1**
		SW											1			*3*	**4**
		SE														*1*	**1**
	10	NW														*5*	**5**
		NE														*4*	**4**
		SW														*1*	**1**
		SE														*2*	**2**
	11	NW														*4*	**4**
14N21E	1	SW														*2*	**2**
		SE						2									**2**
	2	SW						2								*6*	**8**
		SE						1								*3*	**4**
	3	NE														*11*	**11**
		SW						2								*8*	**10**
	4	NW						1								*6*	**7**

		NE						11								*20*	**31**
		SW						3								*15*	**18**
		SE														*7*	**7**
	5	NW						6								*7*	**13**
		SW						4								*15*	**19**
	5A	NE						2								*9*	**11**
		SE														*1*	**1**
	5B	NE						6								*2*	**8**
	6	NW														*5*	**5**
		NE											1			*11*	**12**
		SW														*10*	**10**
		SE											3			*15*	**18**
	7	NW														*4*	**4**
		SW								1						*4*	**5**
	8	NW														*3*	**3**
		NE														*3*	**3**
		SW											1			*10*	**11**
	9	NW														*14*	**14**
	10	NW														*6*	**6**
15N21E	1	NW														*2*	**2**
		NE													2	*3*	**5**
	2	NW		1													**1**
		SW														*2*	**2**
		SE														*7*	**7**
	3	NW														*3*	**3**
		NE														*3*	**3**
		SE												1		*10*	**11**
	4	NW														*4*	**4**
		NE														*4*	**4**
		SE						1						2		*38*	**41**
	5	NE														*24*	**24**
		SW														*8*	**8**
		SE						3								*39*	**42**
	6	NW						1					1			*4*	**6**
		NE						1					1			*59*	**61**
		SW						7								*92*	**99**
	7	NW														*9*	**9**
		NE	40		1		1						3			*79*	**124**
		SW						1	6							*18*	**25**
		SE														*34*	**34**
	8	NW														*7*	**7**
		NE	11					6			1		3			*68*	**89**
		SW						6								*20*	**26**
		SE											1			*20*	**21**
	9	NW						6					1			*13*	**20**
		NE				5		1								*60*	**66**
		SW						1								*17*	**18**
		SE														*14*	**14**
	10	NW														*8*	**8**
		NE				7										*30*	**37**
		SW														*5*	**5**
		SE						2					1			*15*	**18**

	11	NW						5								*31*	**36**
		NE														*33*	**33**
		SW											3			*18*	**21**
		SE											1			*23*	**24**
	12	NW				10										*14*	**24**
		NE														*34*	**34**
		SW														*11*	**11**
		SE														*10*	**10**
	13	NW				4										*35*	**39**
		NE											1			*22*	**23**
		SW														*50*	**50**
		SE														*42*	**42**
	14	NW														*10*	**10**
		NE														*17*	**17**
		SW														*3*	**3**
		SE														*6*	**6**
	15	NW														*12*	**12**
		NE						2								*19*	**21**
		SW														*1*	**1**
		SE														*5*	**5**
Total			**59**	**1**	**1**	**32**	**1**	**147**	**6**	**1**	**1**	**1**	**31**	**3**	**2**	***1562***	**1848**

Table 8.6. Distribution of Faunal assemblage outside the rock shelter by grid , square and level

Fig. 8.3. Lower molar of cattle (Photo by J. Lesur)

Fig.8.4. Lower molar of Alcelaphini (Photo by J.Lesur)

Fig. 8.5. Bone fragment of hippopotamus (Photo by J. Lesur)

Fig .8.6. Human teeth

Chapter Nine   Plant Remains

Few botanical remains were collected through dry sieving and simple flotation techniques. Some of these remains are hard and large while others look small and soft seeds. These remains were sent to department of plant science at Addis Ababa University for identification and analysis. Nevertheless, none of them could be identified to specific taxes or types. Professor Sebsibe Demissew suggested that the tiny seeds might be attributed to wild grass family or to the family of amarantea. It is a wild plant collected and utilized during food scarcity or in times of drought (see fig 9.1). Dorian Fuller examined some of the small soft seed like substances and he suggested that they are more likely insect larva eggs and could be more recent. He only identified one seed charred "Hibiscus sp (family Malvaceae). The larger seeds were sent to Anwar Abdul Magid. He identified them as dicotyledons (belonging to the dicotyledoneae) (see fig 9.2). It is difficult to identify them to specific species (Magid, personal communication).

The absence of crop remains may tentatively imply the possible late emergence of agriculture in the region. Coupled with the presence of very limited number of grinding stones, the absence of crop remains may suggest that the site occupants were less dependent on plant resources. However, due to preservation problem and limitation of recovering plant remains, it is difficult to conclude that plants had represented only small part of subsistence of the inhabitants of the site. Peters (1995:211) indicated "recently abandoned Bushman camp sites show almost no trace of vegetable remains, although it is known that plant food comprises over 60% of the actual Bushman diet." Tiny cereals such as *teff* in particular are more difficult to find through excavation. The isotope analysis on two human teeth fossil dated to about 5600 BP indicated utilization of C4 plants. These could be crops such as *teff*, finger millet and sorghum as well as other tropical plants (D' Andrea, personal communication). Whether these were wild or domestic crops needs to be investigated in the future. Undertaking extensive archaeological study is also demanding to better understand the prehistoric subsistence in the area.

Fig. 9.1. Small seed like remains

Fig. 9.2. Plant remains collected through dry and wet screening

Chapter Ten Lake Tana and Its People: Ethnography of Aquatic Adaptation

10.1. Background: The Historical Context

Situated in Northwest highlands, Lake Tana is the biggest lake in Ethiopia. It is located on the border between Gonder and Gojjam provinces of the Amhara National Regional State of Ethiopia. The Amhara and Woyto ethnic groups currently inhabit the shore of the lake and its environs. The Woyto settlement is entirely confined to the area surrounding the Lake. The Amhara ethnic group occupies wider parts of the region as well as around the lake. The Bête Israel lived mainly to north and northwest of the Lake before their exile to Israel in last few decades (see Tamrat 1972:65-6; Crummey 2000:17-20 Lesau 1951 for their recent settlement in Gonder). Leslau (1951: xx-xxi) suggested that the Bête Israel might be Cushitic in origin.

In chapter three, I presented the general background about the people and historical setting of Northwest Ethiopia. I have also indicated that, people belonging to the sub branches of Afro-Asiatic and Nilo-Saharan major linguistic families are thought to be among the ancient inhabitants of the study area. This reconstruction is made mainly on the basis of linguistic evidence (see also Dombrowski 1971:65-70; Tamrat 1972).

In this section, I will focus on the Amhara and Woyto people (recently called Negede Woyto). I will also describe the Bête Israel since they were one of the ancient people in this region (Leslau 1951: ix, xx, xxi; Quirin 1979, 1998; Crummey 2000:29; Henze 2000:53-56). Understanding the peopling, subsistence and settlement patterns of this particular area in the historic period may give information on the culture-history of the region in the earlier periods.

Nevertheless, written account regarding ancient settlements around Lake Tana region as well as the socio-economic and cultural life of the people is very scarce. Historical description on the early history of the region is often stated in terms of civilizations and states that appeared earlier in northern Ethiopia. Thus, the written account went back only to the period when states in the north declined, the power center eventually moved to the south and Christianity expanded to the region. The available historical sources indicate that place names and ethnic groups of this area are cited mainly after the expansion of the medieval Christian state to the region. The focus on such sources is about the nature of interaction between the expanding state and the local population, spread and expansion of orthodox Christianity, power struggles and conflicts over resources, mainly land (see Leslau 1951; Tamrat 1972; Quirin 1998; Crummey 2000; Henze 2000). Crummey (2000:1) described although the last half century saw growing body of scholarly literature about the country, only few themes are treated in depth. We have very limited knowledge particularly about the people, their subsistence and culture.

Before the medieval period, only few descriptions regarding ancient contacts between Aksum and the Blue Nile further south are available. According to such sources, from areas beyond the Blue Nile, items such as gold were brought to Aksum. The most commonly cited place is Sasu, which may probably be located in western Ethiopia close to the Ethio-Sudan border. Such contacts went back at least to the sixth century AD (Tamrat 1972:26; Henze 2000:29-30). Except such description, we lack written documents about the Lake Tana region in particular and for the entire region in general (see also Dombrowski 1971.72-5).

The only available evidence is oral traditions and legends, which narrates the importance of Lake Tana area in the ancient history of Ethiopia, the legends of Queen Sheba and king Solomon of Israel, early Christianity and other legends related to these themes. According to such sources, during their flight to Ethiopia from Jerusalem, king Minilik I and the Queen of Sheba visited and stayed in the monastery of Lake Tana some time before they set for Aksum. The Ark of the Covenant was kept there for 600 years before it was finally taken to Aksum Tsion. Still the ledged claims that during her flight from the deserts of Egypt,Virgin Mary visited the Lake Tana area (Dombrowski 1971:70-3; Tamrat 1972; Henze 2000:72-3). The tradition also claims that Frumentius, who introduced Christianity to Ethiopia, visited the monastery. He introduced Christianity to the region where ancient Jewish rites were practiced over a long time (ibid). However, according to historians the establishment of monasteries in Lake Tana area did not take place before late twelfth century AD. In those traditions, we also lack detailed information about the ancient peoples of the area (ibid, Tamrat 1988, 1994). The lack of historical sources thus limits reconstruction of life ways of the ancient people and their culture in detail.

In the following section, I will describe about the medieval times for which we have detailed written account about the Lake Tana region. These sources may be important to assess the people who inhabited the region at least in this period. It may also be useful to see changes and continuities in culture, and to explore the historic processes and interactions developed following the spread and expansion of the Christian state in the region. It may be useful to understand how these processes shaped life ways around Lake Tana.

Following the decline of the Aksumite state in the seventh century AD, the power centre retreated southward. Eventually around mid twelfth century AD, a new Dynasty, the Zagwe was established in Lasta area, present day Wollo province (Tamrat 1972:53-4; Zewde 1991:8). The late thirteen, fourteenth and fifteenth centuries saw the expansion of the state from its narrow center around south Wollo and north Shewa to Lake Tana area and other parts of Ethiopia. In Gojjam and around Lake Tana area, majority of Cushitic speaking populations were converted to Christianity and became Semitic speaking. The same historic process had also resulted in the emergence of Semitic speaking Christian communities across vast portion of Gonder. To cite Crummey (2000:21):

> The new dynasty was an Amhara dynasty. *Lesana Negus*, “the Kings tongue,” was Amharic. Although the dynasty ruled over a multi–ethnic empire, one of its most lasting effects was the spread of Amharic and of Amhara identity and customs. Parallel, often separate, processes of military conquest and monastic evangelization lastingly implanted both the Christian religion and the Amharic language in the large provinces between the Takkaze and the Abay and the Lake Tana basin. The result was the emergence of Christian, Amhara provinces of Semen, Bagemeder, and Gojjam.

The Lake Tana area was considered the focal point for the territorial expansion of the dynasty and spread of Orthodox Christianity to wider parts of the region. Christian missionaries first arrived around the southern end of the lake where they established the earliest churches and foundations for the state during the reign of Amde Tsion (1314-1344). Both Amde Tsion and successive Christian kings then conducted military raids and conquests over the vast regions of Gojjam and Gonder south and north of Lake Tana. The Agew of Gojjam and the Bête Israel of Gonder were the main targets of conquest and evangelization. Except the lake region, the local people strongly resisted the conquests and evangelizations. The resistance was so strong from the Bête Israel and the Agew far to south of the lake (Tamrat 1972:189-199).

The earliest phases of this expansion eventually strengthened the state power in the nearby districts of south, and immediate north and east of Lake Tana. The Bête Israel who inhabited vast regions of Gonder, opposed and resisted against the church and the state (Tamrat 1972: 192, Quirin 1979). The campaign pushed their frontier further north to the mountainous districts of Gonder and the Bête Israel gradually lost their land and identity. In a decree, it was issued that “He who is baptized in the Christian religion, may inherit the land of his father; otherwise let him be a ‘Falasha’. Since then, the house of Israeli have been called ‘Falasha’ (=exiles)

(Tamrat 1972:199-201; Quirin 1979:238; 1998:201).” I will discuss later, how such processes led to the formation of the Bête Israel as occupational caste group.

Further south in eastern and central Gojjam, Christianization and evangelization started in late fourteenth and early fifteenth centuries (Tamrat 1972:201). Following the conquest of the region, many churches and monasteries were built in Gonder and Gojjam. All these processes were accompanied by settlement of certain Semitic speaking Amhara from Wollo and Shewa (Ibid; Quirin 1998; Henze 2001:73-6). This eventually made the region to be “the mainstay of the country’s Semitic Christian culture (Crummey 2001:20).” However, isolated Agew and Bête Israel communities survived in the area. Other minority ethnic groups such as the Woyto and the Kemant Agew, and the Shinasha and other Nilotic people survived until these days (Zewde 1991:5; Taddesse 1994). From these historical accounts, it is possible to infer that people belonging to Cushitic speaking family had inhabited the Lake Tana and surrounding area at least before the early medieval times.

10.2. Ethnic Minorities and Caste Formation around Lake Tana

In this section, I will present the ethnic minorities living around the lake in order to get an understanding about the ancient life ways of these people. The focus will be the marginalized hunting and fishing Woyto communities. I will also attempt to address how and why this people are so marginalized. I approach the problem based on the historical processes.

Gamst in Freeman (2001:315) described that the Woyto were autonomous hunting people living around the lake. This people became marginalized groups in the twelfth century AD. In the nineteenth century, they were thought to have maintained their hunting gathering ways of life and egalitarian social system. They were hunting and eating hippopotamus. In his travel to the source of the Blue Nile, Bruce (1790:401-3) wrote about the Woyto around Lake Tana. He indicated that the Woyto spoke a different language from the surrounding people. They were seen as unclean and their settlement was separate from the Amhara. They were not allowed to enter churches and to be involved in divine services. Touching them or their possession was also regarded as being unclean leading to isolation from family and friends until purified in the church or through other divine means.

When I conducted this study, I found some of these attitudes still adhered to the Woyto. The surrounding Amhara people looked upon them as inferior. In various aspects, they are isolated from the other communities. They maintain a separate village and distinct social and ritual practices. Although the Woyto are now Muslims, they have separate mosque and burial places. The other Muslim communities do not see them as "true" Muslims. They blamed the Woyto for not implementing the true practices and religious rites of Islam. They are blamed for example for drinking alcohol and eating wild animals. They used to eat animals such as hippopotamus. Intermarriage with them is strictly forbidden. They do not participate in social ceremonies and local gatherings of the other people. Woyto elders explained that they did not even participate in any military services until the coming to power of the current government. During the military government, the Derge, Woyto youths were not recruited in the military service. The apparent reason as the Woyto informant explained seems to be related to their life style. They explained that we are people of the sea, and were thus considered weak to withstand the challenges and hardships in the army. This may be due to their low position and integration in the society and the nature of their life style. A similar pattern is documented from other parts of the country. Pankhurst (2001:4-5) for example described that marginalized minorities in Ethiopia have generally been excluded from the social, economic and political as well as the cultural arena of the dominant groups. They are considered as anti-social, immoral, untrustworthy, impure and inferior. Most of such negative stereotypes towards the Woyto are still common. However, today touching the Woyto or their possession is not considered as being impure or unclean.

The view that the Woyto is an unclean and marginal group is the dominant attitude among the other population. The main reason why they are looked upon with such attitude seems to be attributed to the earlier views towards this people. People often explain that the Woyto used to eat hippopotamus and *ambaza* (catfish). Such animals are not allowed in either the Quran or the Bible. Therefore, among the non-Woyto communities, eating such types of food is widely cited for their marginalization and impurity.

Furthermore, until the military government, the Woyto did not own land. A similar situation is documented about other marginalized ethnic groups throughout the country (see Pankhurst and Freeman 2001). Polluting the fertility or productivity of land is often cited as one reason for the denial of land right among the marginalized minorities in other parts of the country. Polluting in terms of disturbing the spirit of the land and ancestor is also suggested to some of the marginalized groups in southern Ethiopia (ibid; Haaland et al. 2004). However, among the

Woyto, polluting in this context does not seem to be the main reason for the denial of land right. Today, there is no such attitude or tradition that claims the Woyto have possessed a sprit dangerous and destructive to others. Among the Amhara of the surrounding area, the byproducts of some of the animals the Woyto eat such as the skin, hoof, waste, fat, etc of hippopotamus were even believed to be important for the fertility of their livestock. According to elders, some of these things were considered as medicine for people as well. For example, its fat is regarded as a cure for skin disease and elephantiasis. The specific type of fish, *ambaza* (catfish), is also used for treatment of different diseases by their Amhara neighbors. However, under normal conditions, eating this type of fish was considered as becoming unclean. Therefore, it is ascribed as food of the Woyto. Generally, I did not come across an informant who considers the Woyto as dangerous polluters to the fertility of land or society. Freeman (2001:315-6) categorized the Woyto as fertile polluters rather than being dangerous polluters. According to her description, this category of marginalized minorities is regarded as being polluting (impure) but they also perform different activities associated with fertility rites. The Woyto have their own ritual practices that are different from both Muslim and Christian religious rite and practices of the surrounding areas. Most of these rituals are related to the Lake and the Blue Nile upon which their subsistence has been dependent. Details of their rituals are presented below.

From being an independent hunting gathering people, the Woyto became a marginalized minority sustaining their survival based on the resources of the lake and the surrounding area. With the decline of the wild resources such as hippopotamus, this people are said to have started be to involved in agriculture. To supplement their subsistence, they are also thought to have been involved in other activities such as making grinding stones and reed boats for transport over the lake (Freeman 2001:315-6).

The most important question is how and why such negative attitude is ascribed to this people. Why was the Woyto not the subject to the early evangelization and Christianization activities made against the ‘pagan’ and Judaic peoples of the region? Could the expansion of the Christian state have forced them to hunting and gathering or to remain hunter-gathers as they used to be? Why have they failed to be involved in other crafts such as pottery making and black smith as it happened to the Bête Israel? It is also important to ask why, unlike some of the other evangelized groups, the Woyto did not involve in agriculture as tenant farmers or was denied of land use right. In order to understand these and other issue, it may be important to look at the historic processes or events of the region.

I want to approach the above questions by looking at the situation of other ethnic groups who lived in the region since the medieval times. This comparative approach will be useful to assess the challenges and constraints the Woyto encountered in their history. I will therefore first present the situation of other minority groups: the Bête Israel and the Kemant Agew.

One consequence of the expansion of the Christian state was loss of the political and economic position and change of the religious identities of the local people. Groups who strongly resisted the state and insisted on their religious practices, for example the Bête Israel, lost their main economic base, land. Those who were converted to the state religion and accepted the Christian state were able to acquire land use right. It should be underscored that land was officially decreed as the property of the state. Followers and officials of the state including Christian religious institutions were granted with land (fief) in the form of *gult*. The *gult* system gave those individuals the right to collect tribute from the peasants, administer and control the area on behalf of the state (Tamrat 1972:98-102; Crummey 2000: 17-25). Thus, *gult* system constructed based on land and its agricultural product became the main instrument in defining and maintaining relationships among the king, clergy and the nobility (Crummey 2000:25). As relations between the expanding state and the local population became smooth, the locals secured their land use right. This led to the birth of *rist* (inherited land use right) in those areas (ibid; Quirin 1998).

To the Bête Israel, Quirin (1979, 1998) sees this historic development as the turning point in the formation of their occupational caste identity. Since they resisted conversion to the new faith and insisted on resistance, they lost their rights over land. They were forced to be a tenant. This again forced them to develop a new economic ways of life, handicraft, to supplement their subsistence. As they became socially and economically alienated, they also consolidated the institution of monasticism to maintain their own social integrity and ethnic identity. This further strengthened isolation from the Christian population. However, the pressure against them became strong during the early years of the seventeenth century. King Susenyos (1608-1632) even went as far as decreeing the execution and total abolitions of their religious institutions (Quirin 1979: 242-7).

The growth of urbanism and construction activities in Gonder (1632 -1755) required them in skill demanding tasks. They were then able to enjoy a certain degree of incorporation, prestige and involvement in the state apparatus. Their religious and social identity was also tolerated. They even acquired some degree of land use right (ibid).

Nevertheless, the political turmoil of the monarchy for about a century (1755- 1855) marked a turning point to the Bête Israel economic, socio-cultural and ethnic identity. With the decline of the central state, competent regional and local feudal chiefs became stronger. Urban life and construction activities greatly deteriorated. Rural life with increased importance of land became a privileged socio-economic system during this time. This was another disaster for them as their land use right previously acquired was confiscated. As a result, they shifted to rely completely on crafts such as in pottery making and blacksmith (Quirin 1979). Quirin argues that it was during this period that heightened social separation and negative attitude towards them developed. This attitude spread across the wider society. They came to be despised, feared and categorized as occupational castes (Quirin 1979, 1998). The Bête Israel were also identified as *Buda*. They were regarded as possessing a spirit that attacks or causes illness and could even kill a person. Such an association had political objectives. It is believed that people with the skill of making clay and iron objects were thought to possess certain super natural power. Such ideologies helped the state to maintain its power and solidarity. The source of this ideology could therefore be attributed to the rivalry and competitive political character of the state and the society. "In such a social system, the existence of the *buda* enabled the threats or rivalry to be projected out ward, thereby strengthen internal social and psychological solidarity (Quirin 1979: 251)."

According to Quirin (1998), the situation of the Kemant seems quite different. The Kemant are minority group in northwest Gonder. Although they are in many ways related to the Bête Israel, the Kemant were not forced to be artisans. The underlying reason for this is that they did not resist the expanding Christian state. In addition, they were not rigid in their religious identity, though they had similar religious rites and practices as the Bête Israel. They submitted peacefully and paid tribute to the Christian state. Consequently, they secured land use right and remained mainly agriculturists as they used to be. They also maintained their religion until the end of the nineteenth century, though some of them were willingly converted to Christianity. From this discussion, it thus seems that the underlying factor behind this process is the value system anchored to political power, religious ideology and land. According to Tamrat (1972:98-

106) and Crummey (2000:25-33), in Ethiopian history, land, state and church were interconnected each other. The evolution of outcast groups should thus be reconstructed based on such historical, social and psychological contexts (Quirin 1979, 1998).

This comparison may help us to understand how the Woyto remained marginalized outcaste ethnic minority in the dominant Christian population. However, we lack details on how and when such caste system clearly developed. Bruce (1790:401-3) stated that the Woyto were considered as a caste group due to their dietary habit. They ate hippopotamus and were dependent on hunting activities for their survival. The contribution of this factor to their marginalization can be supported by their reaction to conversion to Christianity. Pankhurst (1997:298) indicated that in the early seventeenth century, emperor Susneyos asked the hunting Woyto to adopt Christianity. They responded to the idea of conversion arguing that "how they could do so as it was their custom to eat hippopotamus flesh, which was traditionally rejected by orthodox Christians." In a broader context, I will thus argue that the caste formation towards the Woyto could be related to their adaptation. The meager evidence indicates this people were hunting and fishing communities at least in the historic period (ibid; Bruce 1790:401-3; Messing 1957; Henze 2000:73). They were also one of the ancient people in Lake Tana area. Henze (2000:73) in particular suggests that

> In Aksumite times and during the still understood period following the collapse of the great north Ethiopian empire, the entire region around Lake Tana and the upper Blue Nile was in all likelihood inhabited by the ancestors of the Wayto, who still live by fishing and hunting from their reed boats on the lake; by the Agew; and by the Gumuz, who live in the lower Metekel country to the east, extending all the way to the Sudan lowlands… The pagan kings of Gojjam whom Ethiopian emperors fought from the late thirteen century to the beginning of the fifteenth century were Agew. A substantial Agew population has survived into modern times in central Gojjam in the district called Agewmeder.

It can thus be assumed that the Woyto were among the ancient people of the Lake Tana Area. Therefore, they should have been under pressure from the expanding Christian state during the medieval times and then after. Lake Tana area was the early center for both the spread of Christianity and territorial expansion of the medieval state further to north and south (See Taddesse 1972; Crummey 2000; Henze 2000 cited above). This people must have been among the earliest to be converted to Christianity. However, the name Woyto is not indicated in this Christianization process. As indicated above, it is only the pressures against the Judaic Bête Israel and the pagan Agew often listed. In his detailed account about the Christianization process in the region, Tamrat did not mention the name Woyto. This may not be due to the absence of the Woyto in the region during this time. As stated above, they were in the region at least before the arrival of Semitic speaking Amhara (see also Cheeseman 1935:491).

Therefore, I assume that depending on the resources of the lake and its surrounding, the Woyto were a marginal society within the then dominant Agew and Bête Israeli communities even before the arrival of the Amhara. The absence of evangelization among the Woyto by the expanding state may thus be attributed to their ways of life and dependence on the aquatic resources. It could also be due to their weak economic and political power. As indicated above, the Agew and Bête Israel were targeted to repeated repressions by the Christian kings. This is because they had strong political power and religious institution. Land was the base of the economic, political, and religious system of these tribes. The motive to have control over land and its products (the basis of their political economic and religious strength) seems to be the ultimate reason behind their annexation and evangelization (see Tamrat 1972; Crummey 2000).

Due to their simple subsistence and institutional system, the Woyto might have therefore been marginal to the state. Quirin (1998) indicated that as the Christian state expanded to the Kemant, the Kemant being less powerful than the Bête Israel was. They were even attacked by the Bête Israel. Instead of revolting, the Kemant therefore considered the Christian state as protectors from their old neighbor and rival, the Bête Israel. They had peacefully submitted to the Christian state and retained their ancient practices and economic system. The Christian state on its part did not see them as the main threat. Written accounts of the period do not show how the Woyto did react to the expanding states. Based on the example from the Kemant, this process might also have been the case to the Woyto.

If the Woyto were hunting and fishing communities, they might not have been of interest for the churchmen either. As later events witnessed, land was the main interest for both the state and the church. There were even serious disagreements between the state and religious institutions over land. The leading religious figures and institution had great demand for land. The land grants as *gult* to the church implemented by successive emperors were to alleviate such disagreements (for details see Tamrat 1972:198-112; Crummery 2000:20-72). A statement in Crummery (2000:29) indicates this to be the issue. He explains, in reply to controversy over land, a certain Monk asked King Dawit (1380-1412) “We consume the fruit of our own labour; but a church does not stand without land. Would it not be like a woman who has no husband?”

This implies the interest of churchmen towards land. The functioning apparatus of the church and overall maintenance of its institution were entirely dependent on the tributes and services it expropriates from the local peasants (see Tamrat 1972; Crummey 2000). The Woyto who were not cultivators might thus not be the main targets of evangelization. Otherwise, living around the lake, the center of early evangelical activities, the Woyto is expected to have been among the first converted people to Christianity.

Therefore, the lack of early conversion of the Woyto to Christianity, and their association to marginalized minority could likely be due to their ways of life, dietary system and lack of well organized political and religious institution. This claim may be supported by the absence of forceful conversion of the Woyto by successive Christian emperors and religious institutions. The way emperor Susenyos approached them at conversion may support this assertion. As Pankhurst (1997:298) argued, emperor Susenyos did not force them to accept Christianity. When they reacted by not accepting Christianity due to what they eat, the emperor only approached them by citing the word of St. Paul. He replied, “whatever went into the mouth couldn’t defile, and assured them that they were free to eat whatever they wish.” This indicates the lenience of the state at their conversion. As I cited above, this is a different approach compared to what the Emperor executed on the Bête Israel. It also indicates that the food ways of the Woyto was one reason for their marginalization. Looking at this issue in its broad context may reflect that the Woyto were primarily dependent on a hunting and gathering economy and were politically less powerful.

This would be one likely scenario for their marginalization and lack of evangelization to Christianity. Freeman (2001:304) indicated that the reason that led the Woyto to be marginalized minorities should be addressed from the political and historical contexts. She also commented that the ways and the reasons why marginalized ethnic minorities evolved differ across areas and groups (see also Pankhurst 2001:1-23). The overall implication of the above description is that the Woyto, throughout their history, remained marginal to the dominant ethnic groups of the region, and their socio-political, economic and cultural life was related to the aquatic resources. The following section investigates the technological, socio-cultural and economic importance of the aquatic resources to the Woyto communities of Lake Tana in the contemporary setting.

10.3. Subsistence, socio-cultural and ritual life of the Woyto and the Water bodies: an overview

My focus here is to describe the ethnographic setting of the Woyto people, especially the role of aquatic resources in the social, economic and cultural life. The Woyto today speak Amharic. As indicated in the previous sections, their ancient language could be Cushitic Agew (see also Bender 1983).

Alongside the archaeological survey and excavation, I collected some ethnographic data among people living around Lake Tana. The Woyto ethnic group was the main target of this ethnographic work because their way of life is still associated with the aquatic resources of the lake and the Blue Nile River. The data was collected among the Woyto communities who live around Gorgora and Bahir Dar using interviews and observations. Interviews were conducted, particularly among Woyto elders. In order to get additional information, interviews were also conducted with elders of the non-Woyto people. The Wotyo settlements and their activities were observed and photographed. The Woyto traditional means of fishing, still in use, were documented and photographed. In addition to their economic activities, I documented the cultural and social aspects of the Woyto people. I observed and interviewed about Woyto belief and rituals related to Lake Tana and the Blue Nile. The data was collected in different field seasons carried out between September 2009 and May 2013.

10.3.1. Subsistence and Traditional Fishing Techniques of the Woyto

As discussed in the preceding sections, the Woyto were hunting and gathering people relying mainly on the resources of Lake Tana and its surrounding. Even today, the Woyto subsistence around Bahir Dar is strongly related to the resources of the Lake and the Blue Nile River. Woyto men engaged in fishing mainly from the Lake and to some extent from the Blue Nile River. They also made boats from the papyrus reed and transport people and items across the lake. Woyto men were making a living based on daily labor. They used to collect the papyrus from the swamps of the lake and the river to fence others' compound and house. In the rural areas around Gorgora and Bahir Dar, the Woyto currently engaged in farming. The Woyto women in Bahir Dar still collect the papyrus reed and make household utensils and sale to other people. Like men, rural Woyto women are involved with farming activities. However, Woyto engagement in agriculture is only a recent phenomenon. Local informants described that some

Woyto started farming in the twentieth century probably after the Italian occupation, mainly during the military government[1].

According to Woyto and non-Woyto informants, hunting-gathering and fishing was the main economic base of the Woyto people. They were dependent on hunting wild animals including hippopotamus, and fishing activities for their subsistence. The abundant resources of the Lake and Blue Nile River were therefore the main source of their livelihood. The Woyto used to hunt terrestrial games such as *Tinchel* (hare), *Kerkero* (wartdog), *Dekula* (bushbuck), *Buher* (reedbuck), *Gosh* (buffallow), *Shikoko* (hyrax) and *Midaqua* (antelopes). Hunting was also common among their Amhara neighbors. This was also recorded by travelers who visited the region in the nineteenth and early twentieth centuries (see Plowden 1868: Rassam 1869; Cotton 1902). Kings were even involved in hunting games. Hunting hippopotamus was, for instance, a favorite sport for emperor Tewoderos II (Rassam 1869:109). Hunting this animal for its skin and tusk was also widespread among the local population around Lake Tana (Cotton 1902:280).

Deforestation, expansion of agriculture to the shores of the lake and population growth greatly reduced terrestrial games as well as the abundance of the aquatic resources. In addition, hunting wild games is now legally prohibited. Around Bahir Dar, the rapid growth and expansion of the town displaced their settlement from the shores of the lake. A combination of these and other factors have affected Woyto traditional ways of life, although the majority are still dependent on fish, papyrus and other resources of the lake and the river. They made reed boats and involved in transporting activities over the lake. They, among other people who recently joined fishing, are making their survival mainly on fishing. Until recently, however, fishing, making boats and sailing on the lake were the occupation solely ascribed to the Woyto people. Before the introduction of modern boat transport (after the Italian occupation), the Woyto were involved in transporting goods and people between Bahir Dar and Gorgora and other offshore settlements using the *tankua* (reed boat).[2] In the 1930s, Cheesman remarked that the Woyto were the people who made and propelled the *tankua* (Cheesman 1935:491). They had additional means of subsistence such as making grinding stones and beehives. The Woyto still make the *tankua* (traditional boat made from papyrus plant) and grinding stones.

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[1] Gete Muchaye, Dagninet Addis, Wotet interviewed in Bahir Dar

[2] Gete Muchaye, Dagninet Addis, Seyid , Awol interviewed in Bahir Dar

Although the non-Wotyo community are involved in fishing today, both non-Woyto and Woyto elders explained that fishing by tradition was the occupation of the Woyto. Since fishing in this area was considered as their main activity, the Woyto were known for making different fishing equipment. They still use some traditional fishing technologies such as *Kefo* (hives), *Nisa, Merz* (poisonous plants), *Mekfefiya* (small nets), *Dula /Betir* (stick) and *Mekatin* (fishhook), in addition to the modern gillnets available in the market.

These types of material can easily be made from locally available resources. They for example collected the fruit of the poisonous plant for fishing from the edge of the Blue Nile River. The widely used poisonous plants today are *Birbira* and *Dedeho*. After drying and pounding or grinding these plants into powder, the poison is sprayed over the water. The fish will then be stupefied and float over the water. They can thus easily collect the fish. Currently, this fishing technique is widely used by non-Woyto fishermen as well.

The Woyto also made traditional net from papyrus, and some other creeping plants. From creeping plants and sticks, they for example made the *nisa* and *kefo* (hive). The Woyto fishermen called the creeping plant *asabila* (literary fish snatcher) often available along the surviving trees around the lake and the river. Both *nisa* and *kefo* are simple fishing techniques, but they are well designed and made so they are very efficient methods of fishing. Especially the *nisa* is such a reliable method that it at a time can catch as many fish as possible. It is designed in such way that it has a small opening at one side. At the opening, the stick or the creeping plant is bent slightly inward. It allows an easy opening for the fish, but it hinders the fish to move back easily. It has a pointed and sharpened end. Instead of moving back, the fish thus swims forward inside the *nisa*. Through this technique, they can catch as much fish as 80 or up to 120 depending on the size of the *nisa*. The hive is based on similar technique. It is made from a stick and creeping plant or a rope. It has two openings, one at the bottom and one on the side of the upper parts of the *kefo*. The opening at the bottom is very wide. While fishing using this technique, the person should always be in the water. As the fish approaches, he puts this equipment over it and keeps the *kefo* anchored to the ground. He then inserts his hand on the upper opening and picks the fish out of it. It is used only along the edge of the lake or in swamps where it can be kept anchored to the ground. The *kefo* (hive) is thus efficiently used to catch the catfish as this type of fish often lives in shallow water around the edge of the lake or in the swamps. Unlike the *nisa,* it cannot catch as many fish at a time. Compared to the *nisa*, it is time consuming, laborious and a less efficient method of fishing.

The other technique of fishing is the use of stick (*dula* / *betir)*. The fishermen hit the fish with a stick as it approaches to the shore or the swamp and the flood plain. This technique is called *asawogera*, which literary means hitting and catching technique. Large fish such as catfish are often caught in this way. As Woyto elders explained, in the past, they used to catch this type of fish by piercing it with spears (*tor*). There is also a small net (*mekfefiya*) hanged at the tip of a long stick whereby the person lets it into the water and picks up as the fish enters the net. This net can easily be made from locally available material such as ropes or creeping plants. The use of fish hooks (*mekatin*) made of iron was also common. They attached food residues or insects on the tip of the fishhook to attract the fish. Fishhooks are still in use, although it is not as widespread as the other techniques of fishing. Currently, new fishing technology, gillnet (*mereb*), purchased in the market is also widely utilized by fishermen of Lake Tana. Before the introduction of the modern gillnet, the Woyto used to prepare the small nets from ropes, cotton thread, and creeping plans. In addition, papyrus reeds were made into ropes for making the nets.

As most of the Woyto informants explained, they used to hunt hippopotamus using guns (*temenja*). They also used spears, but as they explained, spears were not effective for killing hippopotamus because it is a very shy animal. In addition, they argued that unless the hunter shoots exactly at its head, it is difficult to kill hippopotamus with the spear. Therefore, prior to the introduction of modern rifles, the Woyto could have other techniques of hippopotamus hunting such as the use of poisoned arrows. However, among the Woyto informants, there is no sufficient information about this type of hunting strategy. Only one elderly Woyto informant mentioned the use of poisoned arrow for hunting hippopotamus. He described that poison was smeared on a spear (*Filata*) attached with a wooden handle (*Geto*) and used for hunting hippopotamus and other animals as well. Fruit of poisonous plants were collected from around the Blue Nile River. It was pounded and smeared over the iron tip (*Filata*) which was hafted to the wooden handle. The iron tip may have either three or four sharp edges. He also explained that in the absence of an iron tip, sharpened tip of the *Geto* (the wooden handle) immersed with the poison was used for hunting hippopotamus. The memory about these tools and their use, *Geto* and *Filata*, is still fresh among Woyto informants. Nevertheless, they could not describe the technique sufficiently. Their description was also inconsistent and contradictory. I could not find these weapons for documentation and photographing. The introduction and abundance of modern firearm in the twenty century might have contributed to the disappearance of this technology. [3]

There are, however, historical accounts about the use of poisoned arrows by the hippopotamus hunting Woyto in the nineteenth and early twentieth century. Citing the German traveler of nineteenth century, Beckingham and Huntingford (1954:58) write that the Woyto had poisoned arrows for hunting hippopotamus. Plowden (1868) also mentioned that the Woyto used poisoned arrows to hunt hippopotamus. “The spear they use is so made; that the head may break off and remain in the animal, being loosely fastened to the shaft and lanced right in the air, so that it falls usually into the back, nearly upright; the poison is made from some herbs known only to themselves, boiled in water, in which the iron is dipped (ibid: 272-3).” Cotton (1902 gave detailed description about the traditional hippo hunting technology. He stated that

> The hippo hunters were armed with poisoned harpoons and heavy spears. These harpoons are made of wood 18 inches in length, with a barbed iron head 2 ¾ inches long by 1½ inches breadth; for 8 ½ inches below the barb it is thickly coated with a black-coloured poison made by boiling the root of some tree. The shaft is of heavy wood 8 feet long and 4 inches in circumferences; one end is split and a hole bored in it, into which 6 inches of the harpoon are let, and kept in position by a binding made of twisted gut, which can be quickly tightened or loosed. For safety, except when in sight of their game, the barbed head is always kept covered by a sheath made of rush. The spear are 6½ feet long, and have heavily made blades 12 inches in length by 1 ¼ in breadth, with a 7 inch socket (Cotton 1902: 279-80).

[3] Cherie , interviewed in Bahir Dar

Fig. 10.1. Papyrus plant for making the tanqua (boat)

Fig. 10.2. Woyto youths transporting goods using *tankua*

Fig. 10.3. Woyto man making grinding stones

Fig. 10.4. Fishing using hives (*kefo*)

Fig. 10.5. Fishing using small nets attached to a stick (*Mekfefiya*)

Fig. 10.6. Fish caught using these traditional techniques

Fig. 10.7. Fishing using *Nisa*

10. 3. 2. Aquatic Resources and Origin Myth of the Woyto people

The Woyto have maintained and practiced different traditional beliefs and rituals. These traditions are very much connected to the main water bodies of the area. There are different rituals and sacrifices still performed to the lake and the Blue Nile River.

Moreover, their oral tradition and myth including their origin is related to the Blue Nile and Lake Tana. Some Woyto informants claimed their origin to be from Egypt. They argued that their ancestors migrated southward following the course of the Nile River until they settled along the edge of Lake Tana. [4] Their migration, as they claimed, was due to wars and conflicts erupted in Egypt during the times of pharaoh. "In the course of the war, they came near the river and their war leader, the king, ordered his people to drink from it and then to follow him again. However, the Woyto drank too much river water so they could not accompany the king and his

[4] Getie Muchaye, Samuna Mengesha , Muhie kebede, Zemen interviewed in Bahir Dar

army further, and they remained along the river, as they have ever since (Oestigaard and Abawa 2013:113)." There is other tradition as well. Some of the Woyto elders argued that they came from nowhere. They insist on the tradition, which states the Lake Tana area as their original place. They argued that the Woyto is the people of the Sea. They regarded the water of Lake Tana as a sea. According to this tradition, they claimed that the birthplace of the Woyto people is the sea (the Lake Tana). They considered themselves like fish. As fish cannot survive out of a sea or water, the Woyto elders believe that they could not survive far beyond water bodies. They explained that "We are like fish." "We are the son of the fish." The strong emphasis of the Woyto myth or oral tradition to the lake and fish in explaining their original homeland may indicate old established subsistence and settlement pattern based on these aquatic resources.

In addition, the Woyto elders in Bahir Dar argued that wherever the Woyto communities go, they have never lived far beyond water bodies. They also explained that it is here that the fish and the hippopotamus are created. The sea or the lake is the source of creation. The Woyto had thus settled around where there is water, fish and other aquatic resources. According to this explanation, the sea or the lake is their hereditary land. They used to hunt, collect and make their living based on what they obtain from these resources. They gathered different root plants and seeds from around these water bodies as well. Woyto elders, for instance, mentioned some of these plants, which were used as food. They remembered two of such plants: *Sikume* and *Yebahir guansa*. *Sikume* was a wild plant similar to rice. Like rice, it grew densely along water bodies. The Woyto used to harvest this plant from around the edge of the lake and around the surrounding flood plains, thrashed and ground into powder. The powder was then made into porridge. *Yebahir guansa* was a creeping plant with big roots similar to potato. It grew along the shore of the lake. They used to dig out the roots, sliced into smaller pieces and boiled it for consumption.[5] Today, the Woyto neither harvest nor collect these wild plants.

Although they are currently displaced by the expansion of urbanization in Bahir Dar, their entire settlement have until recently been confined along water bodies. Both in Gonder and Gojjam, the Woyto were living surrounding the shore of the Lake. The rural Woyto are now farmers. Yet, they still occupy areas adjacent to the lake. There are no Woyto communities, both in Gojjam and Gonder, living far away from the lake. South of the lake, the Woyto are said to have lived along the Blue Nile. However, they argued that their settlement did not go south of the Blue Nile waterfall.

[5] Cherie, Tahir kassa, Yesof Enyew, Zemzem. Tahir lives in the rural Woyto village around Bahir Dar

Different travellers who visited the region in the last few centuries also documented about Woyto settlement around these water bodies and their survival on the aquatic resources (see Stern 1863:174; Plowden 1868:273-4; Cotton 1902:280). Plowden (1868:251), in particular recorded that the hippopotamus hunting Woyto people populated the whole area along the entire shore of the lake. Cotton (1902:274) described that abundance of hippopotamus and fish in the lake. This is in favor of their oral tradition, which may demonstrate the crucial roles of the aquatic resources for their subsistence and settlement. All these stories can indicate the role of these resources for their survival at least in their recent history. Their mythologies and cultural traditions were also connected to these water bodies (See Cheesman 1935).

Contrary to the Woyto, the Amhara ethnic group who live around the lake had never been involved in fishing and hunting hippopotamus and other edible resources from the lake for their daily consumption. They are entirely dependent on farming. In case they demanded fish and other resources such as grinding stones, they got them from the Woyto through exchange to crops and animal products such as butter. The Woyto, until recent time, had no cattle and never engaged in farming. Asked about why they did not involve in farming, elders attribute this to cultural factors. Although some informants claimed the Woyto had no land or the right to own land, an elderly Woyto informant argued that there were wide and fertile lands around the lake. “Although we have settled around this open fertile land for many years, our ancestors did not involve in farming. Our ancestors did not engage in farming because farming was not our tradition”. He cited a story in Amharic *Yabatin metal neger yametal*, which literarily means, leaving aside the tradition of our ancestors causes a serious problem. He also argued that our ancestors were not wise to predict about the possible depletion of these resources in the future. As he argued, they could not imagine that such traditional ways of subsistence could in one way or another become at risk in the future. Our survival these days is, however, very precarious as our main occupation on the aquatic resources are greatly affected by developments or overall trends going over the region in last few decades, he said.[6]

The non-Woyto elders similarly explained that farming is not an occupation ascribed to the Woyto. They are people who were accustomed to make a living on aquatic resources. The non-Woyto informants explained that the Woyto used to depend on what they get from these areas. Probably due to such types of economic activities and consumption of aquatic resources such as

[6] Cherie, Gedam interviewed in Bahir Dar, Mengiste, Misgan , Worku interviewed in Abrija kebele near Gorgora

catfish and hippopotamus, their neighbors look upon the Woyto as unclean and marginalized minorities.

Although they were entirely confined to the edge of the lake, some of them today live in the city. In rural areas they still live adjacent to the lake, although they have already started farming. As mentioned earlier, they have separate villages or settlements from the dominant Amhara population of the region. Even in the town, the Woyto have separate living areas.

Generally, it seems that their hunting and gathering economy limited this people and their settlement to around the aquatic resources. Elderly Woyto men whom I interviewed in Bahir Dar very much admired their previous life style. They appreciated the rich and luxurious life they had based on hunting and gathering, and the communal sharing and ceremonies they participated. This may give some hint to understand some of the challenges and opportunities ancient hunters and gatherers could have meet while adopting agriculture.

10.3.3. Rituals and Symbolic life of the Woyto

As I have already mentioned, the Woyto have diverse ritual and symbolic activities related to the main water bodies in the area and some of the faunas of these water bodies. I documented these practices using interviews and observations.

As Woyto elders explained the hippopotamus, fish and the Blue Nile River and Lake Tana are all ascribed with different powers. The Woyto people living around the southern edge of the lake still believe in the spirits of both the river and the lake. *Abinas* is the spirit of the Blue Nile River while *Meshiha* is the spirit of Lake Tana. To the Woyto community these spirits are considered the source of good and bad, success and failure, wealth and scarcity, life and death. Therefore, they have often performed various rituals to the lake and the river. These rituals may be conducted in group such as family based or communal gatherings. They may pray and give sacrifices to the spirits of the lake and river individually.

10.3.3.1. The Great sacrifice to the Blue Nile river

The Woyto communities who live in Bahir Dar conduct a big ritual sacrifice to the Blue Nile River once in a year. According to my informants, this ritual is performed immediately before the Christian fasting season (Lent) starts. The Woyto called this ritual 'the great sacrifice'. It is often conducted on communal level incorporating only male Woyto community. This ritual differs from other ritual sacrifices made to the river or the lake because the main sacrifice is bull and it is conducted once in a year. The bull was bought based on shared contribution. However, even during this main ritual event, chicken are also sacrificed. The chicken must be a cock with thick comb. If its comb is thin, they should scarify egg in addition, or otherwise an individual must scarify two cocks having thin comb. As Woyto elders argued, this is to symbolize their devotion to the power of the spirit. The cock sacrifices in this ritual were made individually, although the bull sacrifices was communal.

For this great ritual sacrifice, the community buys an immature bull ahead of the fixed sacrificial date. Color matters in selecting the bull for this sacrifice. It should not be black. The bull bought for the great sacrifice should be clean, uncontaminated (immature) and good looking. Physically impaired bull, for example a bull with a broken horn, will not be sacrificed at all. It is also strictly forbidden to scarify, castrated, fertile and / or matured ox.

I observed the great ritual sacrifice conducted to the Blue Nile River where it leaves the Lake. It took place on Sunday in the morning. When I went to the site, it was quite early and the number of people was not more than about twenty. The Woyto were concerned about letting external people partaking in the ritual. Therefore, I only had few observations on the initial activities of this ritual. They do not want to explain the reasons as to why others are not to be present. It could however be related to the idea of polluting the rituals.

At the beginning of the ritual, I observed that all the people at the spot were Woyto men and youth. There was only one woman who was preparing food and cooking utensils. Before they slaughtered the bull, she made coffee and local bread from *teff* powder. Elders started praying and blessing before they conducted the ritual sacrifices. Both the coffee and small pieces of bread were severed to the river first. All the people attending the event were served with both the coffee and the bread. Individuals then began to slaughter cocks they brought and threw them into the river. Huge number of chicken, cock mainly with thick comb were scarified. After cutting the throat of the cock and threw them to the river, everybody turned his face away from the river and sat on his feet for a while. This was followed by the sacrifice of the bull. The bull sacrificed at this time was red in color. This bull was brought close to the river and was slaughtered just on the edge of the river. After cutting its throat, the blood of the bull was collected in a big plastic bowl. The blood was then spilled to the river, as they argued it was scarified to the spirit *Abinas*. I could not observe the specific details of the ritual then after. I complemented it with information gathered through interviews with Woyto elders.

I conducted interviews with elderly Woyto informants about this great event some days before and some other days after the great sacrifice. According to their information, food prepared from the sacrificed animal should be first served to the river. They thus threw pieces of the cooked bull meat to the river before any one tasted the food. Similarly, they had to serve the river from the cooked cock as well. According to their information, slices of whatever food they prepared in the ritual first served to the spirit. Otherwise, it is believed that the spirit will be dissatisfied and cause harm. Before slaughtering and during the processes of the ritual sacrifices, prayers for mercy, health, wealth, excuse and pleasure were mandatory. They also argued that the chicken scarified to the river may be taken away by the river, or sunk deep in the river or the lake. In this case, it is believed that the spirit is satisfied with the sacrifices. Moreover, they explained that they could pick up the slaughtered cocks from the river only after they assured that the cocks were already dead and floated near to the edge of the river. Besides, they argued that women do not attend the ritual during the bull sacrifice because the tradition does not allow them to participate. However, women can attend during other ritual sacrifices made to the river. The father of the household should also contribute money for the bull even if they could not attend this great ritual because the ritual is for the wellbeing of the entire Woyto community. They believed that unless the sacrifices are made accordingly, *Abinas* would punish them. Dissatisfied *Abinas* can cause catastrophic events and misfortunes to individuals or the community. When such circumstances occurred, sacrifices have to be made to the river to propitiate the spirit that caused those calamities.

As they explained, the ritual will be completed after elders offered a blessing and pray for success, health, mercy and overall wellbeing of the community in the name of *Abinas*. With the completion of the ritual ceremony, they departed for home leaving food left over at the ritual place. It is not allowed to take even a piece of food back home.

In addition, elderly Woyto informants told me that there have been some changes related to the great ritual sacrifices to the river. For instance, they mentioned that in the past, the ritual sacrifices for this great ritual event was hippopotamus. The bull sacrifice is relatively a recent phenomenon. The substitution of hippopotamus sacrifices to the Blue Nile by bull sacrifices was due to the decline of hippopotamus population and the introduction of legal prohibition hunting wild animals in general and hippopotamus in particular.[7]

Fig. 10.8. Praying in the great ritual sacrifices

[7] Awol, Cherie, Getie Muchaye, Seyid, Wotet, Zemzem, Zemen

Fig. 10.9. Sharing food (bread) before the bull sacrifices

Fig. 10.10. Cocks sacrificed to the river

Fig .10.11. Bull sacrifices

Fig. 10.12. Muslim Woyto youth reading religious text at the ritual

10.3.3.2. Other ritual sacrifices to the river and the lake

In addition to the above mentioned main sacrifice, the Woyto community perform different ritual sacrifices both to the Blue Nile river and Lake Tana. These sacrifices do not have fixed dates. It can be made at any time and on individual or family bases. The sacrifices may be a cock or a hen, sheep or goat and other possessions including incense, coffee and food prepared at home.

I observed one particular ritual when a family member made sacrifice to the Blue Nile River. The family came to the edge of the river with all the necessary material for the ritual, such as cooking utensils, coffee beads, local bread *(injera*), khat, incense and cock. The elderly man first cleansed himself in the river bath. After the ritual purification, he was ready to slaughter the cock. Before he slaughtered it, he prayed to the river where he asked *Abinas* (the spirit of the river) to bless his family and to offer them they requested. While the householder was praying for mercy, good wish and forgiveness, his wife and daughter were roasting coffee and preparing cooking utensils. After completing the pray, the householder accompanied by one young man took the cock to the river. When he slaughtered and scarified the cock to the river, he must always be with someone. The old man finally cut the throat of the cock and threw it to the river. He soon turned his face away the river, sat on his feet and started praying for mercy, forgiveness and wellbeing to his family until the cock is dead. The cock flapped its wing back and forth and stirred up the water. After they made sure that the cock is already dead, the young man picked the cock out of the river. The woman then washed, prepared the meat and cooked it in a vessel. Yet, the feather, parts of the legs and the skin of the cock were given to the river. Meanwhile coffee was prepared for drinking. Before any one drinks the coffee, coffee and slices of local bread (brought from home) were given to the river. During the food preparation, the liver was cooked on open fire separately and three of it pieces were served to the river. The remaining part of the liver was distributed to the family member. The cooked meat was then made ready, and after they served to the river first, the family ate the cooked meat. Following a prayer from the family member for success, wealth, mercy and family wellbeing, the ritual sacrifice was completed. Khat and incense were used throughout the ritual. Khat was chewed during this ritual. The stalks of the khat were carefully collected, wrapped in a piece of white cloth and taken home because they considered it an important part of the ritual. Similarly, smokes have values in the ritual. Thus during this ritual, incenses was often used. Serving such pleasant smell to the river, as they claimed, would please the *Abinas* and it would therefore fulfill their wish (See also Oestigaard and Abawa 2013:122-4).

Fig.10.13. Preparation of the Woyto family to perform sacrifices to the Blue Nile River

Fig. 10.14. Chicken sacrifices to the river

Fig. 10.15. Woyto family sharing the ritual food

As Woyto informants explained, the symbolic role of the Blue Nile is not expressed through ritual sacrifices only. People may go to the river, wash their body in the river, and pray for mercy and excuses. *Abinas* will meet their demand although they do not offer any sacrifice. Although I did not encounter ritual sacrifices performed to the spirit of Lake Tana (*Meshiha*), they also told me that a similar ritual is made to the lake. Since the spirit of the Blue Nile (*Abinas)* is considered the supreme deity to the Woyto people around Bahir Dar, they often perform rituals to the Blue Nile. [8]

On the contrary, around Gorgora farther north, it is Lake Tana, which is ascribed with such symbolic and ritual values. This may be because the Blue Nile originated from the mouth of the lake in the south in Bahir Dar. The Woyto in Gorgora argued that the association of great power to Blue Nile could probably be due to its description in the Bible and in the Quran. Therefore, the Woyto around Gorgara make scarifices to the spirit of Lake Tana (*Meshiha*). However, during my field studies, I had no opportunity to observe the ritual sacrifices performed to the lake. I thus collected information using interviews. As informants suggested, the way the ritual sacrifices made to the lake is more or less similar to what I have already documented around Bahir Dar.

One important difference in the ritual practices of the Woyto in Gorgora from around Bahir Dar is the time of the sacrifices. In Gorgora, sacrifices to the Lake are made only around sunset. This, according to their tradition, is to make the spirit satisfied and accept the ritual offering. Asked about why they made ritual sacrifices to the Lake, the Woyto of Gorgora argued that Lake Tana was the source of everything they depended on. They said, “unless you give it some thing, it will not give anything in return.” This is an indication of the belief system linked with the water resources that have remained the mainstay of the Woyto subsistence.

The second important difference is that women do not participate in any ritual activity made to Lake Tana around Gorgora. They argued that the tradition does not allow women to participate. The food prepared at the spot is even made by men. If women appeared in the ritual, they argued that the ritual would not be successful at all.[9]

[8] Awol, Cherie, Getie, Muhie Kebede, Yesuf Enyew interviewed in Bahir Dar

[9] Mengiste, Misgan , Worku, Yekul interviewed in Abrija kebele near Gorgora

In sum, both the lake and the river (Tana and Blue Nile) have strong ritual and mythological values to the Woyto people. They regarded them as the sources of life, mercy, protection and wealth. Thus, they made sacrifices to the lake and the river. Unless they made the rituals and sacrifices accordingly, they believed that the power of these water bodies would penalize them in different ways. The Christians around Bahir Dar and its surrounding acknowledged the healing power of the Blue Nile. Non-Woyto people still offer sacrifices and pray to the river as well. They usually scarified chicken and food individually or on a family level. However, they do not have communal ritual sacrifice to the river. According to the non-Woyto Christians, sacrifices to the river are made because the Nile (*Gihon*) is mentioned in the Bible. I got similar tradition among the Non-Woyto Christian population around the source of the Blue Nile in Sekela (Central Gojjam). Nevertheless, the Christians do not view Lake Tana as ritually important. Of course, the monks at Tana Kirkos and Dega Istifanos argued that the Lake is blessed since Virgin Marry, Jesus and Joseph stayed at Tana Kirkos for three months and ten days following the persecution of Herod (See also Oestigaard and Abawa 2013:77). The association of the lake with holiness is related to the influence of Christianity. However, to the ordinary Christian population the Blue Nile is considered as a river with strong spiritual power. They do not sacrifice to the lake as the Woyto does. The non-Woyto Muslim elders in Bahir Dar similarly acknowledged the power of the Blue Nile. However, both to the Christian and Muslim leaders, the ritual sacrifices made to the river and the lake was strongly condemned and opposed as pagan practices. The Christian religious leaders argued that the use of holy water should be with the participation of the priests. The Woyto belief and practices related to the river and the lake are thus considered as *baed amlko* ('bad spirit').[10] As Woyto elders in Bahir Dar explained, due to the strong pressure and prejudice from their Christian and Muslim neighbors, their traditional belief and practices are now declining. It seems that the Woyto have integrated some of the Islamic tradition in such rituals. I for example documented a young Woyto clerk reading Islamic religious book during the great ritual sacrifices. The use of khat in their ritual may be due to recent spread of khat in the area. Traditional Woyto ritual sacrifices may be found intact in more remote parts of the rural Woyto villages far from urban centers. Constraints of time, logistics and other situations did not allow me to travel to those areas and document ritual activities in such area.[11]

[10] Maeza, Adane, Tarekegn interviewed in Bahir Dar. Maeza is a priest in Bahir Dar

[11] Awol, Cherie, Getie Muchaye, Seyid, Wotet, Zemzem, Zemen

10.3.3.3. Symbolic role and importance of aquatic resources

The lake and the river were not the only main source of Woyto subsistence and the center of their traditional religious belief and ritual activities. Some of the aquatic resources of Lake Tana and Blue Nile have also been ascribed with certain ritual and symbolic values.

The Woyto used to perform initiation rituals using hippopotamus. Accordingly, in the past in order for a mature Woyto engaged in marriage, he should first kill a hippopotamus. Before the marriage ceremony, he with his assistants should venture to the lake or the river to hunt this animal. Unless he is successful at shooting and killing hippopotamus, he will not get married. Shooting and killing the hippopotamus for young boy was difficult. A certain ritual among his family was thus performed in the campaign for the hippopotamus hunt. Before he went for the hunting campaign, his family and elders blessed him for success in the campaign. His family also prepared food, which include local bread (*injera*), chicken and pounded *noog* in the ritual. He should slaughter the chicken as well. In the ritual, his parents devoted themselves in praying to succeed in the hunt and consequently for his engagement in marriage because this event was considered very crucial for his future. According to the Woyto tradition, unless someone killed hippopotamus he would otherwise remain unmarried for life.

After this ritual, he with his companions had to go to the lake or the river to kill the hippopotamus. This campaign would take a couple of days or months or would be successful in a day. However, if he succeeded in the hunting campaign, all the family and the neighbor including his fiancé's family gathered around the lake or the river where the hippopotamus was killed. There, the community would then celebrate the initiation ceremony for a couple of days with provision of food and drink and the hunted hippopotamus was slaughtered in addition. However, certain parts of its meat were given to the young boy. In this ritual ceremony, he appeared in front of the crowd tying the tail of the hippopotamus he shot dead. He tied it at his left hand. They called this practice *ado mesar* (tying the tail) which symbolized his victory in shooting at the hippopotamus. It was only after this initiation ritual that parents discussed and arranged all matters related to the marriage. This tradition was literary called *yegumare serge (*the 'hippopotamus marriage') and the young boy was said to have initiated to manhood (*mireawota*).This tradition is not practiced any more, however.

Furthermore, the Woyto associate the origin of their marginalization with the myth of eating hippopotamus. They described that the name Woyto, symbolize *watew (*swallowed). They argued that we are like other people. However, we were ascribed with the name *Woyto* when our ancestral father swallowed the hippopotamus meat. According to the Woyto elders, since then the name Woyto is used to represent an act of insult to his deed.[12] This indicates that food items and food taboo are strong markers of cultural boundaries and ethnic identity (see Haaland 1992, 2006).

Hippopotamus is not only the source of such rituals of the Woyto community, but it is also considered as an animal with spirit. Parts of its body such as the teeth, the faeces, the fat, the hoof and the skin of a hippopotamus have been used for different medicinal and spiritual purposes. People believed that parts of this animal's body were used for fertility and for protecting people and resources from dangerous spirits. Even non-Woyto farmers kept the hippopotamus faeces in the kraal for the fertility of their cattle. The skin of the hippopotamus had similar purposes. Farmers put salt on the skin and made the cow to lick it. This, it is believed, would make the cow fertile. It is also believed that the faeces of hippopotamus protected cattle from disease. Farmers thus hanged it on the gate of the cattle kraal. In addition, keeping the teeth of the hippo at home was thought to protect people from dangerous and destructive powers. According to the Woyto elders, its meat was used to cure malaria. As informants suggested although hippopotamus hunting is now forbidden, its use for such symbolic value is still common.

Similarly, fish especially the big catfish (*sores*) has still been used for various symbolic and spiritual values and for healing disease. When it is used for protective purpose, it should be sliced into pieces, dried, pounded and kept at home. A sterile woman is advised to eat *sores*. It is also regarded as good for curing malaria, abdominal and joint pains. In addition, the Woyto supply fish to farmers in the grain-threshing yard while threshing crops, especially *teff* and finger millet. The owner of the crop rotated the fish, usually three in number, round the yard and kept them there until these grains are collected. Eventually, the fish were cooked and eaten in the yard. This is assumed to have certain protective value to the grain from bad spirit and would increase its abundance. However, for this ritual, catfish cannot be used. During threshing *teff* and finger millet, food such as porridge, gruel, prepared from *teff (*often the red variety), *teff* bread mixed with pounded *noog* and beer are also served. The practice of serving food to the yard or during threshing *teff* and finger millet (often called *agumas*) is believed to have

[12] Awol, Cherie, Getie Muchaye, Seyid, Wotet, Zemzem, Zemen

protected the grain against malevolent spirits. According to informants, this tradition is still practiced among the farmers in the area.[13]

These rituals and belief system symbolizes the life ways of the Woyto in relation to the aquatic bodies and their resources. It also defines their relation with their dominant neighbors the Amhara. Traditions evolve and change overtime. The persistence of this belief system may entail something about the association of the Woyto with aquatic environment since long time. Kopytoff in Freeman (2001:323) argued "throughout Africa first comers to the land are believed to have a special ritual association with the land and fertility."

Fig.10.16.Hippopotamus tusk kept in the house for ritual/symbolic purpose

Fig 10.17. Hippopotamus and the fisherman in Lake Tana near Gorgora

[13] Adane, Cherie, Gedam, Getie Muchaye, Mengitie, Misganaw, Seyid, Tahir Kassu, Wotet, Worku,

Chapter Eleven Prehistoric Human Occupation, Subsistence and Adaptation around Lake Tana: Discussion of Results

As stated in the introduction, the aim of this thesis is to

1. examine archaeological material around Lake Tana

2. understand the adaptation of the people with an emphasis on the aquatic resources

3. understand changes overtime

These and other questions have been investigated through examination of the fauna and floral remains and material traces unearthed at the site. As Lyman (1982:331) argued, investigation of these aspects of archaeological sites provides wide range of information about human adaptation and interaction with the surrounding environment. Comparative archaeological and ethnographic material are also used to better understand the site and its material evidences.

11.1. Site Occupation, Material Evidences and Implication on Ancient Subsistence

As discussed in chapter five, material remains that suggest occupation at the site goes back to the sixth millennium BP. One charcoal and two human teeth samples provide dates as old as 5600 BP. The charcoal sample is dated to 5560+/-40 BP (Cal BC 4460 to 4340) while the two human teeth are 5668+/-20 BP (BC 4540 to 4458) and 5323+/-20 BP (BC 4236-4052) years old. As the C-14 dating indicated, the rock shelter could have been occupied to more recent time, until about the sixteenth and seventeenth centuries AD. Three C-14 charcoal samples are dated to 280+/-30 BP (Cal AD 1520 to 1590 and Cal AD 1620 to 1660), 290+/-30 BP (Cal AD 1500 to 1500 and Cal AD1510 to 1600) and 330+/-30 BP (Cal AD1460 to 1650).

The stratigraphic disturbance is a great constraint as to how we can interpret the cultural remains of the site. This is clearly shown in the radiometric dates. As discussed in chapter five, dated samples even from the same level of a single grid (square) offered quite different dates. For instance, one charcoal sample from level six of Grid 14N21E is dated to 5560+/-40 BP(Cal BC 4460 to 4340) while another sample from the same level and grid is 2150+/-20 BP.

Similarly, charcoal sample from level five of Grid 12N21E is identified to 2020+/-30 BP (Cal BC 350 to 290 and Cal BC 230 to 220 Cal BC 210 to 110) but the human tooth from the same level is 5668+/-20 BP (Cal BC 4540 to 4458). Four radiometric dates from Grid 15N21E still indicate site disturbance. The charcoal sample from level nine is dated to 4070+/-BP (Cal BC 2850 to 2810 and Cal BC 2750to 2720 Cal BC 2700 to 2480) while the sample from level eleven is as old as 2250+/-30 BP (Cal BC 390 to 340 and Cal BC 320 to 210). The cattle tooth from level twelve is dated to 1750+/-40 BP (Cal AD 180 to 190 and Cal AD 210 to 390). The human tooth sample from the upper middle level (level seven) of the same grid is 5323+/-20 BP (BC 4236 to 4052). As explained in chapter four, within the same level, the distribution of finds show great variation across adjacent grids. Together with the radiometric dates, these show post depositional activities at the site. Thus, change in subsistence as well as in material culture overtime cannot be discussed precisely. The C-14 dating on charcoal, human and cattle teeth, however, provide crucial data to trace site occupation and some aspects of subsistence change overtime. Some of the material evidences also show interregional similarities that may imply contact and interaction or possible movement of people in the past.

Based on the material remains, it is expected that the beginning of the occupation of the site may be traced back some time before 5600 BP. The excavation was limited to only small parts of the rock shelter and the samples dated are relatively few (13 samples). During the survey, abundant surface material were found around the site. Some of the lithic tools can easily be assigned to earlier periods (see fig 6 and 7). Thus, it is likely that there could be occupation prior to the oldest dated samples available at the site. The location of the site may also support quite older occupation.

The site is situated on the edge of the lake. It is also surrounded by different type of landscapes. As indicated in chapter three, mountains, plateaus, valleys and wide plains are found around the Lake basin and the site in particular. The lake is the largest water body in the country, which accounts for more than half of the fresh water resources. Along most parts of its shore, the lake also has large wet lands with permanent, semi permanent and seasonal swamps. In the past, particularly during the humid phases, such wet lands and swamps might have covered wider areas. These areas are favorable for aquatic animals and are rich in fish and bird fauna, and hippopotamus. The lake has diverse fish resources, about 27 fish species, 20 of which are endemic to the lake. The species variety of birds is more than 215. As discussed in chapter three, the basin generally has high amount of annual rainfall (about 1410 mm) with minimum variation in annual temperature. The annual lake level variation is also comparatively low (see Dupuis 1936; Conway 1997; Nagelkerke 1997; Wudneh 1998; Lamb et al. 2007; Vijverberg et al. 2009; Zenebe 2011). The surrounding area had different types of vegetation such as dense evergreen forests, woodlands, revirine, grasslands and thick bushes that had different types of wildlife (see Blashord-shell 1970; Yemene et al. 1985; Alelign et al. 2006; Molla et al. 2010). Such diverse environment and resources could have made this area favorable for ancient human occupation. In many parts of Africa, lakes and major river valleys were main habitation areas before the emergence of agriculture (see Phillipson 1977c, 2005; Stewart 1989:1; Haaland 1992; Barker 2006:285-95). Thus, the excavation at Kurtiye may only show one of the many sites with traces of prehistoric occupation in this localized rich aquatic environment. Proximity of the site to the lake and the surrounding wide plain, the isolated hills near the site and long chain of the plateau escarpment just to the north of the site may suggest different alternatives or choices for prehistoric human adaptation. Additional and extensive archaeological work along the lakeshore and in the surrounding plateau and escarpment may give a better picture about prehistoric settlement, subsistence as well as interregional interaction/contact and diffusion of material culture and idea.

11.2. Faunal Remains and Reconstruction of Subsistence

The site provided rich accumulation of artifacts and faunal remains. The faunal assemblages have high proportion of splinters and significant amount of burning marks and spiral shaped fractures. This indicates that they were products of intentional human activities. However, due to high degree of fragmentation and poor preservation, only limited parts of the faunal assemblages were identified to specific taxa and species, about 20 different animal species. There are also large amount of unidentified faunal remains that are generally classified as bovid and fish. Except for a single cattle and Caprine tooth, all the faunal remains identified belong to wild species. Remains of domestic fauna related to older occupation phases of the site are absent.

The diverse and abundant faunal remains thus signify strong reliance on aquatic resources and terrestrial games. Examination of the amount of faunal remains shows a clear domination of aquatic resources. More than 72% of the identified faunal remains of the site belong to fish and hippopotamus. Terrestrial games (herbivores) account for about 21%, rodent about 4%, small carnivore, bird, snake and shell are represented by less than 1% each (table 8.2). This may indicate that the main source of meat for the inhabitants of the site were aquatic animals, of which fish is by far the most dominant in the assemblage (about 69%). The dominant representation of fish in the faunal remains may not be attributed to differential preservation since this problem applies to the fish fauna as well. As Peters (1995:212) indicated, bones of some species of fish are more fragile and may be less preserved at a site.

Based on the abundance of fish and the location of the site, the dominant role of the aquatic resources in the subsistence bases of the inhabitants seems quite clear. However, questions may arise regarding the role of terrestrial animals in the economy of the people who occupied the site. The small amount of faunal remains of wild animals including hippopotamus may suggest that their role in subsistence was minor or other factors might have influenced their representation. I argue that both the terrestrial and aquatic mammals could have been consumed away from the site, and only parts of the animal's body could have been brought to the site. Most of the faunal assemblages at the rock shelter are fragments of bones. Faunal remains such as teeth are very limited. There are no remains such as phalanges in the faunal assemblage. These parts of the fauna can be preserved well. Their absence or scarcity at the site may suggest consumption around or near hunting areas. However, interpretation based on the absence of certain body parts of the animal such as tooth and phalanges should take into account other taphonomic factors. For example, these parts of the animal body (not meant for consumption) might have been easily thrown away from the rock shelter. Peters argued that different taphonomic factors may influence the frequency of faunal remains at a particular site. Certain parts of the animal body may be left around the kill site. For example, compared to its body weight, the head of an elephant has less food content. It is thus often left around the hunting area. This is an indication that the selected parts of the kill could be brought to the habitation site (Peters 1995:210-11; see also Dennell 1979).

It is thus possible to assume that terrestrial animals might also have constituted an important part in the subsistence of the site occupants. The abundant and diverse types of lithic artifacts excavated suggest the importance of hunting to the site occupants. Grinding stones recovered are few at the site, signifying the minor role of grain in the diet. The inhabitants might thus have complemented their aquatic food sources with terrestrial games.

The environmental aspects of the local area may substantiate this assumption. The area surrounding the site is often flooded during and immediately after the rainy season. This might have limited the availability of terrestrial games around the site during this part of the year.

Hunting could be frequently conducted in areas far from the site, and consumption of the games might also have taken place around the kill site. The rock shelter might have been used as temporary camp. The inhabitants could leave the site for a certain period such as during high flood season and /or return during another time of the year. This type of hunting and occupation strategy might have contributed to the limited amount of the diverse mammalian faunal assemblages found at the rock shelter. Seasonal shift in hunting and occupation areas is indicated in many prehistoric riverine and lacustrine sites in the Saharan and Nile Valley (Stewart 1989:31-40; Peters 1995:213-7).

The ethnographic data collected among the Woyto may provide additional insight about such kind of subsistence strategies among the occupants of the site. As indicated in chapter ten, there were situations in which the whole family of the Woyto community went to the kill site following the success in hippopotamus hunting. They spent days around the site where the hippopotamus was hunted or killed. Except for some parts of its meat, the rest was consumed around the hunting area. A similar kind of subsistence strategy might have contributed to the variation in the amount of faunal remains unearthed from the site.

In other words, such factors might have influenced the proportion of the faunal remains at the site. Particularly remains of aquatic animals such as hippopotamus would be represented in great abundance unless such kind of factors could have played a part. This is because, as indicated, hippopotamus could be abundant in the area. Until recently, hippopotamus was one of the main sources of subsistence as well as culturally important to the Wotyo people living along the lakeshore. These people who have settled around the lake were dependent on the resources of Lake Tana and Blue Nile River (see chapter ten). Ethnographic data cannot be directly linked to prehistoric behavior. Yet, it can give some useful insight on ancient human adaptation where ancient ecological and environmental setting is comparable to the ethnographic present (see Stewart 1989:65).

Alternative explanation may be sought in terms of abundant and stable supply of fish in the lake. Stewart (1989:31-47,227-8) argued that fish almost entirely dominated the faunal remains in many early Holocene aquatic sites in north and east Africa. Even in the terminal Pleistocene, fish was dominant along the Nile Valley sites. This is probably due to abundance supply of fish in such environments both in pluvial phases of the Holocene or arid phases in late Pleistocene when river levels were still low (see also Peters 1995:178-80).

The identified fish remains belong only to limited types of fish, tilapia and catfish. This is surprising in terms of the large number of fish species available in the lake. As indicated earlier, the lake contains 27 different species of fish. The limited types of fish species in the faunal assemblages at the site may be due to the abundance of these species as well as the spatial distribution of the fish resources of the lake. As Wudneh (1998:45-52) suggested, the fish of Lake Tana mainly show spatial rather than temporal variation. He argued that some species prefer shallow water and floodplains while other species are adapted to deep-water. He also described that Tilapia and Catfish, and about half the species of the Labeobarbus genera and Beso (Phragmites beso) are most frequent in the shallow waters or flood plains (see also Vijverberg et al. 2009:166). Similarly, Peters (1995:215-18) indicated these types of fish are more adapted to shallow water or flooded areas. Tilapia, Barbus and Clarias can stay in small pools even with increasing recession of the flood. The lake has wide swamps; especially the shore of the lake northeast of the site has wide plains that are flooded during the rainy season. The flood plains significantly retreat for a short period mainly around the end of the dry season. These areas could thus accommodate plenty of fish for most of the year. During the dry season too, these types of fish might have been available around shallow water of the lakeshore and retreating swamps. Therefore, occupants of the site could have easy access to these varieties of fish throughout most of the year, however they seem to have exploited a limited range of aquatic resources.

This assumption may be supported by the absence of fishing technologies efficient for deep-water fishing. Tools typical to fishing activities such as harpoons, fishhooks, and net sinkers discovered from many aquatic sites in the Nile Valley and east African Holocene aquatic sites (Phillipson 1977b; Stewart 1989:33-47; Haaland 1992, 1993, 1995a) are totally absent at Kurtiye rock shelter. As indicated in chapter ten, simple technologies such as *Kefo* (hives), *nisa*, *mekfefiya* (small net), *dula/betir* (stick), and *merz* (use of poison) might have been used for fishing. Some of these fishing technologies are efficient to catch as much fish as possible at a time, near the shore of the lake. People might have used simple boats made of reed to travel along the lake especially during the dry season. Material of the type used is highly fragile and perishable, and therefore unlikely to be preserved unless under special situations. On the other hand, compared to such simple fishing implements, harpoons, net sinkers and fishhooks can be preserved better (see Stewart 1989: 77; Peters 1995:223-4). Their absence at Kurtiye rock shelter is most likely not attributed to preservation problems.

The abundant and rich supply of fish resources in Lake Tana might therefore have accounted for the absence of more elaborate and efficient fishing equipment such as harpoons. If the wide swamps and shallow lakeshores supported fish in great abundance, which could be caught using simple fishing equipment, people might not need to develop such efficient fishing technology. As local fishermen around the site argued, in the rainy season large fish such as catfish are available on shallow waters along the shore of the lake and even on the flooded plains in great abundance. Generally, the time immediately before and after the rainy season favor some type of fish to appear in abundance to the shore of the lake. Some varieties on the other hand are more available near the lakeshore during the rainy season. Still other species of fish are easily available near the edge of the lake in the dry months. This may imply year round supply of aquatic resources. The absence of other fish taxa in the faunal assemblages at the site may also suggest the absence of stress on aquatic resources. Changes in the diversity and type of fish taxa and fishing equipment at a particular site often suggest changes in the abundance of resources, stress as well as changes in aquatic environment (Stewart 1989:77).

Furthermore, fishing at the site might have been carried out by using lithc tools. Particularly, microliths, which are abundant at the site, might have been utilized for fishing purpose. Brandt (1982:302) and Fernandez (2007) suggested that microliths could be used for fishing. The use of spears for fishing has been common in many parts of sub-Saharan Africa (see Peters 1995:223-4). Inserted as arrow tips, the microliths might have been used as spears to catch large fish such as catfish. As discussed in chapter ten, local Woyto people used to catch catfish by piercing it with metal spears. Before the introduction of metal spears, microlithics might have been used in a similar way. This may be one possible reason for the absence of harpoons and other elaborate fishing equipment at the site.

In addition to the ease availability and great abundance of certain types of fish, cultural factors and preferences should be assessed. It is difficult to explain how such factors influenced the use of certain technology in the ancient past. Catfish is the most preferred type of fish among the hunting and fishing Woyto community of Lake Tana today. It is preferred for its meat, medicinal and ritual values (see chapter Ten). If such factors were important in ancient times too, it would influence the types of technology used for fishing as well as the quantity of fish in the faunal assemblages at a site. Stewart's observation may support the importance of such factor. She argued that variation in the proportion of fish types in the faunal assemblage might be influenced by culinary or fishing preference as well (Stewart 1989:226; see also Peters

1995:211-2). The role of such factors may be important at the site since remains of shallow water fish such as Barbus and Labeo are not indentified in the faunal inventory from Kurtiye rock shelter. Peters (1995:218-9,223) argued these species are often caught in shallow waters or in the spawning locations. According to Vijverberg et al. (2009:174), many of the species of Labeobarbus and all of the species of the Barbus genera are among the commonly available types of fish in Lake Tana. In terms of size, most of the Labeobarbus species are comparable or can be bigger in maximum length than tilapia and catfish (ibid: 174-8). Moreover, "the Barbus and Labeobarbus species dominate the fish community in terms of biomass and production (ibid: 178)." These types of fish, as observed among local fishers, are caught using the traditional fishing equipment such as *Kefo* (hives), *nisa*, *mekfefiya* (small net) and *dula/betir* (stick) (see also Peters 1995:223). Stewart (1989) suggested that procurement and processing areas might cause differences in the representation of fish fauna. Yet, Peters (1995:233) indicated that Barbus, Labeo and Clarias could be processed elsewhere. However, "the overall impression is that they were brought to the site in *toto*." Hence, their absence in the archaeological record at Kurtiye rock shelter may suggest cultural preference or other factors. Probably, consumption of raw fish meat may account for such kind of difference. I observed among the local fishers of Lake Tana that fish type called *Kereso* (Labeo species?) was eaten raw around the procurement area.

As indicated, remains of mammals, birds and reptiles are few at the site. Most of the terrestrial mammalian faunal are identified as large, small and medium bovid. Large amount of faunal remains are unidentified bovid. Compared to fish fauna, this group is limited in the faunal assemblage. Birds and reptiles are negligible. The few remains of bird in the assemblage, in view of their great diversity around the lake, are still enigmatic. The faunal remains in general indicate the dominant role of aquatic resources, particularly fish in the subsistence of the inhabitants.

Another point that needs to be discussed is the seasonality and place for hunting games by the site inhabitants. Such types of issues may be better understand by examining the nature of the site and surrounding environment in relation to the type of faunal remains identified at the site. Peters (1995:214) remarked that "when, where and how animals can be captured is primarily determined by the biology of the species and only by the available equipment." Since the hydrological cycle of the aquatic bodies influences the seasonal distribution or availability of the animals, it would be essential to know the topography, rainfall pattern and behavior of the animals often encountered (ibid).

Based on the species identified in the faunal assemblages, most of the games seem to be adapted to open grassland environment. The expansion of the lakeshore and swamps during the rainy season might have forced most of the games to retreat to better-suited areas to a considerable distance away from around the site. They could thus be available on the shallow and well-drained areas located mainly to west and northwest of the site. This area may be ideal for such games particularly during the rainy season. The wide swamps northeast or north of the rock shelter would be heavily flooded during the rainy reason, but may be favorable grazing land in the dry season. Consequently, in the rainy season, most of the games might have been hunted around well-drained areas away from the site. Hunting around the site could take place during the dry season when grazing pasture and water would be available. Hippopotamus may be hunted all year round from the shore of the lake or in the surrounding swamps, as it prefers to dwell in such environment. Increased flooding around the site might also have restricted occupation in the rock shelter during the rainy season. The types of fish identified at the site are shallow water species. They might thus be caught and exploited at any time of the year. However, the amount of fish caught may vary according to the season or time of their maximum abundance. Peters suggested that the beginning of the flooding season or the time when the water receded is the most important fishing period (Peters 1995:216). The shallowness of the Lake with its wide swamp and the diverse topography of the area around the site might have accommodated year round food supply. There could, however, be seasonal scheduling of food procuring strategies. The availability of few selected species in the assemblages suggests that the inhabitants were "selectionist" rather than "generalist." This pattern of subsistence and lack of elaborate fishing technology such as harpoons was defined as subsistence adaptation common to situations where resources were abundant, and population pressure and stress were less (See Stewart 1989:227-9).

11.3. The Archaeological Material and Implications on Subsistence

The archaeological material recovered at the site is dominated by a variety of lithic tools and abundant fragment of potsherds. As discussed in chapter six, lithic tools are numerous and diverse which include geometric and non-geometric microliths, blades, curved backed tools, scrapers, points, engraving tools, retouched and utilized flakes. These tools could have been used for activities related to hunting and fishing. The large points and microliths could have been used for hunting. Microliths, as mentioned, might have been used for fishing activities as well. The abundant blades could have been used to process the hunted game. Some of the other group of tools, as discussed in chapter six, could be used for shaping wooden objects for shaft or handle to arrow tips. The abundant microliths and curved backed tools might have been inserted as arrow tips or lateral barbs for hunting games or for fishing. The tiny microliths in particular could be more effective and dependable for hunting especially with the use of poison. In the past, the practice of using poison smeared over metal spears for hunting hippo was a common practice among the Woyto of Lake Tana (see chapter ten).

The diversity and abundance of lithic tools may also indicate frequent occupation at the site. It may represent different cultural activities or imply changes in lithic technology in relation to the abundance and scarcity of local resources. This could most likely occur following changes in climate and local environment. Changes in local environment often lead to changes in the type and abundance of wild animals. The various types of lithic tools may thus indicate different adaptation mechanisms under varied environmental circumstances and associated changes in local resources. Some studies indicate that changes in the tool types at a particular site or region overtime may be related to changes in environment and resultant changes in the availability and types of games. For instance, Fernandez (2007) argued that in the Mesolithic sites of Blue Nile region of Sudan, backed points and narrow crescents were abundant in the earliest occupation phases. Broad crescents and curved backed tools became abundant in the later occupation phases. He interpreted such changes in terms of climate change and resultant changes in the availability of games i.e. decline of big game and relative abundance of smaller and faster games overtime. Studies in the Levant demonstrated that crescents and other small non-geometric microliths increased in quantity in many early Holocene sites. This coincided with decrease in the availability of games and increase in human population and settlement. Their abundance in the archaeological record thus indicates more effective resource utilization strategy (Yaroshevich et al. 2010). Similarly, Phillipson (1977:31) proposed that the evolution of microliths in sub-Saharan Africa might be linked to changes in the accessibility and type of games due to changes in climate and environment. Their abundance at a site implies the need for tools quite efficient to hunt small games in more dense and woody environment or in situations when games became limited in the surrounding areas.

Due to the stratigraphic problem at Kurtiye rock shelter, it is impossible to reconstruct adaptation strategies during a certain time period, and changing environment and availability of games based on the types of the lithic tools. In addition, archaeological studies in the area are very limited. Thus, we lack clear picture about the type and intensity of wild animals in prehistoric times. In addition, we have no information about the density of prehistoric settlement. More comparative sites are essential to investigate the palaeofaunal, density of human settlement, changes in material culture and other related aspects of the region.

The pottery material recovered from the site may still be valuable to reconstruct site occupation and subsistence. Small fragments dominate the potsherds, but reconstruction from bigger ones indicates that there were bowls, small globular vessels or pots. Pottery fragments with features similar to ceramics used for baking bread or local dish are quite limited and appear mainly inside the rock shelter or near the surface. This part of the rock shelter as inferred in the radiometric dates mainly represents recent occupation. Thus, the small vessels and pots might have been used for boiling and cooking of terrestrial as well as aquatic animals. As indicated in chapter eight, the bone fragments show high degree of breakage for bone marrow extraction (see the report by Lesur). Such fragmentation of bones would also be for fitting the bone to boiling utensils (see Stewart 1989; Peters 1995:237). Pots might have been used for boiling vegetable foods and root plants that do not need grinding utensils. As indicated in the ethnographic data, the hunting and foraging Woyto people were utilizing such types of resources through boiling (see chapter ten). As mentioned, grinding stones at the site are few. If grains (both wild and domestic) were parts of the main subsistence of the site occupants, there could have been significant amount of grinding stones. Mortar/pestle and sickle blades that may be functionally linked to processing plant foods are also absent. This further supports that plant foods, particularly grains, might have had minor role in the diet.

The abundance of pottery and the limited amount of grinding stones at the site suggests that pottery might have been used to exploit fish and wild animals and possibly vegetable and root plants. Since faunal remains are abundant at the site, the use of pottery for processing animal would be more significant. In Africa, it is even suggested that the invention of pottery could be related to utilization of aquatic resources in the form of stew and soup, and porridge (see Sutton 1974, 1976; Stewart 1989:38; Haaland 1992). Absence of sufficient plant processing tools at the site may imply limited plant management practices that could have limited effect on the processes leading to early cultivation and domestication of local crops.

This interpretation, however, does not totally exclude exploitation of plants. Although I have not yet established whether they were domestic or wild, isotope analysis on two human teeth dated to about 5600 BP indicates utilization of C4 plants. These could be *teff*, finger millet, sorghum and other C4 plants (D' Andrea, pers. com.). These are the most widely cultivated crops around the site today. Interestingly, the few grinding stones excavated at the site have very smooth surfaces. This type of grinding stones is more appropriate to grind small cereal grains such as *teff* (see chapter six). This suggests that the inhabitants could have utilized indigenous crops. It may also imply that there could be other nearby open sites possessing material evidences such as grinding stones that are related to processing grain food. Future study may reveal more open site that may have different types of material remains in the area.

In general, with the available data, the earliest evidence of human occupation at the site is dated to around early mid Holocene. Grinding stones and floral remains are very rare. The domestic faunal assemblage consists of only one cattle tooth dated to early first millennium AD, and Caprine tooth uncovered from a level dated to the second millennium AD. It thus seems that, hunting-foraging and fishing were the basis of subsistence to the inhabitants of Kurtiye rock shelter at least until the end of the first millennium BC. Except the single Caprine tooth, all the faunal remains from the levels dated to the second millennium AD are wild fauna and fish. This suggests continuity of hunting and gathering ways of life around the site even after the development of agriculture in the region. Ethnographic and oral data collected among the hunting foraging Woyto indicated that this subsistence strategy continued until recently (see chapter ten). This pattern of subsistence was documented from a couple of sites in Africa (see chapter one; Gonzalez-Ruibal, et al. 2014).

To conclude based on the diversity of the faunal assemblages, the inhabitants of the site seemed to have been adapted to broad-spectrum resource utilization. Until about the end of the first millennium BC (the first evidence of domesticate animals available at the site), subsistence based on wild resources could be the main economic activities around the site.

11. 4. Material Remains and Interregional Affinity

In this section, I will examine the lithic and pottery material in terms of their similarities with material from other areas. Examination of the material evidences of a particular site in relation to other sites would enable us to better understand the site and material remains. It could be useful to investigate regional or interregional interactions and/or diffusion of material culture, and assess opportunities and challenges of the site compared to other regions. Investigating such issues may allow us to examine whether certain event or culture was wide spread or limited only to specific regions. This may in turn be useful to understand why and how prehistoric adaptation and occupation at a particular area could differ or resemble to situations in other regions.

This approach can be relevant if we have securely dated archaeological context and laboratory analysis of artifacts and proper identification of their raw material sources. The material evidence from Kurtiye rock shelter has not yet been comprehensively analyzed using relevant laboratory such as analysis of raw material sources. As discussed earlier, the site has stratigraphic disturbance. Such problems make interpretation of the archaeological remains difficult. Nevertheless, typological analysis of the material gives some clue on regional and interregional interaction. This may perhaps be relevant to assess prehistoric adaptations and interactions of the site occupants from a comparative perspective.

11.4.1. Lithic Material: Interregional Comparison

As stated in the preceding section, the site has dense concentration of lithic material. Based on frequency of tools, the lithic industry of the site can broadly be attributed to a microlith and blade tool tradition. These and other types of tools such as scrapers were common in Holocene sites of the Horn of Africa (Brandt 1986). The large points, curved backed tools, side scrapers and circular scrapers of Kurtiye rock shelter may, however, be traces of earlier occupations and represent tool traditions of older periods. Such types of tools from Gorgora rock shelter and Benishangul cave sites were for instance dated to Middle Stone Age Industry (see Clark 1988b; Fernandez et al. 2007). As Barnett (1999b:98) pointed out for the Gorgora material, the occurrence of large points, curved backed tools, side scrapers and circular scrapers together with Late Stone Age Industry may be due to stratgiraphic mix up.

Based on tool typology, a general comparison can be made with other sites in the region. The lithic tools of Kurtiye rock shelter can partly be related to tools recovered from Gorgora rock shelter (located about7-8 km west of Kurtiye). Scrapers, backed blades, blades, points, microliths and burins are common to both sites (see Barnett 1999b:107 for lithics from Gorgora rock shelter). Such similarity in lithic tools between these sites may imply contemporaneous occupation, and/ or similar adaptation or subsistence strategy.

However, Kurtiye lithic industry lacked marked similarity to tools recovered from Lalibela and Natchabet caves (about 100 km east of Lake Tana). The absence of significant similarity in the composition of lithic tools may be due to temporal gaps of occupation. The oldest occupation from Lalibela and Natchabet caves is dated to mid first millennium BC. This is quite late compared to the evidence from Kurtiye rock shelter. The variation in tool composition may also suggest different subsistence strategies in the region. The remains of domestic crops and animals discovered from Lalibela and Natchabet caves, contrary to Kurtiye rock shelter, may support this assumption (see Dombrowski 1971).

Surprisingly, lithic material recovered from Kurtiye rock shelter may be comparable to tools discovered from Benishagul sites located far from Lake Tana in the southwest and west (Fig 2.1. & Fig. 2. 2). Both sites had unifacial points, denticulates, side scrapers, end scrapers, elongated flakes and blades. However, microliths, abundant at Kurtiye, were absent or rare at Benishangul sites. This, as the authors proposed, could be due to the absence of good quality raw material for production of microliths at the latter site. Most of the tools from Benishangul sites are made of poor quality quartz (see Fernandez et al. 2007; Fernandez 2007). Yet, the similarity in other types of lithic tools may imply related subsistence strategy, and/or possible contact between the two regions. As presented in chapter seven, pottery excavated at Kurtiye rock shelter show strong similarity to pottery from Benishangul sites. Spaced and packed rocker stamp, alternate pivoting stamp, cord impression and simple incised and impressed dotted line pottery decorations identified from Benishangul sites are typical to pottery decorations of Kurtiye rock shelter (see also Fernandez et al. 2007:113, 120). This may imply some sort of interaction and contact between these two regions. As indicated in chapter two and four, oral traditions suggest movement of people from the lowlands to the highland in ancient times. There were also significant fluctuations in the palaeoclimate of Ethiopia and the Horn (see chapter three). Aquatic resources of Lake Tana area might have attracted people from different areas at least during such climatic instability. Future archaeological survey and excavations between Lake Tana and western lowlands may reveal data crucial to investigate such and other aspects of the region's prehistory.

The few obsidian microliths excavated at Kurtiye rock shelter may still give some insight about possible ancient interregional contact and interaction. In the excavation, we found a few obsidian tools (10). Such limited amount of obsidian tools, without obsidian debitage, may imply distant sources of these tools. Studies about obsidian sources around the study area are not yet available. Due to the stratigraphic problem at the site, it is difficult to determine the temporal context of these tools. Dating and trace element analysis of the obsidian tools will help us to indicate their original source area and assess period of interregional interaction. Identifying the source areas, exploring the use (social and functional dimensions), circulation and production of artifacts can provide much information about past society and interregional relations (see Edwards 2007:217).

Obsidian and other prestigious items were circulated widely across the Nile Valley and Red Sea since prehistoric times. The Rift Valley area and northern Ethiopia highlands were among the main sources of the obsidian items (Fattovich 1996; Agazi 2001: 211-2; Khaldi 2009). The obsidian tools excavated at Kurtiye rock shelter might have been brought from these known sources or other areas. This and other evidences such as pottery may thus suggest possible regional interaction of inhabitants of the site.

Among people living around Lake Tana, obsidian and other cryptocrystalline rocks such as chert, chalcedony and agate have strong symbolic and ritual values. They are considered very useful in protecting people and resources from dangerous spirits. They are also used in fertility rite, in death rituals and symbolize ancestral cult. Such values might have dictated long distant circulation of lithic raw material or tools. Diffusion and spread of ideas and objects widely over long distances were inferred from many prehistoric sites (see Edwards 2007:217).

11.4.2. Pottery: Implication on Interregional Interaction/Contact

As discussed in chapter seven, pottery decoration motifs of Kurtiye rock shelter show strong similarities with material from other areas. Here, I shall discuss the implications of such similarities on ancient interaction and contact. I will also examine the possible impact of the regional/interregional contact or interaction on the subsistence tradition of the site inhabitants.

Impressed and rocker stamp decorations were the most diagnostic motifs of Kurtiye pottery. Sherds with such decoration motifs were excavated from lower/lower middle levels of grids outside the rock shelter. The levels with some pottery fragments of this type were dated to about 5600 BP. It is difficult to precisely attribute these sherds to this period of occupation due to the stratigraphic problem discussed above. However, most sherds excavated from the inner grids were similar to contemporary pottery. The C-14 dates from these grids revealed occupations that were mainly recent. This may indicate that later occupants could have removed material of earlier occupations inside the rock shelter. This in turn suggests that sherds excavated from outer grids of Kurtiye rock shelter were from earlier occupation. This could be useful to indicate inter-site relation and ancient regional contact since most of the sherds with diagnostic decoration motifs were uncovered from this part of the rock shelter.

Decoration motifs of Kurtiye pottery did not show marked similarity to ceramics excavated from sites around Lake Tana, such as Gorgora rock shelter and Lalibela and Natchabet cave sites. As indicated in chapter two, pottery excavated from Lalibela and Natchabet caves were similar to contemporary pottery of the area and therefore lacked parallels to Kurtiye pottery. Pottery from Gorgora rock shelter showed few similarities to that of Kurtiye pottery, but diagnostic decoration motifs (dotted and rocker stamp impressions) were absent on Gorgora pottery. This is surprising in view of its proximity to Kurtiye rock shelter.

The lack of marked similarity in decoration motifs of pottery from these two sites which are located quite close to each other may be attributed to temporal gaps in occupation and /or the two sites might be occupied by people with different material culture. Movement of people between these nearby sites might have most likely occurred. The decoration motifs of Kurtiye pottery had similarities with pottery from distant regions. The pottery bearing contexts of the two sites may thus reflect different period of occupations rather than being occupied by people with different culture. However, this should be confirmed with additional data because the pottery bearing context of Gorgora rock shelter was dated only stratigraphically (see Barnett 1999b:112).

As indicated in chapter seven, Kurtiye pottery indicated remarkable regional similarity. Dotted impressed lines and rocker stamp decoration motifs showed strong similarities with pottery excavated from sites in Nile Valley Sudan, Sahara, Wadi Howar (eastern Sahara/Sudan), East African lakes region and western Ethiopia. The few eroded sherds apparently with dotted impressed wavy line motif may be compared to pottery from Khartoum/central Nile Valley, Atbara, Niger, Libyan Sahara, and East Africa lakes region (see Stewart 1989:44; Haaland 1992, 1995b:113-5; Mohammed–Ali and Khabir 2003; Edwards 2007). Pottery with this type of decoration has a wide range of dates. They have been dated to the 9th millennium BP and as late as the 6^{th} millennium BP (Haaland 1992, 1993; Mohammed–Ali and Khabir 2003; Keding 2000; Garcea 2004; Fernandez et al. 2003, Fernandez 2007). Pottery from Benishingul was late i.e. between 5000-4500 bp and the third millennium bp (Fernandez 2003, 2007; Fernandez et al. 2007).

Mat impressed, comb impressed, fingernail impressions and deeply incised straight-line motifs, simple incisions and incised hatches seen on the Kurtiye pottery were also typical to ceramics from sites in eastern Sudan and Ethiopia. As discussed in chapter seven, these types of pottery were recovered in Butana eastern Sudan (see Fattovich, et al. 1984:179-180,183), Rabak south of Khartoum (c.6000-4500 BP) and Shaqudad further north (c.4880+/-180 bc to 4430+/-180 bc) (Haaland 1989, 1992, 1993: Mohammed-Ali and Khabir 2003), and a number of sites in Tigray northern Ethiopia, Lake Besaka eastern Ethiopia, and Aqordat in western Eretria (see Chapter two; also Barnett 1999b:113-5; Negash 2001:213; Finneran 2007:59-64).

In sum, most of the decoration motifs of pottery recovered from Kurtiye show wide regional similarity such as with material from the Sahara, Nile Valley and other parts of the Sudan, northern Ethiopia and northeastern parts of the Ethiopian Rift Valley and Benishangul area. Dotted impressed and rocker stamp decoration motifs, which were common in sub-Saharan Africa, were in particular abundant at Kurtiye rock shelter.

The problem is what is the implication of this wide range of regional similarities in pottery decoration?

Based on similarity in pottery material, Fernandez et al. (2007) argued in favor of movement of people between the Sudan and western Ethiopia in prehistoric times (also Fernandez 2003, 2007). Haaland (1992) and Mohammed-Ali and Khabir (2003) likewise discussed movement of people out of the Nile Valley and the Sahara in subsequent millennia in the Holocene. Technology as well as the idea of tool making, or people with their technology could thus have spread across wider regions (see also Edwards 2007). Haaland (1992:47) in particular argued that the wide distribution of similar pottery decorations across the Nile Valley, Sahara and east African lake region could imply a common area of origin of the tradition. Invented around the Nile Valley by people dependent on aquatic resources, it could then spread to other areas through expansion of people. Otherwise, "it is unlikely that similar types of pottery were being developed in different areas." Mohammed-Ali and Khabir (2003) argued that the distribution of incised and dotted impressed wavy line pottery across the Sahara and Nile Valley might be due to diffusion of the idea and technology of pottery making. The technology along with decorative motifs could diffuse through inter-group interaction and contact (Stojanowski and Knudson 2011:58-9), more likely through cultural exchange between hunters and pastoralists (Smith 2005:140-1), or it could be independently invented (see Stewart 1989; Holl 2005).

Functional necessity may lead to independent invention of similar technology in different regions. However, as I argued in the introduction, it is less likely to find similar decoration motifs across these vast regions in prehistoric times unless there was some degree of contact. This is because decorations often have symbolic or socio-cultural implications rather than being functional. As indicated in the ethnographic data in chapter seven, pottery decorations represent ethnic or gender identity. Such tradition might have spread or diffuse through migration of people, or as demonstrated in contemporary society practices, objects and traditions of certain group might be adapted by their neighbors and be adopted eventually (Gonzalez-Ruibal, et al. 2014).

Based on the pottery material, I argued that inhabitants of Kurtiye appear to have had wide regional contact or interaction. They could therefore be in contact with people migrating across the Nile Valley, Sahara, western and northern Ethiopia. Occupation at Kurtiye rock shelter was dated to the sixth millennium BP. Pottery reflecting wide regional similarities, as mentioned, seemed to be from older occupations of the site. Such interactions may apparently be traced back to mid Holocene. Consequently, other cultural elements such as domestic species or idea of subsistence technologies might have been introduced to the Lake Tana area during as an early contact period. Contact and probably movement of people (agro pastoral) between northern Ethiopia and eastern Sudan was proposed based on similarities in pottery and other material remains. This was assumed to be one of the routes and mechanisms through which domestic animals were introduced to northern Ethiopian highlands (see Brandt 1982:294-5; Phillipson 1977c:62; Clark 1988a; Barnett 1999b; Negash 2001:212-3; Finneran 2007:61-4). Citing similarities between Narosura ware and northwestern Ethiopian pottery, Bower (1991:74-5) proposed movement of pastoral groups from this part of Ethiopia farther south to Kenya.

Domestic cattle appeared in the eastern Sahara and Nile Valley in the late early Holocene. "Domestic livestock was present in riverine northern and central Sudan by about 5000 BC, spreading south ward to reach northern Kenya in about 3000 BC (Edwards 2007:216)." Cattle herding and possibly cultivation of wild sorghum was quite old in the Nile Valley Sudan going back to around sixth millennium BP (see Haaland 1992). Between 6000 to 4000 BP, pastoralist moved out of the Nile Valley and spread to different direction perhaps due to population growth and increased aridity (Phillipson 1977c:64; Ambrose 1998, Barnett 1999b; Marshall and Hildebrand 2002). Domestic cattle in Northern and eastern Ethiopia were evident in the fourth millennium BP (Brandt and Carder 1987; Clark 1988b; Harrower et al. 2010), which is recent even compared to the neighboring regions. The data from Kurtiye rock shelter was more recent.

Such time lag in the spread of domestic animals to Lake Tana area is surprising in view of the possible wide interregional contact, proximity to the Nile Valley Sudan and its large aquatic environment. As indicated in chapter one, aquatic environments could favor early human occupation particularly during environmental and climatic deterioration (see also Phillipson 1977c:61; Brandt 1986). Clark (1988a) expects that, at least following the severe mid Holocene aridity, aquatic resources of Lake Tana could better suit for human occupation. It could also attract people from other areas. Local population growth and people from other areas could then lead to increased population or demographic pressure. One would expect the site to demonstrate changes in prehistoric subsistence quite much earlier than the available evidence indicates. Although the preliminary results of C13 and N15 isotope samples dated around 5500 BP suggest utilization of C4 plants, at the moment, it is difficult to determine whether they were domestic or wild. There were no material remains that may be related to harvesting of plants. Domestic faunal remain was dated quite late, early first millennium AD.

It is necessary to investigate how hunting and gathering continued in the region until the late Holocene? Why did not palaeoclimatic changes and ensuing environmental deteriorations lead to changes in subsistence or adaptation in the region? Why was the evidence of domesticates late compared even to other sites despite possible wide interregional contacts? I will approach these and other questions based on the assumption I proposed in chapter one.

11.5. Subsistence Strategies around Lake Tana: Explanations for Long Continuity of Aquatic Adaptation

The foregoing discussion indicated that prehistoric subsistence around the site was dependent on hunting and foraging economy with great emphasis on aquatic resources. The domination of the faunal remains by aquatic animals mainly fish suggests the vital role of these resources in the subsistence of the inhabitants of the site even to the historic period.

In chapter one, I proposed that human occupation and subsistence around Lake Tana were influenced by local environmental, socio-cultural and symbolic factors with an emphasis mainly on aquatic sites. I briefly reviewed the approaches proposed to explain subsistence transition in the Nile Valley, sub-Saharan and eastern African lake regions. Mode 5 lithic industries dominated by microliths, pottery, bone harpoons and other fishing equipment, aquatic fauna mainly fish, and fowls and wide ranges of wild animals define the material remains of these sites (see Sutton 1974, 1977; Phillipson 1977c: 45-9, 57, 2005:151-2; Stewart 1989:7-8,327-8; Haaland 1992, 1993). As I mentioned, these sites had rich resources which were often considered crucial for the rise of semi-sedentary and sedentary settlement (see Phillipson 1977c:60-1, 71, 2005: 159-60; Brandt 1986; Clark 1988b; Haaland 1992, 1995a). I summarized the current debate on the role and contribution of aquatic environment in prehistoric adaptation. Some scholars argued that increased sedentism around aquatic sites due to intensified utilization of their rich resources might have led to population growth and socio-economic and cultural changes(see for instance Phillipson 1977c:60-1; Haaland1992; Smith 2005:55-64). These were crucial transformations for the transition towards agriculture (ibid). However, others argued that abundant and predictable resource of aquatic areas could have delayed the adoption and spread of agriculture (Sutton 1974; Wendorf and Schild 1980:273; Clark 1984:113-26).

Foragers and fishermen in sub-Saharan Africa began semi-sedentary and sedentary settlement perhaps as early as 6000 bc, or quite earlier in the Nile Valley (see Phillipson 1977c:49 71, 2005:160). Similarity in the material culture of the aquatic sites was also assumed to reflect a parallel adaptation strategy of people living in similar or related environment (ibid; also Stewart 1989:237-9; Holl 2005). Sutton (1974, 1977) argued that following mid Holocene climatic aridity, several aquatic societies in sub-Saharan Africa started cultivation and/or pastoral activities. Demographic and socio-economic changes accompanied by ecological or environmental changes brought about herding and cultivation. These activities were earlier in the Nile Valley Sudan than sites in the south (Haaland 1992).

Furthermore, it is proposed that these aquatic sites were located in areas where African local cereals were initially cultivated. Phillipson (1977:59-60) pointed that the region where African crops first brought under cultivation was “the southern parts of the broad belts of the territory which was occupied by the early fishermen.” This may signify the role of early fishing settlements for the adoption of agriculture in sub-Saharan Africa.

The situation around Kurtiye rock shelter contrasts to this scenario since the material evidence demonstrated continuation of aquatic adaption to the historic period. As I proposed earlier, this contrasting situation could be related to environmental and socio-cultural and symbolic factors essential to the occupants of the site.

11.5.1. Environmental Factors

The abundant fish remains and diverse ranges of wild fauna recovered from Kurtiye imply broad-spectrum resource utilization. The abundant and predictable resources of the lake and its environs, as implied in the material remain and insight from other aquatic areas, could thus have permitted long continuation of aquatic adaptation around Lake Tana.

As discussed, Kurtiye rock shelter did not reveal an elaborate fishing technology. Despite great diversity of fish in the lake, the fish fauna identified were also represented by few varieties which could be caught easily offshore. This implies that resources were abundant and/or population pressure might have been insignificant. Comparative studies on aquatic sites showed that limited fish taxa in the archaeological remain entail resource abundance and/or limited population pressure near the site. On the other hand, diverse fish faunal (including previously unexploited varieties), and varied and elaborate fishing technologies suggest resource stress. Fishing equipment such as stone rings and grooved stones were indications of intensive fishing and increased population, deteriorating aquatic environment and difficulty of offshore fishing (Stewart 1989:237-9). The absence of such and other fishing equipment at Kurtiye rock shelter may therefore signify rich and predictable resources and/or limited demographic pressure. This could be a potential limiting factor for early subsistence transition around the site. As Clark (1988a:56-7) proposed improved subsistence strategies could be adopted if environmental conditions threatened existing relation between people and natural resources. For instance, herding in sub-Saharan Africa was adopted when hunting could no longer support the meat demands of the growing population (Clutton-Brock 1993:70). In some parts of sub-Saharan Africa, where rich and dependable wild resources were available, subsistence based on domestic species could have begun quite late (Phillipson 1977c:18-9, 69, 2005:172, 186, 212; Haaland 1981:207).

However, resource abundance alone may be insufficient to explain the nature and pattern of prehistoric subsistence around Lake Tana area. This is particularly true if the site is examined in terms of ancient environment and climate change. As discussed in chapter three, the Lake Tana catchment experienced different environmental and climatic changes since at least late Pleistocene. Lake Tana core sediments showed a number of brief arid events even in the early Holocene and a general shift to arid condition even before mid Holocene (see Marshall et al. 2011). This situation could have its own influence on the availability and dependability of local resources. There might, for example, be shift in the vertical distribution and intensity of natural vegetation (see chapter three). This would also affect the distribution of wild fauna and flora probably leading to increased pressure on local resources and changes in subsistence around the site. This is because human subsistence behavior is considered partly a response to changes in environment and demographic pressure (Phillipson 1977c:18-9, 2005:172,198).

If changes in resource availability and environmental conditions were so crucial, there could be traces of changes in subsistence at the site at least after the severe palaeoclimatic and environmental deterioration in mid Holocene. Studies on prehistoric adaptation showed that rich aquatic resources would even attract more people which eventually led to depletion of local resources. This could in turn push people to take different adaptation strategies such as diversification of subsistence (see Stewart 1989:228). The archaeological evidence at Kurtiye demonstrated hunting-gathering and fishing economy even to the early first millennium AD. We should then address the issue how resources in the region remained so abundant and predictable. There could be additional factor that influenced the demographic pattern as well as subsistence behavior of the inhabitants of the area. I will approach this problem in terms of other environmental factors affecting population settlement or density in the region.

I argued that the impact of the highland plateau on population density and settlement pattern might have been additional factor. This could likely happen through the effect of high altitude on human physiological adaptation and the impact of cold highland environment on the distribution of resources and people. Since the site is located in the highlands, this factor could significantly influence the demography and settlement pattern. The oldest evidence of occupation at the site may be comparable to the severe climate and environmental changes of mid Holocene that prevailed across wider regions in Africa (see chapter three). As mentioned earlier, in many areas, change in subsistence was evident following this event. However, this was not the case around Lake Tana. Therefore, it is possible to assume that this area could have limited human occupation or the site might not have been occupied in the early Holocene. As indicated in chapter three, soil erosion was documented in the Tana catchment area after about mid Holocene. Evidence of significant anthropogenic impact in the catchment was inferred only in the early Christian era (see Marshall et al. 2011). This may suggest that the region did not experience demographic pressure perhaps until late Holocene. Therefore, the impact of higher elevation on human occupation could be considered as one potential factor in limiting the demographic pattern in the region. Some studies suggested that the highland plateau such as in Ethiopia could be a constraint for human occupation even in the early Holocene. Settlement widely over the highlands might have been possible after about the major climatic and environmental changes of the Holocene (Aldenderfer 2006; Finneran 2007:48). Evidence implying significant population pressure in northern Ethiopian highlands also appeared after about mid Holocene, more clearly in late Holocene. The picture from other parts of the country seems even late (see chapter three). As mentioned above, low population density was considered as a delaying factor for subsistence changes in sub-Saharan Africa. Therefore, in addition to the abundance of wild resources, the plateau topography could have limited the demographic threshold necessary to bring about significant changes in socio-economic and subsistence traditions in the region. Further investigation of prehistoric sites in the study area may give information on the validity of this argument.

The impact of other environmental constraints such as *tse tse* fly and the high altitude on the physiological adaptation of livestock should also be considered crucial in dealing with early spread of domesticates to the region. Although it is difficult to examine the role of such factors in the prehistoric context, circumstantial evidence can give some useful insight. As indicated in the introduction, to the west of the site, there is a mountain escarpment that divides the western lowlands and the highland plateau. Although the highlands could have been relatively free from fatal animal diseases, the escarpment and plateau might have been a problem to the introduction of livestock farther to the interior highlands. Ethiopia lacks the wild prototype of cattle. Cattle could therefore encounter physiological and adaptational problem at least during their initial introduction to the highlands. This might be a serious problem for cattle coming from the lowlands of Sudan (see also Lesur et al. 2007). The ethnographic data mentioned in chapter one, throw some light on this problem.

Moreover, with its hot and humid climate and rampant cattle disease, the western lowlands might have been a constraint for the spread of livestock to the interior highlands. As Gonzalez-Ruibal et al. (2014) described, the western lowlands stretching from Eritrea to southwestern Ethiopia is a notoriously harsh environment full of cattle and human diseases. The lowlands west of Kurtiye archaeological site would be more hostile than the western low lands farther north in Tigray and Eritrea due to wetter climate in the south. As indicated in chapter one, the lowlands of western Ethiopia have been infested with *tse tse* fly and other cattle diseases. Therefore, such environmental constraints could have been a barrier to an early introduction of livestock from the west. The problems and challenges of animal disease in the spread of domestic animals in Africa have been widely discussed. Until the major climate change of

5000-4000 BP, the *tse tse* fly zone was even thought to have been extended farther north to about 18^0N latitude (see also Shaw 1976:109; Brandt and Cader 1987; Ambrose 1984, 1998; Gonzalle 2000; Phillipson 2005:203; Smith 2005:55-64; Lesur et al. 2007). Kurtiye rock shelter is located south of this latitude, and early introduction of cattle from the west could be difficult.

Forest cover and availability of grazing land might be additional challenges that could have delayed the introduction of livestock to the highlands. As explained in chapter three, many parts of the Ethiopian highlands would have been covered with significant amount of forests until about late Holocene. Surviving vegetation in the study area also indicates that the mountain escarpments and highland plateaus might have limited extent of grassland in the past. This would pose certain constraint on the early spread of domestic animals to the region. The absence of evidence indicating early introduction of domestic animals around the site, in view of pottery material suggesting interregional contact and interaction, may partly imply the role of such constraints on the early spread of domesticates to the region. Various environmental factors such as disease, forest cover, swamps as well as cultural preferences were significant challenges on the spread or diffusion of domesticates to different parts of Africa (see chapter one; also Phillipson 2005:171-2, 198).

11.5.2. Socio-cultural and Symbolic Factors

The continuity overtime of aquatic adaptation around Lake Tana might also be related to people's socio-cultural and symbolic values. Probably due to their role in subsistence, there could evolve strong socio-cultural and ritual values centered on aquatic resources and the surrounding landscape. The impact of these factors could be important if we investigate them in terms of climate and environmental changes. As discussed, climate change and resulting environmental deterioration have often been assumed as one of the decisive factors influencing human subsistence strategies or adaptations. Climatic oscillations around the site were evident in late Pleistocene and Holocene. The changes particularly after mid Holocene were severe which would have brought about contraction of natural resources including forests, flora and fauna, and perhaps also in the geographic limits of the tse *tse* fly. Intensified utilization of aquatic resources with the expansion of varieties of fish species would lead to population growth and increased dependence on plant and animal resources more or less similar to what Sutton and Haaland have argued for the Sudan savannah belt. However, the archaeological evidence showed that, until about the early first millennium AD, the occupants of the site were essentially dependent on hunting and fishing. This shows the importance of the lake and its surrounding as main source of subsistence to the inhabitants of the site.

Greater reliance on aquatic resources may in turn lead to socio-cultural and symbolic practices related to these resources. Such interrelated social-cultural and symbolic values could in turn be crucial in influencing the subsistence behaviors of the people around the lake. In other words, due to well established socio-economic and cultural traditions centered on aquatic resources, the motives for shift to other forms of subsistence such as adoption of the idea and technology of agriculture would be slow and late. Investigating the role of climatic and environmental changes to reconstruct prehistoric aquatic adaptation is important, but it is also necessarily to consider the views and perceptions of the foragers towards aquatic ways of life in addressing prehistoric subsistence changes. For cultural reasons, some foragers viewed aquatic adaptation crucial and prestigious. Such factors might have been imperative for the continuations of aquatic adaptation (see Sutton 1 974, 1977). Similarly, Phillipson (2005:212-3) explained that perhaps due to their socio-economic and cultural values, some hunter gathers in Africa have still remained reluctant to “alien life style and economic practices.” Shift in subsistence is not only ecological but it is the interplay of social, economic, cultural, ideological and even political factors (Muzzolini 1993:237; Bar-Yosef 1998:173; Haaland 2007; Hastorf 2007:107-113; Bettinger et al. 2009:627-8). It is therefore important to understand the social and other local traditions in reconstructing prehistoric subsistence (see also Bower1991). However, as mentioned earlier, there is a methodological challenge in reconstructing such dimensions of the past from the archaeological remains. The ethnographic data collected from the hunting and fishing Woyto of Lake Tana may give valuable insight to understand the probable importance of these factors in the past.

As discussed in chapter ten, the Woyto belong to one of the ancient inhabitants of Lake Tana area. Their survival, social, cultural and spiritual life has been primarily associated with the Lake and Blue Nile River. Their aquatic based subsistence and dietary habit have also defined and demarcated the Woyto from their dominant neighbors. Mainly due to the nature of their subsistence and culinary tradition, this people have been considered marginal and inferior to the surrounding farming communities. The Woyto have been known as hunters and fishermen throughout their history despite the marginalization. The resources of the Lake Tana and Blue Nile and these water bodies themselves also symbolized the cosmology and ideology of the Woyto. Aquatic resources such as hippopotamus and fish, the main source of subsistence, have been integrated into various social-cultural traditions and practices of the Woyto. These water bodies have thus remained as the main livelihood as well as cosmology of creation and ancestral cult of the Woyto. Different rituals and symbolic activities are still performed to the spirit of lake and the river.

These elaborate socio-cultural and symbolic traditions connected to aquatic bodies may signify the vital role of these resources for the survival of the Woyto people. It also indicates the interaction and close links between socio-cultural and symbolic life of people to local environment and its biotic component. In addition, it suggests that under such circumstance, people would prefer to keep and maintain the established socio-economic, cultural traditions and belief systems for long. These highly embedded socio-cultural and symbolic values of the Woyto are still practiced, and their ancient ways of subsistence have continued even long after the introduction of agriculture. The continuity of such practices even after the introduction of agriculture can thus imply how local traditions were essential in influencing human subsistence, survival and identity. Once people had developed such strong symbolic and cosmological connections with certain components of environment such as aquatic resources, they may find it difficult to shift into a new adaptation.

Linking human survival or subsistence strategies to supernatural belief and traditions centered on certain elements of the natural environment were common in many societies. Yet, it is only recently that more emphasis is given to the role of preexisting perceptions, belief, symbolic and ideological values on the understanding of prehistoric human adaptation, motives and activities (Barker 2006:3, 31, 38-9; Hastorf 2007:124-5). In fact, a number of studies demonstrated that decline of aquatic resources following changes in climate and environment were likely to bring about changes in subsistence (Sutton 1974, 1977; Stewart 1989:237-9). In a similar manner, the various environmental factors mentioned above could have an impact on the subsistence behavior of the inhabitants of the site. Yet, there was no evidence recovered at Kurtiye which implies changes in adaptation. These circumstantial evidences may therefore imply the role of the socio-economic as well cultural and symbolic importance of aquatic resources in the region.

The absence of domestic animal in particular may support the importance of aquatic resources in the economic, socio-cultural and symbolic life of the inhabitants around the site since domestic animals especially cattle occupied an important place in the economic, social, cultural and ritual, and even political life of people since prehistory. Such values have been considered decisive for their spread and diffusion in many parts of Africa (see chapter one; Phillipson

2005:169, 185; Haaland 1992; Gonzalez et al. 2014). As indicated in chapter ten, the Woyto community integrated cattle into their ritual and symbolic practices only when hunting hippopotamus was prohibited recently. This implies that cattle were not essential in the symbolic and cultural values of this community.

The absence of crop remains at the site may partly be due to the difficulty of recovery, but it may also be related to rich and abundant wild resources, and lack of significant population pressure on local resources to trigger changes in subsistence. People might have exerted less effort on plant management and exploitation practices around the site. As already mentioned, contact with other areas seemed quite old. Compared to domestic stock, environmental constraints to crops might have been limited. The region has many indigenous crops and the surrounding highland plateau is also favorable to Near Eastern crops. Nevertheless, no archaeological evidence was available at the site. Even the isotope analysis did not show evidence of these crops. Their absence could also be explained in terms of socio-cultural and symbolic factors embedded into locally available resources. Local culinary practices and cultural preferences might have influenced the adoption or rejection of foreign crops (see also Haaland 2007; Hastorf 1999, 2007, 2009).

This is not to underestimate the role of the environment in human subsistence, but environmental factor alone could not explain the activities and situations going on in the region in the prehistoric times. The nature of subsistence based on aquatic resources and socio-cultural and symbolic values attached to these resources, in addition to the local environment, might have influenced or shaped the adaptation strategies of the local people around Lake Tana. Absence of domestic species in spite of the possible early interregional contact and palaeoclimatic and environmental changes in the region may generally show the importance of the socio-cultural and symbolic factors in influencing prehistoric subsistence behavior.

The environmental constraints and challenges could also be important in limiting population pressure and securing the availability of local resources. The lack of significant anthropogenic impact on local environment until about the early first millennium AD may indicate limited population pressure in the region. Thus combination of various local factors, environmental and human, might have influenced the subsistence behaviors of the site inhabitants.

11. 6. Conclusions

The excavation conducted at a small rock shelter on the northern shore of Lake Tana yielded rich and diverse archaeological assemblages that demonstrated subsistence heavily relied on aquatic resource utilization and exploitation of wide ranges of terrestrial animals. Although the earliest occupation was dated to the sixth millennium BP, adaptation based on hunting and foraging strategy persisted to the historic times. This leads to the fundamental question of why and how such adaptation strategy continued for long in the region.

I investigated this issue based on the material remains, relevant theoretical frameworks and supportive ethnographic data, and concluded that local environment, and socio-cultural and symbolic factors might have influenced human occupation and subsistence around Lake Tana.

As mentioned earlier, aquatic adaptation in several areas of sub-Saharan Africa began to decline or deteriorate following severe climate and environmental changes in the Holocene. A similar process or event might have brought about significant environmental changes around Lake Tana. Imbalance between resources and population might have led to decline of aquatic adaptation. The archaeological evidence at the site did not show this trend. Thus either the local resources were abundant to sustain aquatic adaptation or environmental constraints could have restricted the demographic pressure for much of the Holocene.

Environmental opportunities such as abundance of wild resources, mainly aquatic, might have permitted continuation of aquatic adaptation. The large amount of wild faunal remains dominated mainly by aquatic animals might be taken as indication of the importance of this factor. Environmental constraints such as forest, lack of sufficient grazing land or open grasslands and animal diseases could be barriers for early introduction or adoption of domesticates. They might also affect the intensity of ancient population settlement in the region. In addition, the nature and location of the site could have been constraints on population density. Its location on the highland plateau might have imposed physiological and adaptational problems to the inhabitants thereby limiting the demographic pressure. It may also have acted as a constraint to the early introduction of domestic animals especially from the western lowlands.

However, under some of such environmental circumstances, cultivation of crops would most likely be a priority. Near Eastern crops might have been introduced earlier since the highlands could be favorable to these crops. Yet, there was no crop remain or material evidence indicating cultivation and processing of plants. This may imply limited population pressure around the site. Absence of evidence of land clearance in the Tana basin for most of the Holocene may be interpreted as lack of substantial demographic pressure which could have encouraged continuation of aquatic adaptation in the region. It is possible to ask how this factor alone could sustain an aquatic adaptation to such a long time.

I argue in this thesis that, in addition to these factors, situations related to local socio-cultural traditions might have dictated human adaptation and occupation in the region. Understanding the importance of such issues from the archaeological perspective is, however, difficult since the archaeological data cannot allow us to infer a one to one correspondence between material and the behavior of its maker. The present reality could not be directly linked to prehistoric behavior as well. Despite this limitation, the ethnographic data collected among the hunting and fishing communities of Lake Tana may provide some clue on the role of socio-cultural, symbolic and ritual factors in subsistence choices and adaptation.

I explained earlier that the hunting and fishing people of Lake Tana still preserve their socio-cultural and symbolic traditions attached to the local environment. The aquatic resources upon which they depend for survival have also been deeply embedded to their identity and various socio-cultural and ritual practices. Despite old contacts and interactions with the surrounding agriculturalists, this people have been dependent on hunting and fishing. Such ethnographic data may be relevant to get an insight on human perceptions, choices and motives, and about the challenges and opportunities of prehistoric societies in the transition to new ways of adaptation. As mentioned, this people utilize local crops and wild animals in their symbolic and ritual traditions. The use of aquatic resources and some local crops in the socio-cultural and ritual practices may indicate the close links between society and local environment in past. It may also suggest the crucial role of socio-cultural factors to influence human subsistence behavior or adaptation. Socio-cultural practices or traditions did indeed evolve overtime. However, it is difficult to argue that traditions could entirely be abandoned or discontinued. There could be some aspects of the past such as symbolic and ritual or other socio-cultural and belief systems that could transcend time barrier (see also Haaland 2007).

In conclusion, I argue that rich and predictable aquatic resources could not necessarily lead to transition to agriculture. Change in prehistoric subsistence or adaptation might not be an inevitable outcome of climatic and environmental changes. Moreover, people could not integrate new subsistence strategies from outside simply because they had interregional contact and interaction. The site revealed pottery with decoration motifs indicating interregional similarities and possible interaction with other aquatic site. It, however, differed in some aspects of its material remains. Fishing technologies such as bone harpoons, grooved stones and rings, were not recovered at Kurtiye rock shelter. Bone harpoons and wavy line pottery decorations were the most distinctive features of the material culture described by Sutton as 'Aqualitic civilization.' Kurtiye archaeological site seems therefore regional variants of aquatic oriented socio-economic and cultural adaptations in sub-Saharan Africa.

Since there is no detailed archaeological study in the region, there could, however, be other sites with different material culture including even evidence of ancient agricultural practices and / or material remains more similar to other aquatic sites of Africa. It is therefore important to underscore that this interpretation and reconstruction of prehistoric subsistence based on the evidence from this single site excavation could be less representative of the processes and activities for a wider region in the Holocene Ethiopia. More convincing picture would emerge if and only if we carry out large-scale archaeological studies which take into account highland/ lowland sites, and aquatic/ terrestrial sites. More sites along the shore of the lake should also be investigated. It is only when we have comparative sites and evidences that we can obtain a clear picture about the nature of later prehistoric subsistence and transition to agriculture in the region.

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Appendix I: Report on the analysis of Kurtiye faunal collection (by Dr. J. Lesur)

In February 2012, I have analysed the faunal remains coming from the archaeological site of Kurtiye at the National Museum of Ethiopia. Because the archaeological analysis is not complete yet, I will present in this report, the general results on the fauna, without quadrant or level distinction (which will be done in the future).

Presentation of the collection

The faunal collection of Kurtiye contains 5 376 remains (Fig. 1). Bones fragments were identified using the comparative anatomy collection of the National Museum of Ethiopia as well as some bibliographical references such as Boessneck (1969), Halstead *et al*. (2002), Walker (1985), Gentry (1978), Peters (1988) et Peters *et al.* (1997).

The preservation of the collection is on the whole poor and more that 73% could not be identified (Fig. 1). This is due mainly to various post-depositional processes that have caused severe damage: the acidity of the sediment have cause heavy corrosion of the bone surface and acute fragmentation resulting in a high percentage of splinters. Indeed, if we look at the average size of the fragments (Fig. 2), we notice than more than 86% of the assemblage is less than 2 cm long. This is due partly to the presence of small animals such as fishes but also to a very high fragmentation process.

These post-depositional processes have limited bone identification, and the possibility of any anthropic traces, such as cut marks, being preserved. However, more than 20% of the bones show burning marks, suggesting the use of fire in the cooking processes and a quarter of the long bone fragments did present spiral-shaped fractures, characteristic of fresh bone breakages, which could be evidence of intentional breakage for marrow use.

Faunal spectrum

The faunal spectrum shows a clear predominance of fishes, like catfish and tilapia (Table 1 & Fig. 3). The rest of the spectrum includes several taxa of wild bovids such as Alcelaphini (Fig. 4), Grant's gazelle as well as other bovids that couldn't be identified specifically (R*edunca* sp., *Tragelaphus* sp.). We notice also the presence of reptiles (crocodile and snake), hippopotamus (Fig. 5), hare, small carnivores, rodents and birds (due to the lack of differential criteria from the bone fragments the last three taxa could not be specifically identified).

The presence of livestock (cattle, sheep and goat) is very scarce. Only three fragments (two of cattle and one of caprines) could be identified. Most of them come from upper levels. One tooth of cattle (Fig. 6) found in a lower level (15N21E NW Level 12) was send for ^{14}C datation.

The assemblage therefore contains mainly consumption species, including fishes, wild bovid, hare and possibly hippopotamus and crocodile. The large percentage of fishes indicates their importance in the food economy of the inhabitants. The sparse rodent remains can be considered as intrusive, especially as the absence of any marks or breakages and the "fresh" aspect of their bone surfaces suggest subsequent intrusion.

Animal exploitation and environmental aspects

As the percentage of fishes suggests it, fishing seems to have been the main activity for animal exploitation.

According to Getahun and Dejen (2012), there is currently 28 species of fishes in the Lake Tana. Most of them (25) come from the Cyprinidae family and are characterised by the genus *Labeobarbus* that counts 17 species in the Lake. Three other family are present with one species each (Cichlidae: *oreochromis niloticus*, Claridae: *Clarias gariepinus* and Balitoridae: *Nemacheilus abyssinicus*).

The National Museum of Ethiopia where the fauna was studied holds a small comparative anatomy collection. Unfortunately, as for fish's skeletons, it has very few specimens and only catfish (*Clarias*) and tilapia but no individual from Cyprinidae. In consequence, we couldn't identify specifically the bones from Kurtiye for the moment. In the future, we have either to go on the shore of the Lake Tana to collect specimens or to ask for a temporary export permit from ARCCH and study the bones in Europe.

It would be indeed very interesting to know exactly from which species the bones came from to apprehend fishing techniques as well as the season and the location of these practices as it was done on other site of the region (Van Neer & Lesur 2004).

The importance of aquatic resources is also illustrated by the presence of few remains of crocodile and hippopotamus. The latter is represented mainly by teeth fragments but also by few limbs bones (Fig. 5). However there is no evidence of its use (consumption or craft) and of its hunting.

The rest of the identified wild species (Alcelaphini, dorcas gazelle, hare) are characteristic of grassy savannah that must have developed in the vicinity of the site.

For the moment, as we didn't detail the different levels, it is impossible to see a possible evolution of the environment through all the sequence of occupation.

Conclusion

To conclude, this first report on the faunal remains from Kurtiye shows that the people that occupied the site relied mainly on fishing for their animal food supply. Wild animals give the image of a grassy savannah landscape, close to the one that spread today in the area. Very few livestock remains were found. One cattle's tooth from lower level was dated. The date obtained with two calibrations is Cal AD 180 to 190 (Cal BP 1770 to 1760) and Cal AD 210 to 390 (Cal BP 1740 to 1560) (Beta – 326323). It is much more recent that what could be expected as some of the dates of the site show that the occupation started during the 5th millennium BC. Moreover, even if we don't know much about the introduction of domesticates in northern Ethiopia, some sites show the presence of cattle at the beginning of the 2nd millennium BC (Lesur-Gebremariam 2009). We could then expect that the inhabitants of Kurtiye had livestock earlier than the 1st millennium AD. Of course further analysis and data from the stratigraphical sequence of the site is needed to have a better understanding of this question.

Paris, the 27th of November 2012,

Joséphine Lesur[14]

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Representation of the faunal spectrum of Kurtiye according to the % of the NISP(number of identified species (Total = 1413).

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Grid	Level	Quadrant	Human	Hippopotamus	Cattle	Large Bovid	Alcelaphini	*Redunca* sp.	*Tragelaphus* sp.	Grant's gazelle	Sheep / goat	Medium-sized bovid	Dorcas gazelle	Small-sized bovid	Bovid Unidentified	Small carnivore	Hare	Rodent	Bird	Crocodile	Snake	Catfish	Tilapia	Fish Unidentified	Shell	*Unidentified*	Total
10N23E	1	SW		1																							**1**
	2	NE					3												5							*7*	**15**
		SW																	3							*24*	**27**
		SE																	3			2				*12*	**17**
	3	NW		1																							**1**
		NE																	3							*12*	**15**
		SW																				2				*2*	**4**
	4	NE										1							2							*2*	**5**
	5	SE																				1					**1**
2E	1	SW																								*1*	**1**
		SE																								*33*	**33**
	2	NW		2																		1				*10*	**13**
		NE										1			1							8				*43*	**53**
		SW		2											3							2				*54*	**61**
		SE		2								1			4				1			17	1			*145*	**171**
	3	NW													1											*7*	**8**
		NE		4						5		4	16		7		11		2			203		15		*636*	**903**
		SW		2		1						2										8				*104*	**117**
		SE		2		1	1					3	1	9		1			3	1		29				*297*	**348**

	4	NW										2			5							4				*60*	**71**
		NE		1								2										12				*83*	**98**
		SW													3							1				*74*	**78**
		SE										1	1									3				*16*	**21**
	5	NW	20																							*6*	**26**
		NE	40						1							1						5				*20*	**67**
		SW													3											*18*	**21**
		SE	10									1										3				*8*	**22**
13N21E	1	SE				2									8						1					*4*	**15**
	2	NE													2											*2*	**4**
		SE													13											*9*	**22**
	3	NW													2											*5*	**7**
		SW													19											*21*	**40**
		SE																								*13*	**13**
	4	NW																								*4*	**4**
		NE																								*5*	**5**
		SW	8												12							2				*30*	**52**
		SE																								*13*	**13**
	5	NW																								*18*	**18**
		SW													8							4				*30*	**42**

		SE																								*4*	**4**
	6	NW																				1				*10*	**11**
		SW																				1				*12*	**13**
	7	NW																				1				*19*	**20**
		SW																								*15*	**15**
	8	NW																								*8*	**8**
		NE																								*2*	**2**
	9	NW				4																				*5*	**9**
		NE																								*1*	**1**
		SW																				1				*3*	**4**
		SE																								*1*	**1**
	10	NW																								*5*	**5**
		NE																								*4*	**4**
		SW																								*1*	**1**
		SE																								*2*	**2**
	11	NW																								*4*	**4**
13N23E	1	SW															1				2				*15*	**18**
		SE																								*8*	**8**
	2	NW																								*5*	**5**
		NE																								*5*	**5**
		SW															1										**1**

		SE																								*4*	**4**
	3	NW										1						2	1			2				*17*	**23**
		NE		1											3							4				*12*	**20**
		SW		1				1											1			38	10	7		*60*	**118**
		SE																				6				*44*	**50**
	4	NW										2										31	16	10		*49*	**108**
		NE										1			1							3	1			*18*	**24**
		SW		1																		10				*16*	**27**
		SE																				3				*13*	**16**
	5	NW					1								1				1			24	14	6		*44*	**91**
		NE																								*7*	**7**
		SW																				2				*5*	**7**
		SE																								*9*	**9**
	6	NW		1															1			21	9	2		*59*	**93**
		SW																								*5*	**5**
		SE																								*4*	**4**
21E	1	SW																								*2*	**2**
		SE													2												**2**
	2	SW													2											*6*	**8**
		SE													1											*3*	**4**
	3	NE																								*11*	**11**

		SW												2												*8*	**10**
	4	NW												1												*6*	**7**
		NE												1 1												*20*	**31**
		SW												3												*15*	**18**
		SE																								*7*	**7**
	5	NW												6												*7*	**13**
		SW												4												*15*	**19**
	5A	NE												2												*9*	**11**
		SE																								*1*	**1**
	5B	NE												6												*2*	**8**
	6	NW																								*5*	**5**
		NE																				1				*11*	**12**
		SW																								*10*	**10**
		SE																				3				*15*	**18**
	7	NW																								*4*	**4**
		SW														1										*4*	**5**
	8	NW																								*3*	**3**
		NE																								*3*	**3**
		SW																				1				*10*	**11**
	9	NW																								*14*	**14**

	10	NW																							*6*	**6**
14N23E	1	NW																			1					**1**
		NE															4								*4*	**8**
		SW															7				3			1	*15*	**26**
		SE															7				2				*16*	**25**
	2	NW															11				7	5			*15*	**38**
		NE															15	3			5	2		2	*27*	**54**
		SW															6	3			5	5		2	*13*	**34**
		SE																4			4	4		1	*11*	**24**
	3	NW					2					1					4				42	27	6		*52*	**134**
		NE																			14	1	4		*22*	**41**
		SE																			15				*11*	**26**
	4	NW																			51	19	9		*28*	**107**
		NE																			10		2		*5*	**17**
		SW									1	1					3				46	22	16		*73*	**162**
		SE																			9		11		*9*	**29**
	5	SW																			30		8		*16*	**54**
		SE										1									14		11		*11*	**37**
15N21E	1	NW																							*2*	**2**
		NE																					2		*3*	**5**
	2	NW		1																						**1**
		SW																							*2*	**2**
		SE																							*7*	**7**
	3	NW																							*3*	**3**

		NE																							*3*	**3**
		SE																				1			*10*	**11**
	4	NW																							*4*	**4**
		NE																							*4*	**4**
		SE												1								2			*38*	**41**
	5	NE																							*24*	**24**
		SW																							*8*	**8**
		SE												3											*39*	**42**
	6	NW												1							1				*4*	**6**
		NE												1							1				*59*	**61**
		SW												7											*92*	**99**
	7	NW																							*9*	**9**
		NE	40									1									3				*79*	**12 3**
		SW												1	6										*18*	**25**
		SE																							*34*	**34**
	8	NW																							*7*	**7**
		NE	11											6					1		3				*68*	**89**
		SW												6											*20*	**26**
		SE																			1				*20*	**21**
	9	NW												6							1				*13*	**20**
		NE				5								1											*60*	**66**
		SW												1											*17*	**18**
		SE																							*14*	**14**
	10	NW																							*8*	**8**
		NE				7																			*30*	**37**

		SW																							*5*	**5**
		SE												2							1				*15*	**18**
	11	NW												5											*31*	**36**
		NE																							*33*	**33**
		SW																			3				*18*	**21**
		SE																			1				*23*	**24**
	12	NW			1	10																			*14*	**24**
		NE																							*34*	**34**
		SW																							*11*	**11**
		SE																							*10*	**10**
	13	NW				4																			*35*	**39**
		NE																			1				*22*	**23**
		SW																							*50*	**50**
		SE																							*42*	**42**
	14	NW																							*10*	**10**
		NE																							*17*	**17**
		SW																							*3*	**3**
		SE																							*6*	**6**
	15	NW																							*12*	**12**
		NE												2											*19*	**21**
		SW																							*1*	**1**
		SE																							*5*	**5**
		Total	**129**	**22**	**1**	**34**	**7**	**1**	**1**	**5**	**1**	**26**	**18**	**9**	**179**	**8**	**12**	**61**	**36**	**2**	**1**	**736**	**139**	**109**	**6**	***3963***	**5505**

APPENDIX II: Report on radiocarbon dating results and analysis

BETA ANALYTIC INC.
DR. M.A. TAMERS and MR. D.G. HOOD

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beta@radiocarbon.com

REPORT OF RADIOCARBON DATING ANALYSES

Mr. Randi Haaland | Report Date: 5/4/2011

University of Bergen | Material Received: 4/7/2011

Sample Data	Measured Radiocarbon Age	13C/12C Ratio	Conventional Radiocarbon Age(*)
Beta - 297115 SAMPLE : Kurtyie Gorgara Ethiopia level 3 ANALYSIS : AMS-Standard delivery	280 +/- 30 BP	-25.1 o/oo	280 +/- 30 BP

MATERIAL/PRETREATMENT : (charred material): acid/alkali/acid
2 SIGMA CALIBRATION : Cal AD 1520 to 1590 (Cal BP 430 to 360) AND Cal AD 1620 to 1660 (Cal BP 330 to 290)

Sendt april

Dates are reported as RCYBP (radiocarbon years before present, "present" = AD 1950). By international convention, the modern reference standard was 95% the 14C activity of the National Institute of Standards and Technology (NIST) Oxalic Acid (SRM 4990C) and calculated using the Libby 14C half-life (5568 years). Quoted errors represent 1 relative standard deviation statistics (68% probability) counting errors based on the combined measurements of the sample, background, and modern reference standards. Measured 13C/12C ratios (delta 13C) were calculated relative to the PDB-1 standard.

The Conventional Radiocarbon Age represents the Measured Radiocarbon Age corrected for isotopic fractionation, calculated using the delta 13C. On rare occasion where the Conventional Radiocarbon Age was calculated using an assumed delta 13C, the ratio and the Conventional Radiocarbon Age will be followed by "*". The Conventional Radiocarbon Age is not calendar calibrated. When available, the Calendar Calibrated result is calculated from the Conventional Radiocarbon Age and is listed as the "Two Sigma Calibrated Result" for each sample.

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REPORT OF RADIOCARBON DATING ANALYSES

Mr. Randi Haaland — Report Date: 4/28/2011

University of Bergen — Material Received: 4/7/2011

Sample Data	Measured Radiocarbon Age	13C/12C Ratio	Conventional Radiocarbon Age(*)
Beta - 297116	5550 +/- 40 BP	-24.5 o/oo	5560 +/- 40 BP

SAMPLE : Kurtyie Gorgara Ethiopia level 6
ANALYSIS : AMS-Standard delivery
MATERIAL/PRETREATMENT : (charred material): acid/alkali/acid
2 SIGMA CALIBRATION : Cal BC 4460 to 4340 (Cal BP 6410 to 6290)

Dates are reported as RCYBP (radiocarbon years before present, "present" = AD 1950). By international convention, the modern reference standard was 95% the 14C activity of the National Institute of Standards and Technology (NIST) Oxalic Acid (SRM 4990C) and calculated using the Libby 14C half-life (5568 years). Quoted errors represent 1 relative standard deviation statistics (68% probability) counting errors based on the combined measurements of the sample, background, and modern reference standards. Measured 13C/12C ratios (delta 13C) were calculated relative to the PDB-1 standard.

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REPORT OF RADIOCARBON DATING ANALYSES

Mr. Randi Haaland — Report Date: 7/19/2011

University of Bergen — Material Received: 7/5/2011

Sample Data	Measured Radiocarbon Age	13C/12C Ratio	Conventional Radiocarbon Age(*)
Beta - 301880 SAMPLE : KurtyieGorgora Bag 1 ANALYSIS : AMS-Standard delivery	2210 +/- 30 BP	-22.3 o/oo	2250 +/- 30 BP Level 11
MATERIAL/PRETREATMENT : (charred material): acid/alkali/acid 2 SIGMA CALIBRATION : Cal BC 390 to 340 (Cal BP 2340 to 2290) AND Cal BC 320 to 210 (Cal BP 2270 to 2160)			
Beta - 301881 SAMPLE : KurtyieGorgora Bag 2 ANALYSIS : AMS-Standard delivery	4060 +/- 40 BP	-24.6 o/oo	4070 +/- 40 BP Level 9
MATERIAL/PRETREATMENT : (charred material): acid/alkali/acid 2 SIGMA CALIBRATION : Cal BC 2850 to 2810 (Cal BP 4800 to 4760) AND Cal BC 2750 to 2720 (Cal BP 4700 to 4670) Cal BC 2700 to 2480 (Cal BP 4650 to 4430)			

Dates are reported as RCYBP (radiocarbon years before present, "present" = AD 1950). By international convention, the modern reference standard was 95% the 14C activity of the National Institute of Standards and Technology (NIST) Oxalic Acid (SRM 4990C) and calculated using the Libby 14C half-life (5568 years). Quoted errors represent 1 relative standard deviation statistics (68% probability) counting errors based on the combined measurements of the sample, background, and modern reference standards. Measured 13C/12C ratios (delta 13C) were calculated relative to the PDB-1 standard.

The Conventional Radiocarbon Age represents the Measured Radiocarbon Age corrected for isotopic fractionation, calculated using the delta 13C. On rare occasion where the Conventional Radiocarbon Age was calculated using an assumed delta 13C, the ratio and the Conventional Radiocarbon Age will be followed by "*". The Conventional Radiocarbon Age is not calendar calibrated. When available, the Calendar Calibrated result is calculated from the Conventional Radiocarbon Age and is listed as the "Two Sigma Calibrated Result" for each sample.

Page 2 of 4

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REPORT OF RADIOCARBON DATING ANALYSES

Mr. Randi Haaland

University of Bergen

January

Report Date: 1/20/2012

Material Received: 1/12/2012

Sample Data	Measured Radiocarbon Age	13C/12C Ratio	Conventional Radiocarbon Age(*)
Beta - 314124	350 +/- 30 BP	-26.0 o/oo	330 +/- 30 BP

SAMPLE : SE level 3 12.10.11
ANALYSIS : AMS-Standard delivery
MATERIAL/PRETREATMENT : (charred material): acid/alkali/acid
2 SIGMA CALIBRATION : Cal AD 1460 to 1650 (Cal BP 490 to 300)

Sample Data	Measured Radiocarbon Age	13C/12C Ratio	Conventional Radiocarbon Age(*)
Beta - 314125	310 +/- 30 BP	-26.5 o/oo	290 +/- 30 BP

SAMPLE : SW level 5 (40-50) 16.10.11
ANALYSIS : AMS-Standard delivery
MATERIAL/PRETREATMENT : (charred material): acid/alkali/acid
2 SIGMA CALIBRATION : Cal AD 1500 to 1500 (Cal BP 450 to 450) AND Cal AD 1510 to 1600 (Cal BP 440 to 350)
Cal AD 1620 to 1660 (Cal BP 330 to 290)

Dates are reported as RCYBP (radiocarbon years before present, "present" = AD 1950). By international convention, the modern reference standard was 95% the 14C activity of the National Institute of Standards and Technology (NIST) Oxalic Acid (SRM 4990C) and calculated using the Libby 14C half-life (5568 years). Quoted errors represent 1 relative standard deviation statistics (68% probability) counting errors based on the combined measurements of the sample, background, and modern reference standards. Measured 13C/12C ratios (delta 13C) were calculated relative to the PDB-1 standard.

The Conventional Radiocarbon Age represents the Measured Radiocarbon Age corrected for isotopic fractionation, calculated using the delta 13C. On rare occasion where the Conventional Radiocarbon Age was calculated using an assumed delta 13C, the ratio and the Conventional Radiocarbon Age will be followed by "*". The Conventional Radiocarbon Age is not calendar calibrated. When available, the Calendar Calibrated result is calculated from the Conventional Radiocarbon Age and is listed as the "Two Sigma Calibrated Result" for each sample.

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REPORT OF RADIOCARBON DATING ANALYSES

Mr. Gedef Abawa Firew — Report Date: 8/7/2012

University of Bergen — Material Received: 7/19/2012

Sample Data	Measured Radiocarbon Age	13C/12C Ratio	Conventional Radiocarbon Age(*)
Beta - 326322	2130 +/- 30 BP	-23.8 o/oo	2150 +/- 30 BP

SAMPLE : Kurtiye NW 14N21E LEVEL 6
ANALYSIS : AMS-Standard delivery
MATERIAL/PRETREATMENT : (charred material): acid/alkali/acid
2 SIGMA CALIBRATION : Cal BC 350 to 290 (Cal BP 2300 to 2240) AND Cal BC 230 to 220 (Cal BP 2180 to 2170)
Cal BC 210 to 110 (Cal BP 2160 to 2060)

Sample Data	Measured Radiocarbon Age	13C/12C Ratio	Conventional Radiocarbon Age(*)
Beta - 326323	1440 +/- 40 BP	-5.9 o/oo	1750 +/- 40 BP

SAMPLE : Kurtiye NW 15N21E LEVEL 12
ANALYSIS : AMS-Standard delivery
MATERIAL/PRETREATMENT : (tooth): collagen extraction: with alkali
2 SIGMA CALIBRATION : Cal AD 180 to 190 (Cal BP 1770 to 1760) AND Cal AD 210 to 390 (Cal BP 1740 to 1560)

Sample Data	Measured Radiocarbon Age	13C/12C Ratio	Conventional Radiocarbon Age(*)
Beta - 326324	440 +/- 30 BP	-25.4 o/oo	430 +/- 30 BP

SAMPLE : Kurtiye SW 12N22E LEVEL 3
ANALYSIS : AMS-Standard delivery
MATERIAL/PRETREATMENT : (charred material): acid/alkali/acid
2 SIGMA CALIBRATION : Cal AD 1430 to 1480 (Cal BP 520 to 470)

Sample Data	Measured Radiocarbon Age	13C/12C Ratio	Conventional Radiocarbon Age(*)
Beta - 326325	2000 +/- 30 BP	-24.0 o/oo	2020 +/- 30 BP

SAMPLE : Kurtiye SW 12N22E LEVEL 5
ANALYSIS : AMS-Standard delivery
MATERIAL/PRETREATMENT : (charred material): acid/alkali/acid
2 SIGMA CALIBRATION : Cal BC 90 to 70 (Cal BP 2040 to 2020) AND Cal BC 60 Cal AD 30 (Cal BP 2010 to 1920)
Cal AD 40 to 50 (Cal BP 1920 to 1900)

Dates are reported as RCYBP (radiocarbon years before present, "present" = AD 1950). By international convention, the modern reference standard was 95% the 14C activity of the National Institute of Standards and Technology (NIST) Oxalic Acid (SRM 4990C) and calculated using the Libby 14C half-life (5568 years). Quoted errors represent 1 relative standard deviation statistics (68% probability) counting errors based on the combined measurements of the sample, background, and modern reference standards. Measured 13C/12C ratios (delta 13C) were calculated relative to the PDB-1 standard.

The Conventional Radiocarbon Age represents the Measured Radiocarbon Age corrected for isotopic fractionation, calculated using the delta 13C. On rare occasion where the Conventional Radiocarbon Age was calculated using an assumed delta 13C, the ratio and the Conventional Radiocarbon Age will be followed by "*". The Conventional Radiocarbon Age is not calendar calibrated. When available, the Calendar Calibrated result is calculated from the Conventional Radiocarbon Age and is listed as the "Two Sigma Calibrated Result" for each sample.

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REPORT OF RADIOCARBON DATING ANALYSES

Mr. Gedef Abawa Firew

Report Date: 8/7/2012

Sample Data	Measured Radiocarbon Age	13C/12C Ratio	Conventional Radiocarbon Age(*)
Beta - 326326	670 +/- 30 BP	-24.6 o/oo	680 +/- 30 BP

SAMPLE : Kurtiye SW 13N23E LEVEL 5
ANALYSIS : AMS-Standard delivery
MATERIAL/PRETREATMENT : (charred material): acid/alkali/acid
2 SIGMA CALIBRATION : Cal AD 1270 to 1310 (Cal BP 680 to 640) AND Cal AD 1360 to 1390 (Cal BP 590 to 560)

Dates are reported as RCYBP (radiocarbon years before present, "present" = AD 1950). By international convention, the modern reference standard was 95% the 14C activity of the National Institute of Standards and Technology (NIST) Oxalic Acid (SRM 4990C) and calculated using the Libby 14C half-life (5568 years). Quoted errors represent 1 relative standard deviation statistics (68% probability) counting errors based on the combined measurements of the sample, background, and modern reference standards. Measured 13C/12C ratios (delta 13C) were calculated relative to the PDB-1 standard.

The Conventional Radiocarbon Age represents the Measured Radiocarbon Age corrected for isotopic fractionation, calculated using the delta 13C. On rare occasion where the Conventional Radiocarbon Age was calculated using an assumed delta 13C, the ratio and the Conventional Radiocarbon Age will be followed by "*". The Conventional Radiocarbon Age is not calendar calibrated. When available, the Calendar Calibrated result is calculated from the Conventional Radiocarbon Age and is listed as the "Two Sigma Calibrated Result" for each sample.

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Darden Hood
President

Ronald Hatfield
Christopher Patrick
Deputy Directors

August 7, 2012

Mr. Gedef Abawa Firew
University of Bergen
Department of AHKR
Oisteins.gt 1
Bergen, 5020
Norway

RE: Radiocarbon Dating Results For Samples Kurtiye NW 14N21E LEVEL 6, Kurtiye NW 15N21E LEVEL 12, Kurtiye SW 12N22E LEVEL 3, Kurtiye SW 12N22E LEVEL 5, Kurtiye SW 13N23E LEVEL 5

Dear Mr. Firew:

Enclosed are the radiocarbon dating results for five samples recently sent to us. They each provided plenty of carbon for accurate measurements and all the analyses proceeded normally. The report sheet contains the dating result, method used, material type, applied pretreatment and two-sigma calendar calibration result (where applicable) for each sample.

This report has been both mailed and sent electronically, along with a separate publication quality calendar calibration page. This is useful for incorporating directly into your reports. It is also digitally available in Windows metafile (.wmf) format upon request. Calibrations are calculated using the newest (2004) calibration database. References are quoted on the bottom of each calibration page. Multiple probability ranges may appear in some cases, due to short-term variations in the atmospheric 14C contents at certain time periods. Examining the calibration graphs will help you understand this phenomenon. Calibrations may not be included with all analyses. The upper limit is about 20,000 years, the lower limit is about 250 years and some material types are not suitable for calibration (e.g. water).

We analyzed these samples on a sole priority basis. No students or intern researchers who would necessarily be distracted with other obligations and priorities were used in the analyses. We analyzed them with the combined attention of our entire professional staff.

Information pages are enclosed with the mailed copy of this report. They should answer most of questions you may have. If they do not, or if you have specific questions about the analyses, please do not hesitate to contact us. Someone is always available to answer your questions.

The cost of the analysis was charged to the VISA card provided. A receipt is enclosed. Thank you. As always, if you have any questions or would like to discuss the results, don't hesitate to contact me.

Sincerely,

Darden Hood
Digital signature on file

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Mr. Darden Hood
President

Mr. Ronald Hatfield
Mr. Christopher Patrick
Deputy Directors

The Radiocarbon Laboratory Accredited to ISO-17025 Testing Standards (PJLA Accreditation #59423)

Final Report

The final report is accessed as a PDF via a secure personal directory on our website. UserID and password are initially provided to you, which you can change to values of your choosing (letters and numbers only). A mailed copy is also sent to you including a statement outlining our analytical procedures, a glossary of pretreatment terms, calendar calibration information, and billing documents. In addition to the analytical result, the final report sheet includes the individual analysis method, the delivery basis, the material type and the individual pretreatments applied.

Pretreatment

Pretreatment methods are reported along with each result. All necessary chemical and mechanical pretreatments of the submitted material were applied at the laboratory to isolate the carbon, which may best represent the time event of interest. When interpreting the results, it is important to consider the pretreatments. Some samples cannot be fully pretreated, making their ^{14}C ages more subjective than samples, which can be fully pretreated. Some materials receive no pretreatments. Please look at the pretreatment indicated for each sample and read the pretreatment glossary to understand the implications.

Analysis

Results reported using the AMS technique were derived from reduction of sample carbon (after pretreatment) to graphite (100 %C), along with standards and backgrounds, with subsequent detection in one of two AMS instruments here in our facilities. Results reported using the radiometric technique were analyzed by synthesizing sample carbon (after pretreatment) to benzene (92% C), measuring for ^{14}C content in one of 53 scintillation spectrometers. If the Extended Counting Service was used, the ^{14}C content was measured for a greatly extended period of time.

The Radiocarbon Age and Calendar Calibration

The Conventional ^{14}C Age and related "percent modern carbon" (pMC) is the result after applying $^{13}C/^{12}C$ corrections to account for isotopic fractionation differences between the sample and modern reference. Always cite both this age and the 13C/12C ratio in your reports and papers (as well as the laboratory number). The Conventional Radiocarbon Age is cited with the units "BP" (Before Present). "Present" is defined as AD 1950 for the purposes of radiocarbon dating. Results are reported as pMC for samples containing more ^{14}C than the modern reference standard. pMC results indicate the material was respiring carbon after the advent of thermo-nuclear weapons testing and is less than ~ 60 years old.

Calendar calibrations are included for applicable materials. If calibrations are not included for a result, it means it was too young, too old, or inappropriate for calibration. The calibration database and mathematics used are cited at the bottom of each calibration printout. The most appropriate approximation of age is the "2 sigma calibrated result". Be sure to cite this as well as the calibration database and mathematics used in your reports and papers.

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PRETREATMENT GLOSSARY
Standard Pretreatment Protocols at Beta Analytic

Unless otherwise requested by a submitter or discussed in a final date report, the following procedures apply to pretreatment of samples submitted for analysis. This glossary defines the pretreatment methods applied to each result listed on the date report form (e.g. you will see the designation "acid/alkali/acid" listed along with the result for a charcoal sample receiving such pretreatment).

Pretreatment of submitted materials is required to eliminate secondary carbon components. These components, if not eliminated, could result in a radiocarbon date, which is too young or too old. Pretreatment does not ensure that the radiocarbon date will represent the time event of interest. This is determined by the sample integrity. Effects such as the old wood effect, burned intrusive roots, bioturbation, secondary deposition, secondary biogenic activity incorporating recent carbon (bacteria) and the analysis of multiple components of differing age are just some examples of potential problems. The pretreatment philosophy is to reduce the sample to a single component, where possible, to minimize the added subjectivity associated with these types of problems. If you suspect your sample requires special pretreatment considerations be sure to tell the laboratory prior to analysis.

"acid/alkali/acid"

The sample was first gently crushed/dispersed in deionized water. It was then given hot HCI acid washes to eliminate carbonates and alkali washes (NaOH) to remove secondary organic acids. The alkali washes were followed by a final acid rinse to neutralize the solution prior to drying. Chemical concentrations, temperatures, exposure times, and number of repetitions, were applied accordingly with the uniqueness of the sample. Each chemical solution was neutralized prior to application of the next. During these serial rinses, mechanical contaminants such as associated sediments and rootlets were eliminated. This type of pretreatment is considered a "full pretreatment". On occasion the report will list the pretreatment as "acid/alkali/acid - insolubles" to specify which fraction of the sample was analyzed. This is done on occasion with sediments (See "acid/alkali/acid - solubles"

Typically applied to: charcoal, wood, some peats, some sediments, and textiles "acid/alkali/acid - solubles"

On occasion the alkali soluble fraction will be analyzed. This is a special case where soil conditions imply that the soluble fraction will provide a more accurate date. It is also used on some occasions to verify the present/absence or degree of contamination present from secondary organic acids. The sample was first pretreated with acid to remove any carbonates and to weaken organic bonds. After the alkali washes (as discussed above) are used, the solution containing the alkali soluble fraction is isolated/filtered and combined with acid. The soluble fraction, which precipitates, is rinsed and dried prior to combustion.

"acid/alkali/acid/cellulose extraction"

Following full acid/alkali/acid pretreatments, the sample is bathed in (sodium chlorite) $NaClO_2$ under very controlled conditions (Ph = 3, temperature = 70 degrees C). This eliminates all components except wood cellulose. It is useful for woods that are either very old or highly contaminated.

Applied to: wood

"acid washes"

Surface area was increased as much a possible. Solid chunks were crushed, fibrous materials were shredded, and sediments were dispersed. Acid (HCI) was applied repeatedly to ensure the absence of carbonates. Chemical concentrations, temperatures, exposure times, and number of repetitions, were applied accordingly with the uniqueness of each sample. The sample was not be subjected to alkali washes to ensure the absence of secondary organic acids for intentional reasons. The most common reason is that the primary carbon is soluble in the alkali. Dating results reflect the total organic content of the analyzed material. Their accuracy depends on the researcher's ability to subjectively eliminate potential contaminants based on contextual facts.

Typically applied to: organic sediments, some peats, small wood or charcoal, special cases

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PRETREATMENT GLOSSARY
Standard Pretreatment Protocols at Beta Analytic
(Continued)

"collagen extraction: with alkali" or "collagen extraction: without alkali"

The material was first tested for friability ("softness"). Very soft bone material is an indication of the potential absence of the collagen fraction (basal bone protein acting as a "reinforcing agent" within the crystalline apatite structure). It was then washed in de-ionized water, the surface scraped free of the outer most layers and then gently crushed. Dilute, cold HCI acid was repeatedly applied and replenished until the mineral fraction (bone apatite) was eliminated. The collagen was then dissected and inspected for rootlets. Any rootlets present were also removed when replenishing the acid solutions. "With alkali" refers to additional pretreatment with sodium hydroxide (NaOH) to ensure the absence of secondary organic acids. "Without alkali" refers to the NaOH step being skipped due to poor preservation conditions, which could result in removal of all available organics if performed.

Typically applied to: bones

"acid etch"

The calcareous material was first washed in de-ionized water, removing associated organic sediments and debris (where present). The material was then crushed/dispersed and repeatedly subjected to HCI etches to eliminate secondary carbonate components. In the case of thick shells, the surfaces were physically abraded prior to etching down to a hard, primary core remained. In the case of porous carbonate nodules and caliches, very long exposure times were applied to allow infiltration of the acid. Acid exposure times, concentrations, and number of repetitions, were applied accordingly with the uniqueness of the sample.

Typically applied to: shells, caliches, and calcareous nodules

"neutralized"

Carbonates precipitated from ground water are usually submitted in an alkaline condition (ammonium hydroxide or sodium hydroxide solution). Typically this solution is neutralized in the original sample container, using deionized water. If larger volume dilution was required, the precipitate and solution were transferred to a sealed separatory flask and rinsed to neutrality. Exposure to atmosphere was minimal.

Typically applied to: Strontium carbonate, Barium carbonate
(i.e. precipitated ground water samples)

"carbonate precipitation"

Dissolved carbon dioxide and carbonate species are precipitated from submitted water by complexing them as ammonium carbonate. Strontium chloride is added to the ammonium carbonate solution and strontium carbonate is precipitated for the analysis. The result is representative of the dissolved inorganic carbon within the water. Results are reported as "water DIC".

Applied to: water

"solvent extraction"

The sample was subjected to a series of solvent baths typically consisting of benzene, toluene, hexane, pentane, and/or acetone. This is usually performed prior to acid/alkali/acid pretreatments.

Applied to: textiles, prevalent or suspected cases of pitch/tar contamination, conserved materials.

"none"

No laboratory pretreatments were applied. Special requests and pre-laboratory pretreatment usually accounts for this.

Appendix III: Report on Isotope Sample results and Dates on Human Teeth

Catherine D'Andrea
To MeMichael Richards
Sep 30, 2013
Hello Gedef,

I hope all is going well with you in Norway and your dissertation is nearing completion. You can see below the dates and results of isotope values for the teeth from your site. From what you told me of your site, these dates seem very good and the isotope results really quite interesting.

Make sure to thank Prof. Michael Richards at the University of British Columbia (copied on this message) who arranged for and financially supported this work. And don't forget to send my best wishes to Randi.

All the best,
Cathy

From: "Mike Richards" <michael.richards@ubc.ca>
To: "Catherine D'Andrea" <adandrea@sfu.ca>
Sent: Monday, September 30, 2013 12:25:04 PM
Subject: 14C dates!

Hi Cathy,
We do have the dates for the two tooth samples!

Here are the isotope values:
S-EVA 26867, (#1, 12N22E), d13C=-12.3, d15N=8.7
S-EVA 26868, (#2, 15N21E), d13C=-10.6, d15N=10.0

So, very much a C4 signal for both of them.

The dates are:
S-EVA 26867, (12N22E), (MAMS-17751), 5668 +/- 20 BP (Calibrated 2 sigma 4540-4458 calBC)
S-EVA 26868, (15N21E), (MAMS-17752), 5323 +/- 20 BP (Calibrated 2 sigma 4236-4052 cal BC).

If you have any questions please let me know. Were these dates what you were expecting?

All the best,
Mike

p.s. here's the info about the two samples from your e-mail:
#1 12N22E, NE, Level 5 (40-50 cm)
#2 15N21E, NE, Level 7 (35-40 cm)

Appendix IV: Pottery material excavated from kurtiye rock shelter

Grids	Levels	Quadrants	Total no. of sherds	Weight in gram	Rims	Weight in gram	Bases	Handles	Decorated	Weight in gram
10N23E										
	1	SW								
	2	NE	1	153.6	1	153.6				
	2	SE	3	39.0						
	2	SW	5	43.5						
	3	SE	1	256.5	1	256.5				
	3	NE	4	153.5	1	69.5				
	3	NW	1	15.50						
	4	NE	1	1.610						
			16	**677.7**	**3**	**479.6**				
14N23E	1	SW	2	38.0						
	1	NE	2	33.30						
	1	SE	8	55.12						
	2	NW	5	43.00	1	21.61				
	2	SE	15	288.40	1	60.3				
	2	SW	27	397.50	1	5.610				
	2	NE	14	310.0	2	133.6				
	3	NE	7	16.00						
	3	SW	2	11.530						
	3	SE	5	142.50						
	4	SW	4	5.00					1	3.610
	4	NW	3	17.00						
	5	SW	1	2.00						
			95	**1359.35**	**5**	**221.12**			**1**	**3.61**
13N23E	1	SW	2	11.410						
	2	SW	11	95.80						
	2	NE	1	27.30	1	27.17				
	2	SE	23	390.40	5	216.6				
	2	NW	4	30.75						
	3	NW	3	54.51						
	3	NE	11	88.40						
	3	SE	8	93.61						
	3	SW	28	390.00	1	43.1			1	18.50
	4	SW	1	18.70						
	4	SE	2	11.630						
	4	NW	10	187.80	4	144.3			2	44.71
	5	NW	9	379.60	3	315.0				
	6	NW	1	11.2 0						

			114	**1791.11**	**14**	**746.17**			**3**	**63.01**
12N22E	1	SW	5	40.60						
	1	SE	10	73.32	1	18.51				
	2	NE	23	1782.54						
	2	SW	48	436.00						
	2	SE	39	451.62	1	7.610				
	2	NW	13	122.12						
	3	NE	38	330.30	3	18.30			6	114.50
	3	SW	26	387.35	1	3.610			1	3.712
	3	SE	3	29.00	1	6.200			1	5.121
	3	NW	24	239.4					1	3.700
	4	NE	29	161.7						
	4	SW	3	20.70						
	4	SE	8	68.53						
	4	NW	12	162.0	2	10.310		1	1	5.00
	5	NW	2	37.14						
	6									
			283	**4343.32**	**9**	**64.63**			**10**	**132, 03**
13N21E	1	SW	8	58.00						
	1	SE	31	270.15	1	6.910				
	2	SW	26	449.00	4	138.7				
	2	SE	30	216.00	3	43.4				
	2	NE	17	80 .15						
	2	NW	12	89 .00						
	3	SW	34	425.00	4	115.6			3	18.30
	3	NW	7	68.10					1	15.00
	3	SE	10	89.5 0					1	31.40
	3	NE	4	20.60					1	6.330
	4	NE	14	91.53						
	4	SE	7	26.77						
	4	SW	36	243.30					2	28.00
	4	NW	9	169.40					4	26.20
	5	NW	24	204.30					1	3.304
	5	NE	7	65.50						
	5	SE	2	19.3 0						
	5	SW	10	377.00	1	11.00			3	314.8
	5	NW(b)	19	127 .10	1	29.20			2	15.20
	6	NE	6	36.60	1	2.800			2	18.61
	6	NW	6	63.60	1	26.40				
	6	SW	6	27.00					1	7.321
	6	NW	13	371.41						
	7	SE	1	18.92						
	7	NW	16	16.60						
	7	NE	8	58.00						

	8	SW	1	15.67						
	8	NW	1	4.150						
	8	NE	7	50.60					1	9.0
	9	SE	1	18.71						
	9	NE	4	21.64						
	9	SW	3	13.00						
	9	NW(b)	3	64.20					3	18.30
	9	NW	2	18.15						
	10	SW	7	42.62					1	3.410
	10	NE	6	31.14						
	10	SE	1	8.610						
	11	NE	2	13.60					1	6.314
	12	NE	2	11.650						
			403	**3995.57**	**16**	**374.01**			**27**	**521.48**
14N21E	1	SW	33	74.67	2	74.6			4	56.30
	1	SE	75	959.30	7	236.0				
	1	NE	70	500.70	4	101.0				
	1	NW	38	418.51	2	178.1				
	2	SE	49	349.00	1	16.30			8	67.10
	2	NW	13	132.83	1	31.60				
	2	SW	30	249.60	1	48.1				
	2	NE	17	62.70						
	3	SW	38	246 .54						
	3	SE	22	167.78	1	6.300			5	78.60
	3	NE	57	250.70	1	7.110			1	18.90
	3	NW	18	86.79						
	4	NE	100	323.10					6	28.70
	4	SE	14	60.30	1	2.00			3	19.50
	4	NW	26	97.62						
	4	SW	89	221.73	2	7.800			8	51.70
	5	NW	32	132.70						
	5	SW	23	160.7 0	2	5.160			8	36.10
	5	SE(b)	2	16.37						
	5	SE(a)	5	30.85						
	5	NE(a)	20	109.56	1	2.600			6	9.420
	5	NE(b)	11	79.34	1	5.700				
	6	SE	9	42.30	1	4.510			3	36.70
	6	NE	18	69.00					2	7.920
	6	NW	58	183.00						
	6	SW	26	176.81	2	2.410			10	148.70
	7	SW	8	28.43						
	7	NE	21	69.00	1	1.400			3	13.50
	7	NW	34	343.30	1	10.600			11	178.50
	8	NE	9	52.41						
	8	SW	28	167.00	1	4.700			14	133.60

	8	NW	34	366.40					14	158.20
	9	NW	35	732.45	1	2.300			17	255.60
	10	nw								
			1062	**6961.49**	**34**	**748.29**			**123**	**1299.04**
15N21E	1	SE	48	338.60	1	6.600				
	1	NE	24	220.00						
	1	NW	57	374.50						
	2	SE	23	161.00	2	8.930				
	2	SW	47	239.31						
	2	NE	11	65.62	1	4.350				
	2	NW	18	84.14						
	3	SE	21	292.33	1	46.30				
	3	SW	52	346.35	2	26.50				
	3	NW	11	64.00						
	3	NE	21	103.60	1	2.500				
	4	NW	18	192.00	1	63.80				
	4	SE	25	155.20						
	4	NE	16	97.31						
	5	NE	33	278.00	1	36.30				
	5	SE	20	132.31	1	15.30				
	5	NW	17	93.30						
	5	SW	34	158.72						
	6	NE	55	446.24						
	6	SE	81	387.50						
	6	NW	14	88.61	1	26.30				
	6	SW	32	160.73						
	7	SW	177	785.60						
	7	NE	60	384.60					3	34.70
	7	NW	16	88.67						
	7	SE	132	744.50					1	11.220
	8	NE	50	267.30						
	8	NW	10	78.71						
	8	SW	3	14.30						
	8	SE	123	586.50						
	9	SE	64	407.60					3	50.40
	9	SW	127	593.40						
	9	NW	14	284.21	2	9.300			1	3.700
	9	NE	46	199.00	1	4.600			4	14.630
	10	SE	72	403.15					17	186.00
	10	SW	67	329.40						
	10	NW	60	329.53	1	8.110			5	104.4
	10	NE	32	149.61	2	21.80				
	11	NE	39	175.30					1	18.30
	11	NW	52	395.60						
	11	SE	88	526.60					16	120.20

	11	SW	75	494.72	2	62.50			3	18.50
	12	NW	61	520.60						
	12	NE	38	184.64						
	12	SE	23	107.61					9	84.30
	12	SW	35	382.60	1	7.410			6	53.60
	13	SW	59	209.46					16	118.60
	13	NW	72	590.35					4	56.70
	13	SE	36	206.54						
	13	NE	37	380.63					5	54.70
	14	NW	43	184.13	1	2.620			3	19.30
	14	SE	8	54.40					1	3.740
	14	SW	6	70.81						
	14	NE	24	153.90						
	15	SE	9	78.00						
	15	NE	3	22.61						
	15	NW	25	90.42						
	15	SW	5	28.20					5	38.60
			2469	**14985.57**	**22**	**353.22**			**103**	**991.59**
Total			**4442**	**34104.62**	**93**	**2987.04**		**1**	**255**	**3010.76**

Appendix V: Weight of lithic debitage and tools (in gram) inside the drip line

N0	Grid	Level	QUAD	Total weight in Gram	Total weight in Gram
				Debitage	Tools
1	10N23E	1	SW	36.05	2.12
2	1ON23E	2	SW	35.18	10.5
3	10N23E	2	NE	47.35	
4	10N23E	2	SE	21.23	0.52
5	10N23E	3	SE	40.45	33.45
6	10N23E	3	NE	49.5	3.78
7	10N23E	3	SW	1.32	
8	10N23E	4	NE	51.12	5.34
9	10N23E	4	SE	158.61	35.8
9	10N23E	5	NE	48.34	
10	10N23E	5	SE	58.43	8.23
11	14N23E	1	SW	30.12	2.14
12	14N23E	1	NE	13.78	0.5
13	14N23E	1	SE	22.65	
14	14N23E	1	NW	2.35	1.08
15	14N23E	2	NE	24.18	
16	14N23E	2	SW	44.23	
17	14N23E	2	SE	13.45	
18	14N23E	2	NW	84.23	1.09
19	14N23E	3	NW	6.71	0.5
20	14N23E	3	SW	13.54	0.5
21	14N23E	3	NE	19.84	2.75
22	14N23E	3	SE	43.68	8.12
23	14N23E	4	SE	26.62	5.32
24	14N23E	4	NE	10	5.37
24	14N23E	4	SW	39.89	1.23
25	14N23E	4	NW	194.31	49.67
26	14N23E	5	SW	66.87	1.12
27	14N23E	5	SE	30.65	0.5
28	13N23E	1	SW	1.52	
29	13N23E	2	SW	32.78	3.65
30	13N23E	2	NW	5.72	
31	13N23E	2	NE	6.78	1.14
32	13N23E	2	SE	43.18	2.72
33	13N23E	3	SE	396.7	19.34
34	13N23E	3	SW	822.39	94.11
35	13N23E	3	NE	44.43	2.22
36	13N23E	3	NW	8.9	
37	13N23E	4	NW	392.52	186.05
38	13N23E	4	NE	192.23	66.29

39	13N23E	4	SE	154.34	10.14
40	13N23E	4	SW	1100.6	218.67
41	13N23E	5	SW	106.05	3.12
42	13N23E	5	NE	6.66	3.09
43	13N23E	5	NW	278.78	29.78
44	13N23E	5	SE	88.09	2.4
45	13N23E	6	SE	9.67	0.5
46	13N23E	6	SW	12.42	
47	13N23E	6	NE	57.36	1.34
48	13N23E	6	NW	234.77	7.23
49	12N22E	1	SE	37.07	
50	12N22E	1	SW	3.41	2.98
51	12N22E	2	SW	570.92	62.4
52	12N22E	2	NW	88.18	2.61
53	12N22E	2	NE	300.2	60.05
54	12N22E	2	SE	964.78	47.41
55	12N22E	3	SE	990.82	214.3
56	12N22E	3	SW	718.59	144.5
57	12N22E	3	NW	618.83	52.23
58	12N22E	3	NE	2170.56	192.45
59	12N22E	4	NE	292.61	6.92
60	12N22E	4	SE	166.07	13.73
61	12N22E	4	SW	930.57	98.09
62	12N22E	4	NW	796.51	136.5
63	12N22E	5	NW	49.93	3.76
64	12N22E	5	NE	43.54	6.23
65	12N22E	5	SW	52.66	4.37
66	12N22E	5	SE	22.56	
67	12N22E	6	NE	6.09	1.82
68	12N22E	6	NW	40.81	2,75
				14095.28	1881.77

Appendix VI: Frequency, raw material and other attributes of chips

Grid	Level	Quadrant	Chips by Raw material						Fire treated			Cortex		Rejuvenated	Bipolar		water rolled	
			RY	CH	CA	BA	AG	other	CH	CA	AG	CH	CA	CA	CH	CA	CH	CA
10N23E	1	SW	4	6	4	1			1									
1ON23E	2	SW	1	11	3	1			2									
10N23E	2	NE	2	9	3								1					
10N23E	2	SE	1															
10N23E	3	SE		11	1	1			2					1				
10N23E	3	NE	1	5	2	4			1	1								
10N23E	3	SW	1	2					2									
10N23E	4	NE	5	10	5	1			1									
10N23E	4	SE	4	65	16				7	6		1						
10N23E	5	NE	2	18	4				2							3		
10N23E	5	SE	5	25	29				5	3		1	2			1		
14N23E	1	SW	2		9	1			5	2								
14N23E	1	NE	6	3	3	1												
14N23E	1	SE	5	15	7													7
14N23E	1	NW	1	1	4				1									3
14N23E	2	NE	8	12	9				2									7
14N23E	2	SW	3	20	8	1			6							1	5	6
14N23E	2	SE		1												2		
14N23E	2	NW	9	12	18				4			3	10				12	
14N23E	3	NW	1	3	1	1			2			2						
14N23E	3	SW	1	6	4				3	2		2	2			1		
14N23E	3	NE	5	7	3	1			1			1						
14N23E	4	SE	4	10					3			1						
14N23E	4	NE	2	8					3									
14N23E	4	SW	4	6	13	1			3	1		2	1					9
14N23E	4	NW	12	66	15	4			13			2	2			1		3
14N23E	5	SW	7	47	13	4			5	1		7	3			2		
14N23E	5	SE	2	8	7	2				2			1					2
13N23E	1	SW		8					3			1				1		
13N23E	2	SW	5	10	10				3	3		1	5					2
13N23E	2	NW		2	5				2			1	2					1
13N23E	2	NE		2	3				1	1		1	1					
13N23E	2	SE	2	9	2	1			1			4	1					1
13N23E	3	SE	75	45	14	4			4	2		3	3					
13N23E	3	SW	8	310	82	15			13	3		13	12			1		
13N23E	3	NE	3	7	7	1			3			1	2					
13N23E	3	NW	2	5	7				1	2		1	1			2		

13N23E	4	NW	22	69	21	4			5	2		9	8					
13N23E	4	NE	10	12	4				1			2						
13N23E	4	SE	4	43	7	3			9			6			1	1		
13N23E	4	SW	8	222	38	7		3	18	12		35	6		1	1		
13N23E	5	SW		57	19	1			5	3		12	6					
13N23E	5	NE	1	9	2				2			1						
13N23E	5	NW	36	19	5				3	1		4	1					
13N23E	5	SE	3	80	21	2			7	1		11	1					1
13N23E	6	SE		19	2				3									
13N23E	6	SW	2	10	2				1	1		2						
13N23E	6	NE			1								1					
13N23E	6	NW	34	30	17				6	8		3	4			2		
12N22E	1	SE	3	20	5	2			8	2		4						
12N22E	1	SW				1												
12N22E	2	SW	8	70	15	14			9	2		9	6					
12N22E	2	NW	3	20	5	3			8	2		4	2			1		
12N22E	2	NE	12	100	38	27	3		21	7	2	13	11		7	3		
12N22E	2	SE	27	158	38	40			23	8		15	12		5	9		
12N22E	3	SE	9	293	79	8			37	22		32	20		8	10		
12N22E	3	SW	10	225	65	4			32	13		25	22					
12N22E	3	NW	20	97	39	6			13	12		19	14		5	6	8	
12N22E	3	NE	37	819	161	15			90	16		96	30		19	6	8	2
12N22E	4	NE	9	56	14	5			12	1		1	5		2	1		
12N22E	4	SE	9	78	28				19	4		20	10			4		
12N22E	4	SW	28	494	132	7			96	18		58	24		8	4		
12N22E	4	NW	37	415	113	10			52	24		38	27		2	4		
12N22E	5	NW	10	69	16				17	4		14	3					
12N22E	5	NE	2	53	2				11	1		5				1		
12N22E	5	SW	16	98	29	2			18	8		17	7		1			
12N22E	5	SE	2	13	1				1			2						
12N22E	6	NE		6	3				3				1					
12N22E	6	NW	4	6	3				3	1		1						
			559	4445	1236	206	3	3	638	202	2	506	270		59	68	33	44

Appendix VII. Frequency, raw material and other attributes of flake debitage

No.	Grid	Level	Quadrant	Raw material							other	Fire treated		Cortex						Bipolar flake		Rejuvenated			Water rolled	
				RY	CH	CA	BA	QR	AG	QZ		CH	CA	CH	CA	RY	BA	AG	QR	CH	CA	CH	CA	QR	CH	CA
1	10N23E	1	SW	1			1																			
2	1ON23E	2	SW	3	3	1	1								1											
3	10N23E	2	NE	9	2									1												
4	10N23E	2	SE		3																					
5	10N23E	3	SE	3	5	3	1							3									1			
6	10N23E	3	NE	2	2					1		1														
7	10N23E	3	SW																							
8	10N23E	4	NE	4	5		1							1												
9	1ON23E	4	SE		15	5									3											
9	10N23E	5	NE	1	5				1					1				1		1						
10	10N23E	5	SE	3	5	2																				
11	14N23E	1	SW	2	2																					
12	14N23E	1	SE		3																					
13	14N23E	2	NE	1																						
14	14N23E	2	SW		5	2	1					1	2	1												
15	14N23E	2	SE		1							1														
16	14N23E	2	NW		7	1	1					4	1							1						
17	14N23E	3	NW	4	1							2		2												
18	14N23E	3	SW	1	1						1	1				1				6	1	1				
19	14N23E	3	NE	1	2							1													1	

20	14N23E	3	SE	1	1																					
21	14N23E	4	SE		4		2					2														
22	14N23E	4	NE	2	1	1						1	2			2										
23	14N23E	4	SW	1	4	2						1		1						1		4				
24	14N23E	4	NW	17	26	4	5					5	1		1							3				
25	14N23E	5	SW	2	8	3	1					1	1	4	1											
26	14N23E	5	SE	2	5		2							4	1	1										
27	13N23E	1	SW		1																					
28	13N23E	2	SW	5	1	1								1	1											
29	13N23E	2	NW		2									2												
30	13N23E	2	NE		1																					
31	13N23E	2	SE	3	2																					
32	13N23E	3	SE	34	23	1						6		3	1	2										
33	13N23E	3	SW	10	123	24	11					15	2	12	12											
34	13N23E	3	NE	4	5							3														
35	13N23E	3	NW	1	1	1						1	1		1											
36	13N23E	4	NW	24	47	7	4					5	1	8	5	2										
37	13N23E	4	NE	5	26	7	3					7		8	2											1
38	13N23E	4	SE	9	19	3	5					5	2	6		1										
39	13N23E	4	SW	19	195	10	10					18	3	41	4											
40	13N23E	5	SW	2	23	3	1					5		3	2											
41	13N23E	5	NE	1	3							1														
42	13N23E	5	NW	32	24	1						5		8	1											
43	13N23E	5	SE	1		5	1					4		5	2											
44	13N23E	6	SE		3							1		1												

45	13N23E	6	SW			1									1											1
46	13N23E	6	NE	2	4	1	1					1		1		1										
47	13N23E	6	NW	22	20	2						5	1	3	1					1		1				
48	12N22E	1	SE	2	5	1	2					4		1	1											
49	12N22E	1	SW	1																						
50	12N22E	2	SW	16	25		14					10		7		2	3									
51	12N22E	2	NW	2	6							2		3						1						
52	12N22E	2	NE	5	18	5	5					4	2	8	4						1					
53	12N22E	2	SE	26	64	9	17					14	5	16	7		1			5	1					
54	12N22E	3	SE	21	130	22	6					22	4	38	9	4				12	2					2
55	12N22E	3	SW	13	127	21	2					32	7	35	10					1	2					
56	12N22E	3	NW	9	60	15	11					14	6	20	6		1			5	2					
57	12N22E	3	NE	20	246	37	13				1	42	9	72	13					13	5	1				
58	12N22E	4	NE	7	36	5	2	1				9	1	12	4				1	1		1		1		
59	12N22E	4	SE	1	15	8						4	2	9	5											
60	12N22E	4	SW	17	117	20	3					36	3	37	12					1	3	2				
61	12N22E	4	NW	20	125	21	5					34	14	23	5						4				1	
62	12N22E	5	NW	3	9	1						2		4	1	1										
63	12N22E	5	NE	1	7							5		2												
64	12N22E	5	SW	1		4						2	1		3											
65	12N22E	5	SE	1	4	2							1		1											
66	12N22E	6	NE	1	1																					
67	12N22E	6	NW		3							2		2												

Key RY = Ryiolite CH= Chert C= Chalcedony BA=Basalt AG= Agate QR = Quartz QZ =Quartizite

Appendix VIII: Core Fragments and their attributes

No.	Grid	Level	QUAD	Raw material				Fire treated		Cortex	
				CH	CA	QR	AG	CH	CA	CH	CA
1	1ON23E	2	SW	1	1			1			1
2	10N23E	2	SW	1							
3	10N23E	3	NE			1				1	
4	10N23E	4	NE	1							
5	10N 23E	4	SE	1							
6	10N23E	5	NE	2				1		2	
7	10N23E	5	SE		2			2			
8	14N23E	2	NW				1			1	
9	14N23E	4	NE	1				1			
10	14N23E	4	NW		1						
11	14N23E	5	SW		1			1			
12	14N23E	5	SE		1					1	
13	13N23E	2	SW		1						
14	13N23E	2	SE	1	1					1	
15	13N23E	3	SE	4	1				1		
16	13N23E	3	SW	5	5			3	2	2	2
17	13N23E	4	NW	1							
18	13N23E	4	NE	1					1		
19	13N23E	4	SE		1						
20	13N23E	4	SW	3	3			2	2		
21	13N23E	5	SW	1				1			
22	13N23E	6	SW	1						1	
23	12N22E	2	NE								
24	12N22E	2	SE	4	3			3	1	1	3
25	12N22E	3	SE	3	6			3	1	2	4
26	12N22E	3	SW	1	2			1			2
27	12N22E	3	NW	2	4			1	1		1
28	12N22E	3	NE	3	13			2	5	3	10
29	12N22E	4	NE	2				1		2	
30	12N22E	4	SE	1				1		1	
31	12N22E	4	SW	2	8			1	4	1	4
32	12N22E	4	NW	3	2			2		1	2
33	12N22E	5	NW		1				1		
					57	1	1	27	19	20	29

Key CH= Chert CA = Chalcedony BA= Basalt AG= Agate QR= Quartz

Appendix IX. Cores and their Attributes

No.	Grid	Level	Quadrant	Core Raw material						Fire treated		Cortex				
				RY	CH	CA	BA	QR	AG	CH	CA	CH	CA	RY	AG	QR
1	1ON23E	2	SW													
2	10N23E	3	NE					1								1
3	10N23E	4	NE		1											
4	10N23E	4	SE		4	1							1			
5	10N23E	5	NE		1	1						1	1			
6	10N23E	5	SE			1										
7	14N23E	1	SW		1											
8	14N23E	1	NE		1					1		1				
9	14N23E	2	SE						1						1	
10	14N23E	3	NE		1					1		1				
11	14N23E	3	NW		1	1				1	1		1			
12	13N23E	3	SE	1	4					2		1		1		
13	13N23E	3	SW		8	1				5		3	1			
14	13N23E	4	NW			1					1		1			
15	13N23E	4	NE			1					1	3	1			
16	13N23E	4	SE			2					1		1			
17	13N23E	4	SW	3	2					1		1				
18	13N23E	5	SW		1											
19	13N23E	6	NE		1											
20	12N22E	2	SW	1	1		1									
21	12N22E	2	NW		2				1	1		1				
22	12N22E	2	NE		2	1				1	1	2	1			
23	12N22E	2	SE		2	1				2		1	1			
24	12N22E	3	SE		4	2				2		3	1			
25	12N22E	3	SW		3	4				2	1	1	2			
26	12N22E	3	NW	1	5	2	1			3	2	3	1	1		
27	12N22E	3	NE		10	5				6	3	9	5			
28	12N22E	4	NE			1					1		1			
29	12N22E	4	SE		1					1		1				
30	12N22E	4	SW		3	2				2	1	2	2			
31	12N22E	4	NW		5	3				3	2	2	2			
32	12N22E	5	SE		1							1				
33	12N22E	6	NW		2											
				6	67	30	2	1	2	34	15	37	23	2	1	1

Key CH= Chert CA = Chalcedony BA= Basalt AG= Agate QR= Quartz Ryholite

No.	Grid	Level	Quadrant	Bipolar core	Blade core	Multifacial core	opposed striking plat form	Single striking plat form	Double striking plat form	
1	1ON23E	2	SW							
2	10N23E	3	NE		1			1		
3	10N23E	4	NE		1					
4	10N23E	4	SE			3*			1*	
5	10N23E	5	NE			1*	1*	1*		
6	10N23E	5	SE	1						
7	14N23E	1	SW						1*	
8	14N23E	1	NE							
9	14N23E	2	SE			1				
10	14N23E	3	NE						1*	
11	14N23E	4	NW			1				
12	13N23E	3	SE			1				
13	13N23E	3	SW			5	2		1	
14	13N23E	4	NW			1				
15	13N23E	4	NE			1			1*	
16	13N23E	4	SE						1*	
17	13N23E	4	SW			1				
18	13N23E	5	SW			1				
19	13N23E	6	NE						1*	
20	12N22E	2	SW			1	2			
21	12N22E	2	NW	1			1			
22	12N22E	2	NE			1				
23	12N22E	2	SE			2			1*	
24	12N22E	3	SE			2			4*	
25	12N22E	3	SW			5			2*	
26	12N22E	3	NW			8			1*	
27	12N22E	3	NE	1	1	10*			2*	3 of the multi facial core have cortex
28	12N22E	4	NE						1*	
29	12N22E	4	SE			2*	2		2	
30	12N22E	4	SW			1				
31	12N22E	4	NW			8				
32	12N22E	5	SE			1				
33	12N22E	6	NW			2				
				3	3	59	8	2	20	

*Cores with cortical surfaces