Archaeological Site Distribution and the Formation of Early Polities in Eastern Tigrai (Agame), Ethiopia

by

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Abstract

Archaeological site formation and distribution in Eastern Tigrai, Ethiopia can reveal the characteristics behind the formation of the earliest polities in the Northern Horn of Africa during the past three millennia. Within a landscape archaeology framework, site attributes, landscape attributes, diagnostic artefacts, chi-square analysis, and settlement patterning can be synthesized to understand the socio-political and economic conditions present within the study area, specifically, and Eastern Tigrai, generally, between the Pre-Aksumite (>700 BCE) and Post-Aksumite (<700CE) periods. The unique characteristics present within the archaeological record in Eastern Tigrai during the Pre-Aksumite, Aksumite, Post-Aksumite, and Ethnographic periods indicates that an atypical heterarchical political organization is present within Eastern Tigrai. This atypical political trajectory combined with recent research raises questions about the exact relationship between Eastern Tirgai and the rest of the Aksumite Empire during its influence in the region.

Keywords: Ethiopia; Settlement; Landscape; Aksumite; Pre-Aksumite; Survey

To the people of Gulo Makheda and Ghanta Afeshum who shared their time and culture history with me.

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List of Acronyms

ARCCH	Authority for Research and Conservation of Cultural Heritage
ETAP	Eastern Tigrai Archaeological Project
ESA	Early Stone Age
GIS	Geographic Information System
G-MAP	Gulo-Makheda Archaeological Project (precursor to ETAP)
LSA	Late Stone Age
MSA	Middle Stone Age
PA-A	Pre-Aksumite/Aksumite Transition
RSBOOT	Rank-Size Bootstrap Software
SFU	Simon Fraser University
TCTB	Tigrai Culture & Tourism Bureau

Glossary: Tigrinya Terms

amba	An elevated plateau on the landspace (mesa)
tabia	An Administrative district in Tigrai, similar to a ward
woreda	An administrative district in Tigrai, similar to a county

Chapter 1. Introduction

1.1. Chapter Introduction

The Northern Horn of Africa (Figure 1) has seen an increase in systematic archaeological survey in recent years, leading to discussions about settlement patterning, and conclusions about site formation (e.g., Curtis 2008; Michaels 2005; Sernicola 2017; D'Andrea et al. 2008; Harrower and D'Andrea 2014; Harrower et al. 2019). Discussions of settlement patterning in the region have indicated an atypical relationship between sites on the landscape, differing from classical settlement hierarchies (Harrower and D'Andrea 2014). There has been a shift in investigating areas away from well-known elite centers of Yeha and Aksum in Western Tigrai adding to the conclusions of atypical political organization in the northern Horn of Africa. Continuing to explore areas which have yet to be studied in detail will help to support or refute claims of atypical political organization and development in the area. In this thesis I investigate settlement patterning, and landscape use in the Gulo Makeda and Ghanta Afeshum regions of Eastern Tigrai (Figure 1).

1.2. Early Political Development in the Northern Horn of Africa

Recent studies of the Pre-Aksumite period (>800 - 450 BCE) through to the end of the Aksumite Kingdom (ca. 450-700 CE) in the northern Horn of Africa are providing new insights into the development of polities during the past three millennia. The Pre-Aksumite witnessed the initial development of social complexity in the Horn, when polities are suggested to have emerged from the consolidation of smaller chiefdoms or agro-pastoralist populations subsisting in the highlands of Ethiopia and Eritrea (Curtis 2008; Schmidt et al. 2008a, 2008b; Fattovich 2010; Schmidt 2009; Harrower and D'Andrea 2014; D'Andrea et al. 2008; D'Andrea and Welton in prep). Later, the Aksumite Kingdom expanded trade, linking the Horn of Africa to the Mediterranean, Arabian Peninsula, and the Indian Ocean. The transition from small nomadic settlements to larger settlement sites and political centers during this expansion is an important aspect of the development of these polities.

The distribution and size of archaeological sites has long been an important method for gauging the origin and development of complex societies (Trigger 1967, Pearson 1980, Savage 1997). The size and location of sites on the landscape has been connected to political organization and population density of developing societies (Conolly and Lake 2006; Drennan and Peterson 2004; Savage 1997; Johnson 1980; Harrower 2016). Studies on the spatial relationship of sites on the landscape typically fall within the study of settlement patterning. Settlement patterning analysis is aided using statistical analysis to determine mathematically how archaeological sites of certain size classifications relate to one another on the landscape (Drennan and Peterson 2004; Bevan and Conolly 2006; Savage 1997; Johnson 1980). Archaeological survey is the primary tool for identifying these sites, and gathering the appropriate information to conduct settlement patterning studies, and discuss site formation on a macro scale. Archaeological excavation is an important step of investigation, and provides high resolution information about activities and settlement but within one or few localities.

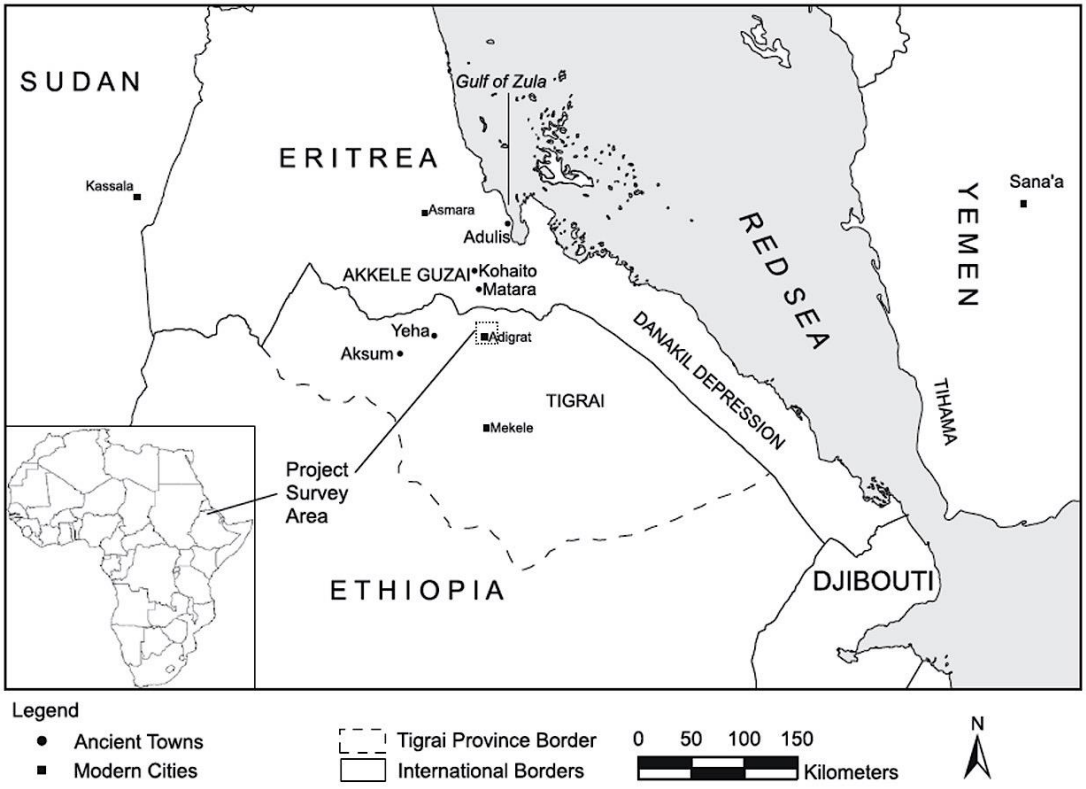


Figure 1 The Northern Horn of Africa with Project Area.
Modified from Harrower and D'Andrea (2014)

Previous archaeological investigation in my study area was limited to opportunistic survey, most of the time very near to major transportation arteries due to difficult terrain and lack of reasonable access to many parts of the northern Horn (e.g., Coulbeaux 1929; Conti Rossini 1928; Mordini 1941; Franchini 1953; Leclant and Miquel 1959; Anfray 1973). In comparison to other areas of classical archaeological research in Ethiopia-Eritrea, this region has seen limited systematic archaeological survey to locate archaeological sites. Most early publications focused on well-known elite centers such as Aksum and Yeha because of an abundance of visually imposing architecture and the rich historical record of these sites (e.g., Littmann et al. 1913). These sites have historically received a disproportionate amount of investigation, and recent studies in neighboring regions of Western and Eastern Tigrai have yielded surprising results challenging decades of accepted norms (D'Andrea et al. 2008; Curtis 2004, 2007, 2008; Harrower et al. 2019; D'Andrea and Welton in prep.). For example, Eastern Tigrai has yielded data indicating that the area played an important role in trade and agricultural production over the past three millennia, even being referred to as the heartland of the region (D. Phillipson 2012: 213). The importance of Eastern Tigrai to the Northern Horn of Africa, and its unique socio-political developments could be reflected in the positioning of sites across the landscape, and the relationship between sites in the area throughout the past three millennia.

1.3. Research Goal and Objectives

The goal of this thesis is to document the nature and development of early political entities in Eastern Tigrai between 1000 BCE and CE 700. This thesis will also extend into the Late Stone Age, and Medieval Periods to further discuss settlement patterning and landscape use throughout time. Settlement patterning studies in the region have shown atypical results regarding the nature of political entities, in particular that a possible heterarchical organization of settlement sites occurs in Eastern Tigrai (Harrower and D'Andrea 2014). This conclusion is similar to some other regions in pre-colonial periods across Western, Eastern, and Central Africa, which do not fit into standard hierarchical schemes of settlement areas (McIntosh 2009; Southall 2009; Crumley 1987). In addition to settlement patterning statistical analysis of site density and connections between site types and landforms in also important in understanding the

nature of past political entities. As such, the main research objectives of this thesis are to:

1. understand the association of landforms and settlement sites in Eastern Tigrai;

2. assess regional continuity of occupation from the Late Stone Age (LSA) and Pre-Aksumite era through to the Classic Aksumite and Post-Aksumite times;

3. characterize and quantify settlement patterning in the study area using rank-size analysis.

The field methods and data collection employed involve incorporating archaeological survey with statistical GIS (Geographic Information Systems) based analysis to explore the development of early political entities in the study area. Surface collections were conducted at each archaeological site to provide dates through ceramic and lithic analysis. This study area overlaps two administrative zones or *woredas*, Gulo-Makeda and Ghanta-Afeshum, most of which have never been systematically surveyed for archaeological sites. Figure 2 shows the study area in relation to previous systematic survey programs conducted by the Eastern Tigrai Archaeological Project (ETAP), and formerly G-MAP (Gulo-Makeda Archaeological Project), over the past decade (Figure 2) (Harrower and D'Andrea 2014, D'Andrea et al. 2008). Data from these past surveys which employed similar methodologies will not be integrated into statistical analyses for this study, but the results will be discussed in comparison to this thesis to reconstruct the past political organization in the wider region.

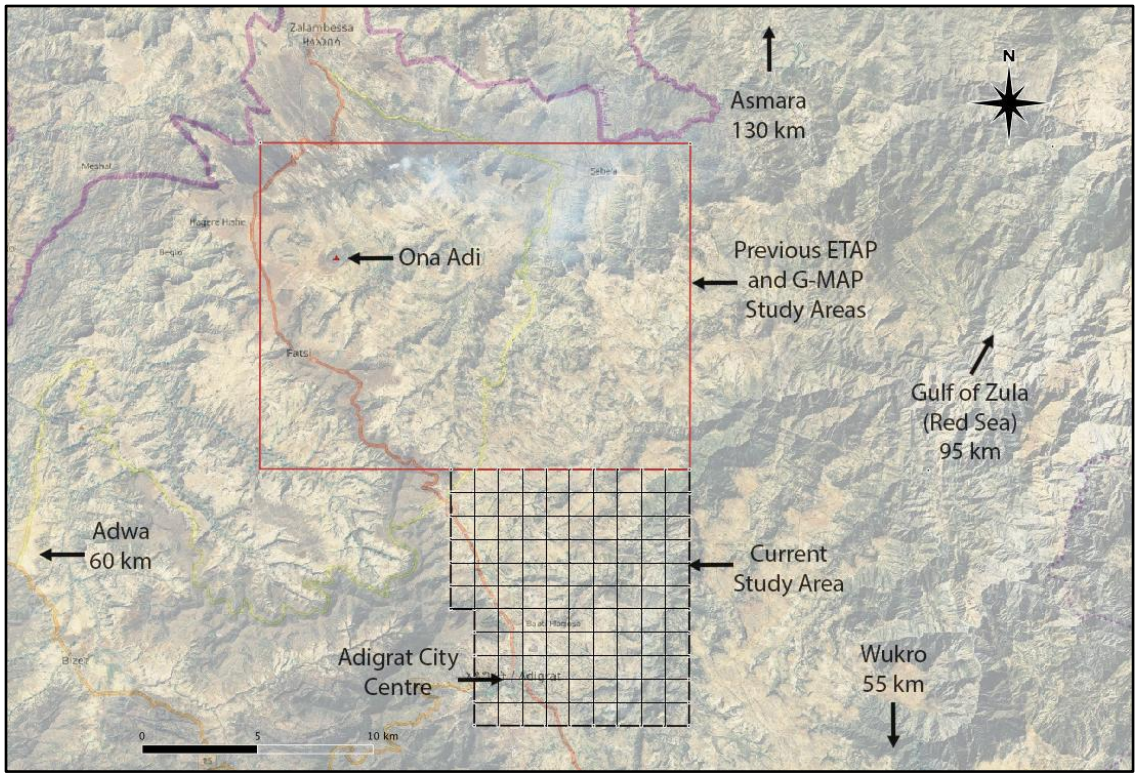


Figure 2 Current study area and previous ETAP (and G-MAP) study areas. Current study area outlined in black, general previous ETAP (and G-Map) study areas outlined in red.

1.4. Eastern Tigrai Archaeological Project (ETAP)

The goals of this study are situated within the objectives of the ETAP, which is investigating the earliest polities during the Pre-Aksumite and Early Aksumite Periods in Eastern Tigrai. One of ETAP's primary goals is investigating the development of social complexity in the Pre-Aksumite period and the transition of political development into the Aksumite periods (Harrower and D'Andrea 2014, D'Andrea et al. 2008). Recent archaeological investigations have shown different trajectories for the development of social complexity, unique to both this part of Africa, and this specific region of the Ethiopian Highlands (Harrower and D'Andrea 2014; Peterson 2017; Mekonnen 2019; D'Andrea and Welton in prep.). New theories propose that Eastern Tigrai may have developed as and remained a semi-autonomous political entity alongside Pre-Aksumite kingdoms, and the Aksumite Kingdom during the past three millennia (D'Andrea et al. 2008; D'Andrea and Welton in prep.). These ETAP hypotheses are based on intensive archaeological investigation, and ethnoarchaeological studies in Eastern Tigrai over the past decade which have resulted in the discovery of culture history with distinct

differences from Western Tigrai, Central Tigrai, and other areas in the Horn of Africa (D'Andrea 1997, 2003, 2005; D'Andrea et al. 1999).

This thesis will provide more data relevant to these observations, while also enlarging the number of archeological sites identified in Eastern Tigrai. Analysis of artefact assemblages, combined with the exploration of spatial relationships between archaeological sites will provide better clarity as to the development of social and political complexity in the region over time. This thesis will also recommend archaeological sites within the study area best suited for excavation and further investigation to continue to build upon research conducted at the sites of Mezber and Ona Adi.

1.5. Chapter Summary

This chapter has introduced the goals and objectives of this thesis and introduced the goals of ETAP. The following chapters will provide a detailed description of the development of early polities in Eastern Tigrai through the use of archaeological survey and statistical analysis of site distribution. Background to this study including a critical discussion of the regional culture history and material culture are provided in Chapter 2. This is followed by a discussion of the theoretical background and methodology employed in this study in Chapter 3. The results of the systematic archeological survey and statistical analysis of GIS data will be presented in Chapter 4. A discussion of the results and their implications on the development of early polities will be presented in Chapter 5, and final conclusions presented in Chapter 6.

Chapter 2. Background

2.1. Chapter Introduction

This chapter provides a critical review of archaeological research in the Northern Horn of Africa relating to the Tigrai region of Ethiopia. A brief background on Later Stone Age (LSA) through to the Medieval Period, focusing mainly on the Aksumite Kingdom, is presented with a discussion on how polities changed through time, and how that change is generally reflected in each period or phase of material culture. A limited description of material culture is presented, but this is by no means a comprehensive review of the varied archaeological research which has been conducted to this date in the northern Horn. Understating each period, and associated phases, in terms of history and material culture is important to contextualise past socio-political organization and development in Eastern Tigrai.

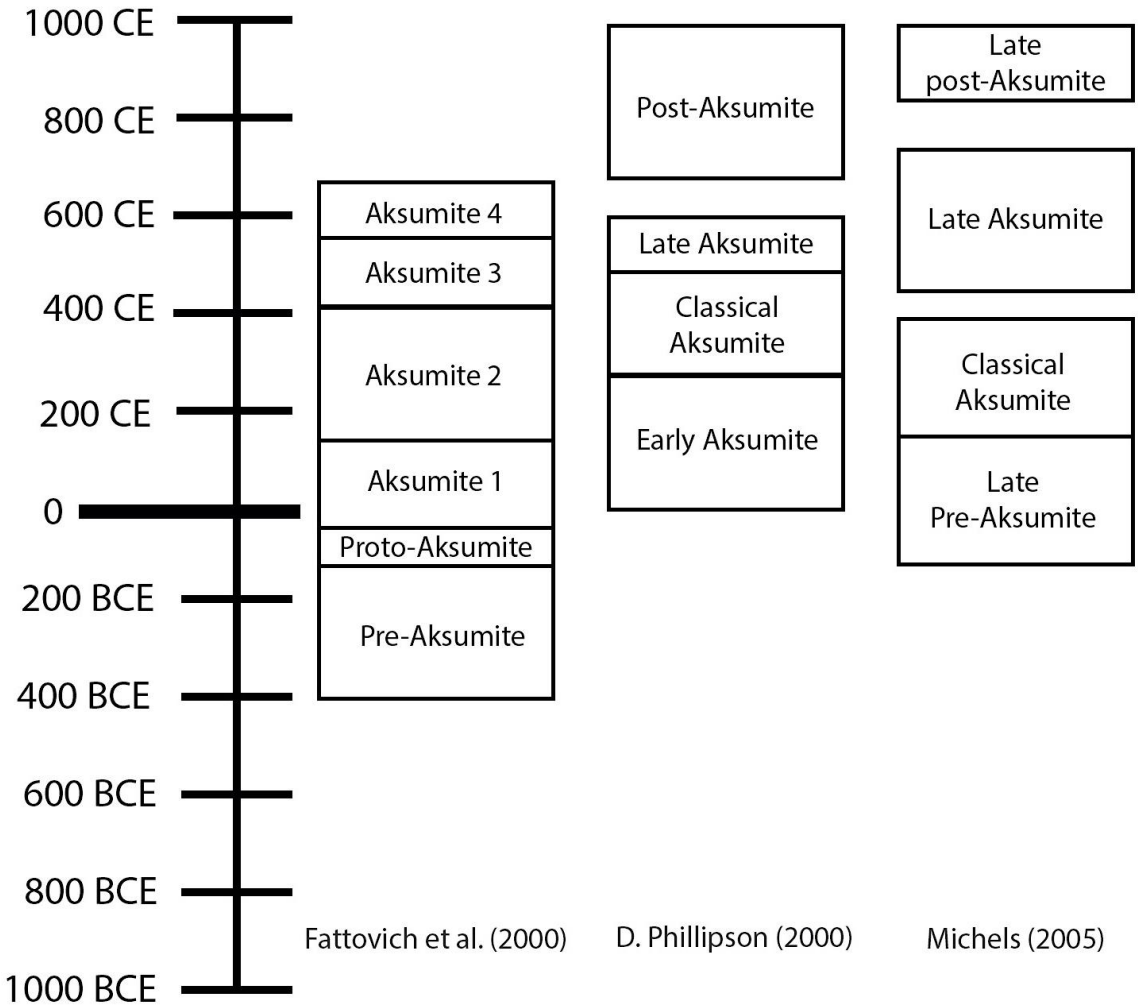
2.2. Overview of Prehistoric to Medieval Periods in the Ethiopian Highlands

The range of culture history relevant to this study is from the LSA (beginning ca. 35,000 BP) through to the Medieval period (ending ca. 1700 CE) in Eastern Tigrai; of particular importance in further results and discussions are the transitions between the Pre-Aksumite, Aksumite, and Post-Aksumite periods. The wider range including the LSA and Medieval Periods are included to create an inventory of heritage resources in an area of Eastern Tigray which have not been systematically surveyed for archaeological resources. The transition from periods on the periphery of this study will prove important for relating the narrative of transition, occupation, and cultural change throughout time in the region as it relates to the place, size, and composition of archaeological sites.

More than one cultural chronology for the region has been developed since formal research began at the beginning of the twentieth century, each with its own rationale for subdividing the culture history of the region into specific periods (*Table 1)*. For this study, the chronology presented by Fattovich and Bard (2001) will be applied, keeping in mind that it was developed in central and western Tigrai and therefore it should be used as a guide, rather than a precise history (*Table 2*). Recent excavations

by ETAP at the site of Mezber, in Eastern Tigrai have pushed back the oldest threshold for the Pre-Aksumite period by more than 800 years indicating that the culture history of Eastern Tirgai differs from Central and Western regions (D'Andrea and Welton in prep.). It is not the aim of this thesis to refine, refute, or confirm these regional chronologies, but rather to use them as a framework to discuss past settlement patterning and site formation over time.

Table 1 **Examples of chronologies for the Pre-Aksumite and Aksumite periods in the Ethiopian and Eritrean Highlands.**



Modified from D. Phillipson (2012).

Table 2 Pre-Aksumite and Aksumite dates.

Designation	Age
Post Aksumite Period	After AD 700
Aksumite Period	50 BC – AD 700
Late Aksumite phase	AD 550-700
Middle Aksumite phase	AD 400/450-550
Classical Aksumite phase	AD 150 – 400/450
Early Aksumite phase	50 BC – AD 150
Proto-Aksumite Period	400 – 50 BC
Pre-Aksumite Period	700 – 400 BC

From Fattovich and Bard (2001).

2.3. From Hunter-Gatherers to the Proto-Aksumite Period

Africanist archaeologists have developed broad schemes to characterize cultural development over millions of years in material culture developed by anatomically modern humans across the continent. The term *Stone Age* is applicable when discussing the groups of hunter-gatherers which occupied the continent from 3.5 million years ago, up until approximately 10,000 BP. General typologies have been developed over the past century for the African continent, with region specific variations in North Africa, East Africa, The Nile Valley, South Africa, and Central Africa. Within these general regions some work has been done in recent decades to refine these chronologies (e.g., D. Phillipson 2012; Finneran 2007; Brandt 1986) but as with other areas of Sub-Saharan African archaeological studies the amount of work conducted continent-wide (Ancient Egypt being a major exception) pales in comparison to areas of classical research in Europe, the Mediterranean, Asia, and the Americas (D. Phillipson 2012).

For the purposes of this study, the Early and Middle Stone Age (ESA and MSA), ranging from 3.5 million BP to 150,000 BP and 150,00 BP to 35,000 BP respectively will not be discussed as they are not typically encountered in the study area. This is in part due to a lack of comprehensive Stone Age archaeological survey and testing in the area, but also to paleo-environmental climatic conditions presenting wildly variable environment conditions in the ESA and MSA especially, making consistent occupation in

the highlands unlikely (Finneran 2007, 2000a, 1998). The LSA, 35,000 BP to 8000 BP, is represented in the archaeological record in the study area and is of interest to this study as it may highlight the transition from hunter-gatherer to the earliest examples of sedentism, farming, and related socio-political developments in the Horn of Africa.

2.3.1. The LSA in Ethiopia and Material Culture

The LSA spans approximately 35,000 BP to 8,000 BP in Ethiopia, with neighboring regions such as the Nile Valley, East Africa and the Red Sea each having slight variations on this range (Brandt 1986; Finneran 2007). The LSA saw a change in climatic conditions starting with the Late-Terminal Pleistocence (20,000 – 12,000 BP) characterized by hyper-arid conditions across Tigrai. The Early Mid-Holocene (12,000 - 8,000 BP) was characterized by a shift to a humid and wet conditions across the region, possibly aiding in the ability to reliably harvest wild grains and start the earliest forms of agriculture. The climatic shift would have greatly impacted past lifeways in terms of seasonal foraging, hunting, and settlement selection (D. Phillipson 2012; Finneran 2007).

Many LSA sites are located within rock shelters and caves throughout Eastern Tigrai, due to the abundance of these features on the rugged sandstone landscape in the area. The plateau tops of *amba* throughout the region are also a desirable locale for LSA sites because of to their vantage point over travel corridors and game, especially in areas proximal to extant waterways which would have flowed more reliably in past paleo environmental conditions (Brandt et al. 2007; Terwilliger et al. 2011; Harrower and D'Andrea 2014).

The LSA was characterized by a shift from Acheulian and Levallois style large bifacial pear shaped axes and knives, to a smaller and more refined toolkit including blade technologies (D. Phillipson 2012; Finneran and Phillips 2003). Tools in the LSA are more finely crafted, utilizing precise flaking techniques to create tools for hunting, wild plant cultivation, and processing a variety of organic materials (D. Philipson 2012). Unfortunately, there is a lack of in-depth LSA research and excavation in Tigrai. While some sites have been located, very few have been further excavated due to a focus on Pre-Aksumite and Aksumite material culture in the region and a lack of sedimentation at

LSA sites to provide stratification of material remains (D. Phillipson 2012; Finneran 1998, 2000a, 2000b, 2001; Peterson 2017; Brandt 1987; Negash 1997, 2001).

2.3.2. Pre-Aksumite Period in Eastern Tigrai

The Pre-Aksumite period (>800 – 400 BCE) is the precursor to the later Aksumite state that dominated the Horn of Africa from the first century CE onwards. Human occupation in the Ethiopian Highlands is consistently present from at least 10,000 BCE; however, in the final two millennia BCE there was a shift from hunter-gatherer communities to permanent settlements and the formation of early polities (D. Phillipson 2009, 2012; Finneran 2007). The term polity offers a more accurate description than states, as these early socio-economic and political organizations do not seem to fit into typical political hierarchies such as chiefdoms. For this reason, polities will be used exclusively when discussing socio-economic and political organization in the periods prior to the Aksumite Kingdom. The exact reasons why individuals shifted from nomadic hunter-gatherer systems to permanent settlements is not well understood, which has led to a gap in the understanding of cultural developments in the Horn of Africa developed over the past three millennia.

Prior to the Pre-Aksumite period the second millennium BCE witnessed a rise in polities on the Ethiopian Plateau, part of a region (along with the Gash Delta) known to the ancient Egyptians as the Land of Punt, where many trading missions were conducted (Kitchen 1971, 1993; Fattovich 2005). The earliest researchers ascribed the first millennium BCE with two previously interchangeable names, the “Pre-Aksumite” and the “Ethio-Sabaean” periods. The latter was based on the discovery of limited Sabaean inscriptions associated with monumental architecture at sites such as Yeha in Central Tigrai and near Wukro in southeastern Tigrai (Bent 1893: 134-151; Glaser 1895; Conti Rossini 1928: 99-101; Sergew Hable Selassie 1972: 26-34; Ullendorff 1973: 47; Ricci 1984). The Sabaean people were of South Arabian heritage (modern day Yemen) who founded the Kingdom of Saba, with a capital in Ma’rib, which flourished between approximately 1250 BCE and 275 CE as one of the most powerful kingdoms on the Arabian Peninsula (Breton 1999; Ricci 1984; Bent 1893; Schmidt et al. 2008). In addition to inscriptions found in association with temples and elite structures, certain iconography undoubtedly shows affiliation with the Kingdom of Saba in forms such as the crescent and moon motif representing the Sabaean moon god Almaqah, a focus on the Nubian

ibex (*Capra nubiana*), and the mention of other Sabaean gods (Anfray, 1963, 1968; Manzo 2009; Fattovich 2004; D. Phillipson 2012). Early researchers postulated that Sabaean writing and religious iconography, albeit limited in distribution and quantity, indicated that there was emigration among elite Sabaean merchants and masons from the Arabian Peninsula to the Ethiopian Highlands as far back as the eighth century BCE (Anfray 1990, Robin and de Maigret 1998). Further research and attempts at translating the Sabaean inscriptions located references to kings, rulers, kingdoms, or polities represented with inscriptions such as *D'MT, MKBR,* and *MLK* in the Ancient South Arabian (ASA) language of South Arabia Peninsula (Fattovich 2009; D. Phillipson 2009, 2012). The latter two terms which occur more frequently, *MKBR* and *MLK,* have closer ties with an African linguistic form, which is designated as 'Old Ethiopic' or 'Proto-Ge'ez.' Both are precursors to the modern Amharic and Tigrinya scripts of Ethiopia/Eritrea (Schneider 1973, 1976). The combination of early Sabaean-influenced elite material culture and the use of the Sabaean language, especially regarding a ruler, king, or overlord, led to the hypothesis of the 'Ethio-Sabaean' State origin theory (Bent 1893: 134-151; Glaser 1895; Conti Rossini 1928). The Ethio-Sabaean State for many years served as a convenient explanation for the mixture of Sabaean material culture with non-Arabian architecture in the highlands during the first millennium BCE and attributed the development of Ethiopic polities to be the result of these foreign influences. However, under increased scrutiny and further excavations in non-elite areas, the hypothesis regarding the formation of the earliest polities during the Pre-Aksumite period in the Horn of Africa is now under reconsideration, including the role of indigenous agency and influence (D'Andrea 2008; Harrower and D'Andrea 2014: 517-518; D'Andrea et al. in prep; DiBlasi 2005: 4-12; Curtis 2008; Schmidt 2009).

A shift from the study of a few large elite centers, including Yeha, to more representative residential settlement sites in the late twentieth century created a shift in how the Pre-Aksmuite period is understood. Fattovich's work at the site of Bieta Giyorgis (near modern day Aksum) was one of the first major works to redefine the Pre-Aksumite period (Fattovich 1980, 1988, 1990). This study synthesized those findings with data collected by Anfray (1967, 1969) and Michaels (2005) decades earlier and concluded that the previous explanation of elite merchant Sabaean immigration solely developing the first polities in the Horn of Africa was likely erroneous (Fattovich 2010; D. Phillipson 2012, 2009). A focus on the ceramic assemblages at Bieta Giyorgis built upon

Fattovich's unpublished dissertation on ceramics of the region which showed more connections to African as opposed to Sabaean influences (Fattovich 2012b). The ceramic assemblage from Beta Giyorgis, especially in non-elite settings showed much greater affinities to indigenous African design, and continuity from LSA ceramics in the region (Fattovich 2012). This proved crucial to the understanding of the earliest Pre-Aksumite polities and served as an initial paradigm shift in how we understand the earliest polities in the Ethiopian Highlands.

The western highlands, near the modern-day border between Ethiopia and South Sudan, also contains Pre-Aksumite material culture which does not fit within the Ethio-Sabaean state model. Finneran and Curtis noted after years of extensive systematic archaeological survey that ceramic assemblages showed earlier prehistoric indigenous African traits, and traits from groups in the lowlands of South Sudan to the north and west (Curtis 2007; Finneran 2007). This study was synthesized with data collected from surveys in the Asmara region to draw even more connections to Meroë, Nubian, and even Egyptian influences on Pre-Aksumite material culture (Curtis 2009; Finneran 2007).

In the Eritrean highlands surrounding Asmara investigations by Schmidt et al. (2008a) of the Pre-Aksumite and Ancient Ona culture found a complete absence of Sabaean material culture in association with elite sites (Schmidt et al. 2008b). Curtis suggests, that indigenous Ona elites would have actively appropriated religious architecture, iconography, and other South Arabian elements to legitimize claims to rulership and boost prestige (2008). From these absences, Curtis has gone as far to suggest that there were no Sabaean colonialists at all (2004, 2007, 2008). This idea is supported with studies at the D Site in Aksum where domestic contexts from the Pre-Aksumite Era contain no Sabaean influences or material culture (Phillips 2004, D. Phillipson 2000). Based on this evidence it is likely that Sabaean material culture and influences were restricted to a few elite centers in Tigrai. DiBlasi suggests that the presence of limited Sabaean influence in Pre-Aksumite material culture is the result of a small number of Sabaean merchant elites settling in the northern Horn and introducing elements of their own culture while interacting with local political elite (2005). The lack of Sabaean elements diffused into rural areas in the region remains unexplained as one would expect at least some of these elements to be present in elements of material culture outside of these limited centres.

2.3.3. Pre-Aksumite Material Culture

Pre-Aksumite material culture is characterized by limited inscriptions, Pre-Christian symbolism in elite and religious features, and a small but growing number of non-elite sites. It is important to move beyond the limited amount of elite and religious material culture to more typical day-to-day Pre-Aksumite material culture and architecture in reconstructing that time. My study area has yet to yield exposed monumental architecture or stelae, therefore a detailed discussion into religious, funerary, ritual, and elite architecture is not directly relevant. Ceramics, as with the following Aksumite Period, provide the most numerous and variable form of material culture which can be used to attempt to reconstruct past function and determine the period or phases of archaeological sites. Pre-Aksumite ceramics tend to be smaller, less ornately adorned, and rougher than Aksumite successors (Fattovich and Bard 2001). Pre-Aksumite ceramic assemblages show affinities to earlier LSA ceramics, especially in terms of handmade production and basic artistic design elements. Interior scraping of vessels is also common, which continues into the Aksumite Periods and is seen millennia earlier in examples of pottery in the Sudan (Fattovich 1990). Within the study area the 'Agame Ceramic Tradition' is present at this time described by Fattovich (2012: 11) which is characterized by black or brown bowls decorated with rim-bands of incised triangles, sometimes filled with a white or red paste, and black –topped jars from assemblages dating to the early 1st millennium BCE at Sobea and Mezber in Eastern Tigrai, and Matara to the north in Southern Eritrea (Anfray 1966; Fattovich 1980: 35-38; D'Andrea et al. 2008; Teddese 2019; D'Andrea and Welton in prep.)

Stone, both in terms of architecture and lithic tools is another important defining material characteristic of the Pre-Aksumite period (D. Phillipson 2012; Finneran 2007). Pre-Aksumite architecture is characterized by large stone walls, without mortar, in non-elite residential settings, and ashlar masonry in temples (D. Phillipson 2012; Finneran 2007; D'Andrea and Welton in prep.). Residences, in general, were not expansive but a paucity of research into non-elite architecture and lifeways leaves much to learn about daily Pre-Aksumite life. Examples of non-elite architecture have been located during excavations in Eastern Tigray at the sites of Mezber, and Ona Adi as well as in Aksum, Shire, and on the Asmara Plateau (D'Andrea et al. 2008; D'Andrea 2011, 2013, 2014, 2015; Mekonnen 2019; Peterson 2017; D'Andrea and Welton in prep.; Schmidt et al. 2008; Curtis 2008; Finneran 2007). The ancient Ona sites of the Asmara plateau share

some structural and artefact affinities to Pre-Aksumite architecture in the Ethiopian Highlands, but have been classified by researchers in the area as a socio-political entity separate from that of the Pre-Aksumite (Schmidt et al. 2008a, 2008b; Curtis 2004, 2008). Analysis of lithics from the Aksum region provide the most useful comparisons to help sequence the chronology of Eastern Tigrai lithics from this period (D. Phillipson 2000; Finneran 1998, 2000a, 2000b, 2001; Finneran and Phillips 2003; L. Phillipson 2000a, 2000b, 2009a, 2009b). In the Aksum-Yeha area the use of chipped stone tools appears to be most prevelant in the Late Aksumite phase (L. Phillipson 2000a; Michaels 2005), however, several Pre-Aksumite sites in Eastern Tigrai have substantial lithic assemblages (D'Andrea et al. 2008; Peterson 2017). Functions of these tools range from scrapers for hide production (Peterson 2017), piercing hides (L. Phillipson 2000a: 58), and a variety of household tasks (D. Phillipson 2012). Silicified sandstone and obsidian appears in archaeological contexts most frequently in this period, with studies indicating the trade of obsidian in the region could go as far back at 5000 BCE (D'Andrea et al. 2008; Finneran 2000a, 2000b; D Phillipson 2000: 216).

2.3.4. Proto-Aksumite Period and Material Culture

The Proto-Aksumite period serves as an intermediary period as Pre-Aksumite polities in the Aksum area shifted to control under the Aksumite Kingdom (Fattovich and Bard 2001; Mekonnen 2019). It is a local cultural manifestation that may not be applicable Tigrai outside of the greater Aksum area. The Proto-Aksumite period was defined by Fattovich and Bard (2001) during excavations at the sites of Ona Nagast and Ona Enda Aboi Zegwè starting in 1993, on the hill of Beta Giyorgis (northeast of Aksum). This has been the only work focusing strictly on this time period and its definition. Ona Enda Aboi Zegwè is a cemetery with shaft tombs and stelae, while Ona Nagast represents a residential site with occupation starting in the fourth century BCE (Fattovich and Bard 2001). While two tombs are present within the ETAP study area, one of which was located by accidental impact during residential development in 2019, Fattovich and Bard's work at Ona Enda Aboi Zegwè is largely irrelevant to the study due to a complete lack of stelae, pit burials, and extensive cemeteries encountered during systematic survey. Ona Nagast however, is highly relevant due to the predominance of non-elite sites on the landscape in number, compared to large elite sites in Eastern Tigray.

Excavations at Ona Nagast uncovered material culture, particularly ceramics, which helped to define a distinct transitionary period between the Pre-Aksumite and the Early Aksumite period. Proto-Aksumite ceramics from Ona Nagast have the following important defining ceramic morphological features: a) large ovoid molded decorations on large basin rims; b) wide ledge-rims, with an S-shaped profile; and c) bowls decorated with incised vertical grooves (Fattovich and Bard 2001). This typology connects the Pre-Aksumite and Aksumite periods through progression in style and fabric. The name 'Proto-Aksumite' indicates that this period would have served as a period of technological and political growth between the scattered polities of the Pre-Aksumite period and the consolidation of political power throughout the Aksumite Period. Fattovich and Bard confirm this by mentioning at the time of Ona Nagast there would have been a scattering of small polities (mentioned also as chiefdoms) around the Aksum area, rather than consolidated power (2001). In addition to portable material culture, masonry and residential construction share affinities to the Pre-Aksumite in terms of large walled structures utilizing dry stone masonry (with an abundance of local sandstone sources) (Fattovich and Bard 2001).

Fattovich and Bard draw connections between funerary traditions at One Enda Aboi Zegwè to northern influences such as the Meroic and the "Eritrean-Sudanese lowlands," while also indicating there is no connection to assumed Sabaean Pre-Aksumite cult worship, in terms of the size, position, and context of stelae and pit tombs from One Enda Aboi Zegwè (2001: 20). This shows again the number of traits and sites which show local African affinities, rather than assumed adoption of Sabaean culture in the Pre-Aksumite period as stated by others (e.g., Wolf and Nowotnick 2009; Gerlach 2012, 2013; Jap et al. 2011; Glaser 1985). The tombs from One Enda Aboi Zegwè contained the remains of elite individuals from the area, as evident by the rich grave goods interred with the individuals (even after likely centuries of looting), however there were no cult objects or southern Arabian affinities in relation to tomb construction and grave goods. This again points to an indigenous regional African influence playing a much more important role in the region, as opposed to the examples of South Arabian influence.

2.4. The Aksumite Kingdom

The exact beginning of the Aksumite Kingdom is still debated; however, centralized power focused at the city of Aksum was evident near the end of the first century CE (Finneran 2007, Kobishchanov 1967). A shift from decentralized polities in the Pre-Aksumite and Proto-Aksumite periods to a centralized Aksumite Kingdom approximately two thousand years ago is certain, but the exact social, political, and economic mechanisms whish fostered a centralized kingdom are only now starting to be illuminated (D. Phillipson 2012; Finneran 2007). It is believed that power was centralized out of the modern-day city of Aksum, and likely took time to spread across Western Tigrai, Eastern Tigrai, Eritrea, Southern Ethiopia, and coastal Yemen (Kobishchanov 1967; Finneran 2007; D. Phillipson 2012).

2.4.1. Aksumite Period in Tigrai

The transition period from the Pre-Aksumite period to the Aksumite Kingdom is described in three major ways, each with some disagreement (see previous Tables 1 and 2). Scholars such as Michaels and Munro-Hay assert that the transition occurred from a Late Pre-Aksumite phase to an Early Aksumite phase at 150 CE (Michaels 1994, 2005; D. Phillipson 2012; Munro-Hay 1991; Sernicola 2017). Fattovich et al. provides an alternate timeline in which the Pre-Aksumite and Aksumite Kingdom were linked by the Proto-Aksumite period discussed earlier (Fattovich and Bard 2001). In this example, the Pre-Aksumite Period ended in approximately 400 BCE, and the Proto-Aksumite period is present between 400 BCE and 150 BCE (Fattovich and Bard 2001, Fattovich et al. 2000, D. Phillipson 2000). At 150 BCE Fattovich et al. (2000) and D. Phillipson (2000) diverge from one another, Fattovich et al. ascribing the 150 BCE - 150 CE phase with the title Aksumite 1, whereas D. Phillipson ascribes the same period from 0 CE – 300 CE as Early Aksumite. The synthesis of regional cultural materials recovered through excavations and survey collection from each scholar has led to the refinement of each chronology; however, Fattovich et al. and D. Phillipson's chronologies are most widely accepted by active scholars in the region – particularly the focus on a transition from the Pre-Aksumite period including the Proto-Aksumite period to the Aksumite Kingdom (Fattovich and Bard 2001; D'Andrea et al. 2008; Harrower and D'Andrea 2014; Sernicola 2017).

Regardless of which chronology is used to frame the past, it is certain that by the second and third centuries CE the Aksumite Kingdom was a formidable empire focused on trade and expansion in the Horn of Africa. Beginning in the third century CE, accounts by historians and travelers including Pliny the Elder (NH 6.34: 173), Cosmas Indicopleustes (AD 525 [McCrindle 1897: 57; 372-373]), and listed in *The Periplus of the Erythraean Sea* (Huntingford and Agatharchides 1980) indicates international trade being conducted by the Aksumite Kingdom via the Mediterranean, Red Sea and beyond (Kobishchanov 1976). Trade items changed throughout time include salt (from the Danakil depression), incense, ivory, gold (likely from the Eritrean highlands), and obsidian were traded out of Aksum (Kobishchanov 1976; Fattovich 2010). Ivory and salt appear to have been the biggest exports from Aksum, based on written accounts, with some scholars believing the widespread hunt for ivory lead to the extinctions of elephants and rhinoceroses in the highlands (Kobishchanov 1976, D. Phillipson 1998, 2000). In return spices, silks, wine, metal, and glass were imported by the Aksumite Kingdom, and became commonplace in elite residences throughout the highlands (Curtis 2008; Fattovich 2010). Controlling the entrance to the Red Sea through the port of Adulis allowed Aksum to act as a central intermediary between India and China, the Near East, the Mediterranean, and Central Africa. This strategic position served as a desirable way to enter the booming trade between kingdoms in the early centuries CE, but also would lead to the introduction of ideas in addition to goods.

Coinage was one of the technologies adopted by Aksum to foster international trade. Coins serve as one of the most tangible ways to define a chronology of Aksumite rulers throughout time, while also providing insight into the kingdom itself. Archaeologists and historians alike gravitate to these examples of material culture, as they present images, names, written language, and even religious symbology that can be compared to the archaeological record and written accounts from the period (Kobishchanov 1976, D. Phillipson 1997). The earliest Aksumite coinage recovered to date is from the reign of King Endubis at approximately 270 CE. This example is particularly interesting as the crescent and moon motif located above Endubis on the coin indicates ties to a Pre-Aksumite religious belief system (Munro-Hay 1991, 1993). The coinage from the reign of King Ezana is also significant as coinage before 324 CE shows the crescent and moon motif, while all coinage from that date onwards exhibits an Aksumite cross motif (Munro-Hay 1993, Kobishchanov 1976; D. Phillipson 1997, 2000). This tangible example of

material culture shows the transition from pre-Christian spiritual beliefs to Christianity for at least the king and possibly his court during the rule of Ezana. It also demonstrates the multifaceted use of coinage, both as a means of standardized trade and to spread religious and political ideology across the empire. However, how quickly the religion dispersed beyond the king and the capital and Aksum is unknown (Kobishchanov 1976; D. Phillipson 2012; Finneran 2007)

The introduction of Christianity in 324 CE serves as a focal point for many scholars. Records as to the exact reason Christianity was adopted are vague, and Ethiopian Orthodox scripture across Tigrai often tells the story of transitioning to Christianity metaphorically and colloquially. Scholars have tied this adoption of a new standardized kingdom-wide religion to recurring themes of political control and international trade (D. Phillipson 2009, 2012). Regardless, Orthodox Christianity adopted in Ethiopia under the reign of King Ezana is one of the earliest (or the earliest, according to many Ethiopians) polities to fully adopt Christianity as an official religion for all in the kingdom (Finneran 2007). Like themes of political organization and Sabaean influences discussed earlier, Christianity is another complex socio-political concept that was introduced to the kingdom, but rather than being imposed it was adopted and given a unique Aksumite personality (D. Phillipson 2000, 2012). Christianity in the Aksumite Kingdom was a top-down belief system starting with the elite and rulers, and being forced down to non-elite common peoples, likely taking longer to be fully adopted in areas such as Eastern Tigrai, opposed to the capital of Aksum. This is juxtaposed to other belief systems in the region such as Islam, which grew from a bottom-up approach, starting with common non-elites, later being adopted by elites and rulers in the Arabian Peninsula (D. Phillipson 2012). *Table 3* shows a chronology of rulers throughout the Aksumite Period; exact dates for most rulers are still debated and the following figure should only be used as a general idea of political change throughout the period.

Table 3 General Chronology of the Kings and Rulers of the Aksumite Kingdom prior to the mid-sixth century.

King	Date	Coins	Internal Evidence	External Evidence
GBR	c. 200		*	
Endybis	c. 270-290	*		
Aphilas		*		
WZB		*		
Ousanas (Ella Amida)		*	*	
Ezana	c. 330-360	*	*	*
Wazebas		*		
Eon		*		
MHDYS		*		
Ebana		*		
Nezana		*		
Nezool		*		
Ousas		*		
Ousana[s]		*		
Kaleb	c. 510-540	*	*	*
WZB	after 540		*	

From D. Phillipson (2012).

Throughout the following fifth and sixth centuries CE, the Aksumite Kingdom reached its zenith in terms of power, area, influence, and wealth (Finneran 2007, D. Phillipson 2012). At its height, the Aksumite Kingdom stretched to the east from the Red Sea coast of the South Arabian Peninsula in what is now Yemen, as far north as Meroë in Sudan, as far south as modern day Addis Ababa, and west to the Nile in South Sudan (Kobishchanov 1976, D. Phillipson 1998). The early sixth century is seen by most scholars as the golden age, or 'Classic' phase of the Aksumite Kingdom, with the largest holdings of wealth, and trade booming through Red Sea ports, especially Adulis (Fattovich 2004). It is unclear if Aksum itself was the true secular center of the Kingdom, although it was certainly the religious capital and resting place of most rulers (Phillips 2004). The increasing size of the Kingdom made control difficult. Wars on the peripheries of the Kingdom grew larger, and the Islamic Empire's shifting control over the Red Sea in the seventh century caused the Aksumite Kingdom to decline, in addition to a shift in trade routes away from inland Aksum to the Red Sea and Atlantic Ocean, which ended the production of currency in the same century (Kobishchanov 1976; Fattovich 2010; D. Phillipson 2012).

2.4.2. Aksumite Material Culture in Eastern Tigrai

Aksumite material culture changed in many ways between the Early and Late-Aksumite periods in Eastern Tigrai. Again, ceramics are the most abundant and visually distinguishable form of material culture available to researchers in the area. Early Aksumite ceramics share many affinities with the Pre-Aksumite and Proto-Aksumite periods, especially in terms of black-topped decoration, with red clay fabric, often utilizing locally available mica in the temper, creating a unique shine within the ceramics (D. Phillipson 2012). Smaller, wide rimmed containers and jars are common, with some artistic motifs around the rim (Fattovich 1977, Bard et al. 1997). Transitioning to the Classical and Middle Aksumite phases in Eastern Tigrai the black topped ceramic tradition vanishes and is replaced almost exclusively with carefully fired high quality red clay temper, especially in elite settings (Mekonnen 2019). Also, upon the adoption of Christianity crucifix motifs can be seen on many vessels, especially those in elite or religious contexts. While not originally Aksumite in origin, amphora style vessels are indicators of the Middle and Classic Aksumite site assemblages as increased trade resulted in international objects to be traded from the Mediterranean (Mekonnen 2019; D. Phillipson 2012). Some researchers theorize these vessels originally brought wine to the region, and would have boosted status within elite areas and churches introducing wine for early sacramental rituals (Mekonnen pers comm.)

When the Aksumite Kingdom began to decline, entering the Late Aksumite phase, the largest change in ceramic typology and style is noticed in the archaeological record. A lack of wealth and resources at this time saw a clear shift from high quality red clay temper to dark black low quality temper across the region (Mekonnen 2019). Ceramics still contain artistic motifs, symmetrical line designs and there is a wide array of ceramic types including jars, cooking items, basins, and even some thin-necked spherical-based items resembling the modern day *jebena* used to brew coffee across Ethiopia. However, ceramics are much thicker, coarser, and potters begin to utilize whatever was available as temper, from common rocks to organic matter. This example mimics the shift from a wealthy controlled kingdom to more small scale regional political entities which for the most part lost the influx of wealth during the height of the Aksumite Kingdom (D. Phillioson 2012; Finneran 2007).

Lithics do not provide a sensitive indicator of the changes throughout the Aksumite Period, although there have recently been studies on the use of lithics in complex societies in Eastern Tigrai (Peterson 2017, Brandt et al. in prep; D'Andrea et al. 2008; L. Phillipson 2000, 2009). Laurel Phillipson has conducted the most in-depth research in the region on different lithic technologies in the area surrounding Aksum, and has created a chronology and typology for the region relying mostly on stylistic elements opposed to functional components (2000; 2009; 2012; 2013a; 2013b). However, major issues have been raised in relation to this scheme in that such a small sample size and uncontrolled collections of a few lithic scatters are being extrapolated to make wide-ranging conclusions about socio-political organization and identity, which is known not to always be the case (Peterson 2017).

Locally available chert outcrops provided a readily available source for scrapers, knives, and other tools used for day-to-day tasks, however increased trade though the Classic Aksumite phase led to a large amount of imported goods including metals and glass which begin to replace lithics as the predominant tool, aside from hide working, especially after the Middle Aksumite phase (D. Phillison 2012; Finneran 2007; L. Phillipson 2000, 2009). Lithics were used largely by hide workers in this period (and are still used by them today), however this craft specialization group remained largely ostracized and contained to specific areas of large settlement sites (Peterson 2017; D. Phillipson 2000, 2012; Brandt et al. 2007). Lithic tools in this area were specialized, and obsidian was still a prized raw commodity, however a comprehensive study as to which tools were used at each time has not been completed to date in the region (D. Phillipson 2012; Finneran 2007).

Large numbers of finished goods were imported during the Aksumite period in exchange for local raw materials, as described earlier, during the height of the Aksumite Kingdom. An important indicator of the Aksumite period, especially in the Classic phase, was the importation of metal and glass objects from Rome, the Arabian Peninsula, the Middle East, and even as far as South Asia (D. Phillipson 2012; Finneran 2007). While there are elite objects made of these materials located in specific elite sites in Pre-Aksumite times, it is not common to find them across the region until the Aksumite Period where a variety of local elites in Eastern Tigrai would have possessed some of these items (D. Phillipson 2012). Metallurgy was a more common practice in other areas of Africa, and the Middle East at periods pre-dating the Aksumite Kingdom, however no

widely accepted examples of metallurgy have been located in Eastern Tigrai to date (Finneran 2007). However, a paucity of research in that specific field of material culture may also be the reason why local metallurgy sites have not been located, as with many other specific areas – ceramics aside – in Eastern Tigrai (D. Phillipson 2012; Finenran 2007; Fattovich 2010, 2012). An abundance of international elite goods ranging from glass and shell beads, to glass containers and vases, personal adornment, and metal incense burners all increased in relative abundance in the Classical Aksumite phase compared to the Early and Pre-Aksumite, and declined sharply in the Late Aksumite era (D. Phillipson 2012; Finneran 2007).

Structures in the Aksumite period are another indicator distinct from the Pre-Aksumite, Proto-Aksumite, and the later Post-Aksumite and Medieval periods in Eastern Tigrai. Buildings of this period are typically more complex, with more rooms, and can contain step features in elite structures mid-way up walls (Fineran 2007; D. Phillipson 2012; Munro-Hay 1991). For purposes of this archaeological study and survey architecture, objects, and primarily ceramics provided the best means of determining the age of sites, and placing their occupational history into the phases of the Aksumite period. After the decline of the Aksumite Kingdom the region saw a shift back to scattered political control and more specific regional traditions in the form of material culture (D. Phillipson 2012; Finneran 2007).

2.5. Post-Aksumite and Ethnographic (Medieval) Periods in Eastern Tigrai

The Post-Aksumite and Medieval periods in Eastern Tigrai represented a shift from the prosperity and central control exerted by the Aksumite Kingdom from the region around the city of Aksum to regional polities and leaders. These periods are similar to the LSA in terms of a more peripheral focus in terms of the research objectives of this thesis, but still present an interesting comparison regarding settlement patterning throughout time. The term ‘Ethnographic’ is used by ceramicists to describe the ceramic style after the Post-Aksumite period, due to the similarities between these artefacts and the types of ceramics used in the region today (D. Phillipson 2012). This term is used to describe this chronological period, sometimes interchangeably with the term Medieval (D. Phillipson 2012). ‘Ethnographic’ and ‘Medieval’ are used in this thesis to describe a chronological period utilizing nomenclature developed by researchers in the region, but

should not be taken as an accurate description of the cultures present at that time. By the middle sixth century CE economic decline was apparent across the northern Horn of Africa, especially in the area around Aksum (D. Phillipson 2012; Finneran 2007; Kubishchanov 1967). This decline is debated by scholars, but some prevalent ideas for the downturn in the Aksumite Kingdom relate to over-expansion, environmental change, and possibly internal conflict (Finneran 2007; Kubishchanov 1967). The marked expansion of Aksumite territory and population in the fourth and fifth centuries CE likely led to a depletion of natural resources, notably timber, followed by environmental deterioration (Terwilliger et al. 2011; Butzer 1981, 1982). A rapid and pronounced depopulation followed, partly due to reduced carrying capacity of the local environment, among other factors (D. Phillipson 2012).

The Post-Aksumite Period does not have a specific start date, as coinage and written sources become sparse towards the end of the Aksumite Kingdom (Phillipson 2009). However, it is generally accepted that by the sixth century Aksum ceased to be the political capital, and was replaced with political control from a place called Kubar (Vantini 1975, Anfray 1970). The town of Nazret, some 70 km south of Mekelle is suggested to be the location of Kubar, although there is little supporting evidence and archaeological investigation beyond translations from the Arab historian al-Masudi (mid-tenth century), and al-Harrani (c. 1295) who spoke of this new capital (D. Philipson 2012). Scattered political control throughout the northern horn due to an economic collapse was prevalent, however it is still suggested by many that the largest remaining population in the northern horn, and the largest number of resources were in Eastern Tigrai (D. Phillipson 2012). Ecclesiastic centers such as Debre Damo, the Hawzien Plain, and Debra Selam serve as the only datable features from this period at the end of the first millennium CE (D. Phillipson 2009) A lack of sites this age in the Aksum or Western Tigrai area (to date) along with scattered historical records, place the political control during this time in Eastern Tigrai (D. Phillipson 2009). This can also be linked to ongoing research in the region by ETAP showing that in contrast to Aksum, the density and prosperity of settlement slightly increased during this time (D'Andrea et al. 2008; Harrower and D'Andrea 2014).

The Zagwe Dynasty became the next face of political control following the decline of a possible successor kingdom in eastern Tigrai, or its rulers' loss of authority (D. Phillipson 2012). Contemporary sources of information about the Zagwe Dynasty are

not plentiful, and unfortunately most information was written long after events occurred (Tekeste Negash 2006). The chronology of the Zagwe Dynasty is still contentious, with estimates of its duration ranging between 130 and 370 years, placing its inauguration between 900 and 1140 CE (Godet 1977; Anderson 2000). The end of the dynasty is more securely dated to 1270 CE, when rulers in Ethiopia returned to a notion of dynasty based on claims to direct descent from Aksumite rulers, and thus ultimately King Solomon and the Queen of Sheba (D. Phillipson 2012). The tradition of Solomonic tradition would carry on for many centuries, and featured in the 1955 Ethiopian Constitution in the form proclamations of 'Solomonic Restoration' in the country (Huntingford 1965).

2.6. Chapter Summary

The northern Horn of Africa has seen remarkable change throughout the past three millennia transitioning from the Later Stone Age to the Medieval and Historical Periods. Growing from small scale regional polities to a thriving kingdom with trade across the Indian Ocean, Red Sea and the Mediterranean Sea saw remarkable growth in terms of population and technology along with a mix of people and ideas which comes close to the metropolis feel of many major western cities today (D. Phillipson 2012). This osmosis of new ideas and material culture added to the rich indigenous history of culture developed in the Horn of Africa, creating a unique Kingdom which lasted for centuries. As with any large boom in natural resource extraction and international trade, the kingdom reached its zenith in the fifth century and quickly declined afterwards due to shifting economic control of the Red Sea, and likely environmental change throughout the northern Horn. Throughout the past three thousand years of culture history in the region it is important to note that Eastern Tigrai has developed uniquely in terms of political growth and material culture. As more research has been focused on a traditionally understudied area, compared to Aksum and the Yeha areas for example, a distinct culture history has developed (e.g., Curtis 2008, D'Andrea et al. 2008).

Chapter 3. Theory and Methodology

3.1. Chapter Introduction

Landscape archaeology holds great potential as a theoretical framework and provides a set of tools to explore the spatial relationship and development of polities in Eastern Tigrai. This framework focusses on human interaction with the landscape, the application of GIS analysis, and utilizes interdisciplinary approaches incorporating the inclusion of disciplines such as geology, physical geography, soil science, and hydrology (Bender 2002, Howry 2017, Metheny 1996, Kelley and Thomas 2012, Walker 2012).

3.2. Landscape Archaeology

Landscape archaeology as a theoretical framework was born out of the environmental archaeology and physical geography movements in the mid-twentieth century (Gibbon 2012). Beginning in the 1960s with Binford's processual approach, landscape archaeology sought to connect physically tangible aspects of the landscape to past cultures (Kluiving and Guttmann-Bond 2012). The changes that cultures experienced, as explored through a processual lens, could be predicted by artifact assemblages and settlement patterns (Bindord 1983). Processualists were initially drawn to landscape archaeology because of its ability to explain the theme that cultures are adaptive and responsive to their environment (Hodder 2001; Jones 2001; Johnson 2010). This focus on agency and scientifically quantifiable criteria led to the earliest ideas regarding predictive modelling and landform classification. However, ideas of landscape were firmly rooted in the physical and scientifically quantifiable, and collaboration likewise was focused on fields such as geology, physical geography, geomorphology, and hydrology (Johnson 2012).

The 1980s saw the development of post-processual archaeology, and the idea that cultures are not predictable, because of human agency (Metheny 1996, Bender 2002). Culture, as theorized by Ian Hodder, was a more important influence over past practices and settlement patterns (Hodder 1990, 2012, 2018). This shift from the directly tangible to a more intangible focus on abstract ideas of culture and cognition reflected what was happening across much of archeological research (Gibbon 2012). However,

as time progressed a more nuanced view of how cultures developed was beneficial, including a post-processual lens of interpretation in addition to a traditional processual viewpoint.

The twenty-first century fostered significant changes to landscape archaeology, mainly due to advances in computing technology and satellite imagery. Kluiving and Guttmann-Bond in their summary of the first landscape archaeology themed conference held in Amsterdam in 2010 indicate two main focuses of the discipline in the twenty-first century (2012). The first focus is intensive fieldwork, mapping, and quantitative methods applied to settlement pattering and predictive modelling (Kluiving and Guttmann-Bond 2012). The second focus is a post-processual understanding of landscapes as reflections of past societies. These two focuses tie together the origins of landscape archaeology, while also utilizing the developments in the technological interpretation of data and a post-processual lens of investigation (Kluiving and Guttmann-Bond 2012).

Physical geography is an important base upon which the growing field of landscape archaeology is developing. The combined study and evolving research within the fields of geology, geography, botany, soil science, geomorphology, and ecology, to name a few, are directly tied to the developments within landscape archaeology as well as the incorporation of local oral traditions (Fowles 2010; Walker 2012). A collaborative approach with each of these disciplines is necessary to accurately apply the important data they each provide within frameworks to understand the human past. However, it is important to understand the biases each of these disciplines may apply, and how one utilizes these pieces of research to form a picture of past cultural development. Bender, for example, states that a researcher cannot be objective in the application and study of past cultures within landscape archaeology, so we as researchers should not pretend or try to be objective (2001, 2002). Instead, researchers should address these biases and note the limitations that their studies may have based on subjective interpretations of past cultures (Bender 2002).

Twenty-first century landscape archaeology encompasses two general approaches currently taken within the sub-field. The first is concerned with *territory* specifically, incorporating the disciplines of geology, physical geography, historical geography and the natural sciences (e.g., botany, soil sciences, etc.) (Schütt et al. 2013; Metheny 1996). The second group is comprised of researchers with a post-processual

focus on the *perceived,* incorporating newer cultural geography and various social sciences (Tuner 2006; Metheny 1996). It is not necessary to pick one group or the other when conducting research, however, research goals and specific research techniques undoubtedly place a researcher in one of these two general groups.

This study incorporates both mentioned groups to address the research objectives. Research for this thesis that is concerned with *territory* specifically combines disciplines including, but not limited to, geology and physical geography to understand the landscape, and specific relationship between site size while utilizing GIS. However, each research objective also touches on the idea of the *perceived* landscape, to explore the broader social questions regarding political development, choice of settlement location, and cognition as is related to the past two ideas.

3.2.1. Landscape Archaeology in the Northern Horn of Africa

Archaeology in the northern Horn of Africa has seen several studies apply landscape archaeology as a theoretical framework. Long term archaeological projects began in the 1960's, focusing on the origins of agriculture and early state formation across the region (Anfray 1967, 1968; D. Phillipson 2012). While these projects up to the 1990s do not explicitly state that they were rooted in the framework of landscape archaeology, because it did not exist as a theoretical approach as it does today, some projects were applying methods of landscape archaeology to reach their research goals (Michels 1996, 1998; Finneran 2001; Fattovich 2012).

Archaeological investigation by researchers such as Michels, Finneran, Schmidt, and Curtis explicitly focused on territory in terms of landscape archaeology, incorporating the natural sciences to determine settlement patterning, site functionality and human agency in the formation of these archaeological sites (Finneran 2005; Michels 2005; Schmidt and Curtis, 2001, 2008; Schmidt et al. 2008). Archaeological surveys have encompassed much of the archaeological studies directly tied to landscape archaeology in the northern horn of Africa, however ethnographic studies, particularly focusing on the origins of agriculture, also directly discuss landscape and how human interaction with the landscape has developed over time (Finneran 2005; Harrower and D'Andrea 2014; Michels 1998; Sernicola 2015).

Investigation of monasteries, religious centers, and the evolution of Ethiopian Orthodox Christianity after the decline of the Aksumite Empire is an area which has seen much study within a landscape framework since the 1980s (Bosc-Tiessé 2008; Finneran 2012; D. Phillipson 2012). The perceived landscape is relevant in this regard as the melding of pre-Christian local stories and Ethiopian Orthodox teachings create interesting discussions about the placement, utilization, and relationship between churches and monasteries (Conti Rossini 1940; Matthews and Mordini 1959; Finneran 2009). Rock-hewn churches are a focal point on the landscape of the Ethiopian highlands, and their tendency to be positioned in hard to reach, often perilous locales on the edge of cliffs or mountains is a juxtaposition to the way other landscape archaeology investigations tend to focus on more territory stream and practical human agency (i.e., water, level terrain, trade routes). In the case of rock-hewn churches the idea of perceived landscape and spirituality are paramount (D. Phillipson 2012).

Recent studies in the northern Horn of Africa have mixed perceptual and territorial frameworks in discussing social complexity and political development in the region (D. Phillipson 2012). Relevant to this research are recent works by Harrower, D'Andrea, Sernicola, and Curtis, all of which actively incorporate a wide range of natural science disciplines such as paleoclimate, geology, geography, soil science, and ecology in unison with archaeological sub-fields such as archeobotany, ethnoarchaeology, and historical ecology to discuss settlement history over the past five thousand years in the northern Horn (Curtis 2001; Harrower and D'Andrea 2014; Sernicola 2015). This research will build upon previous frameworks laid by D'Andrea, Harrower, and the larger ETAP team in integrating such fields as geology, geomorphology, soil science, and paleoclimate to discuss the development of social complexity and polities in the region (D'Andrea et al. 2008).

3.3. Methods: Study Area

This study is located in the Horn of Africa, specifically northern Ethiopia, within the province of Tigrai (Figure 3). The province of Tigrai stretches across the north portion of Ethiopia sharing a border with Sudan, and a modern boundary with Eritrea. The study area is located in Eastern Tigrai, near the boundary with the neighboring Afar Province to the east. Within the province of Tigrai the area is split into *woreda* and furthermore into *tabia* (similar to county and ward designations respectively). The study

area is within the *woreda* of Ghanta Afeshum and Gulo Makeda, and within the city limits of the town of Adigrat. Numerous *tabia* encompass the study area and are listed in Table 4.

Figure 3 Project area in Eastern Tigrai.
Study area in black, previous ETAP study areas in red, with modern international boundaries/borders in purple. Modified from QGIS Geographic Information System (2019).

Table 4 *Tabia* listed below each *woreda*.

Gulo-Makheda	Ghanta-Afeshum
Ambeset Fekada	Arena
Shewit Lemelem	Tseado Halo
Adis Tesfa	Hadnet
Adis Alem	Mgulat
Marta	Haveresekan
Sobea	Guahgot
Kileat	Cahra Sheta
Haben	Dbla Siet
Hayelom	Sasun
Firedashum	Bukot
Hagere Selam	Beati May Mesanu
Mai Tseada	Mergahya
Kokebe Tsibah	Whdet
Kisad Meateb	Smret
Mereta	Qtagedba
Mezabir	Adiqnay
Rigbay Medebay	Mayweyni
	Haguarega
	Bizet

The study area is a 100 sq. km area stretches north towards and is adjacent to previous ETAP survey areas in Gulo Makeda (*Figure 3)*. The size of the study area was selected because it is the largest area allowed for a single study by the ARCCH. Utilizing the maximum allowance also conforms with initiatives by the ARCCH (Authority for Research and Conservation of Cultural Heritage) and TCTB (Tigrai Culture and Tourism Bureau) for archaeological inventory studies across the country.

The landscape within the study area is extremely variable, with fertile valley bottoms rising to sediment slopes, and then to extremely steep bedrock slopes and cliffs. It is not uncommon to traverse over 300 m in elevation through one survey transect, let alone a single day's walk (Gamachu 1988; Bard et al. 2000). The average elevation in this portion of the highlands in 2400 m asl, with *ambas* (similar to a 'mesa' geological formation in North America) reaching heights in excess of 2600 m asl (Terwilliger et al. 2011; McCann 1995). The climate is arid and dry, with rainy seasons in the summer months, and the driest time of year from November-June (Friis 1992; Terwilliger et al. 2011). No major rivers run through the survey area, however two large incised valleys contain some flowing watercourses, especially after heavy rainfalls (Abbate et al. 2015). Most drainages are ephemeral and seasonal, and no natural lakes occur in the area

(Terwilliger et al. 2011; Abbate et al. 2015). The most common foliage throughout the study area are imported from across the world with *Opuntia ficus-indica* cactus from Central America, and *Eucalyptus* trees from Australia dominating the landscape (Billi 2015: 10; Ebru et al. 2009; Friis 1992: 20). Native juniper *Juniperus procera* trees grow above 2500 m asl, and other native species including *Acacia spp.* and *Commiphora myrrha* are scattered in churchyards and other areas less subject to development and agriculture (Gebru et al. 2009; Friis 1992). Over two millennia of intensive land clearance and agriculture in the study area has led to terracing of almost all land with the exception of exposed bedrock slopes, which have only scattered areas of vegetation and timber (Nyssen et al. 2015: 376; Terwilliger et al. 2011; Billi 2015).

3.4. Methods: Archaeological Survey

Archaeological survey provides the baseline data necessary to discuss the formation of the earliest polities (Banning 2002; White and King 2007; Phillips and Wiley 1953). Survey programs are often the first stage of any long-term archaeological program allowing for the location of archaeological materials, definition of archaeological sites, and the exploration of spatial relationships between archaeological sites (Collins and Molyneaux 2003; Darvill 2008; Pacina 2008). The methods that landscape archaeologists choose for collecting data during survey are determined by several factors, but generally are chosen to balance the need for accurately identifying anthropogenic features on the landscape while also efficiently completing satisfactory coverage of the study area (Banning et al. 2006; Miller 1989; Newhard et al. 2013). The methodology utilized for this study is adapted from previous ETAP archaeological surveys north of the current study area between 2006 and 2008 (D'Andrea et al. 2008; Harrower and D'Andrea 2014). Archaeological survey can be limited at times due to ground cover, erosion, historical land modification, and current development (Banning 2002). However, the arid and relatively foliage free environments in Eastern Tigrai, combined with focusing survey efforts in May and June when fields are not yet grown allowed surveyors to more readily identify archaeological remains on the landscape.

This study utilized a randomized-systematic approach to archaeological survey, to balance satisfactory coverage within the study area while also systematically covering the landscape to allow of discussions of site density and landform usage. Randomization was utilized to choose the orientation of each survey transect, and its area, to not only

conduct survey transects in areas subjectively chosen due to perceived traits aiding in the location of archaeological sites. The idea of 'field walking' is a still popular idea among some researchers, however it is impractical when attempting to conduct statistical analysis and discuss the spatial relationship between sites due to its subjective nature (Banning 2002; White and King 2007). Judgemental sampling did occur during this study, however, these data are not included in chi-square statistical analyses.

Table 5 below describes the six landform classifications used in this study, five of which were adopted from previous ETAP studies (Figure 4) (D'Andrea et al. 2008). The class name 'Urban Area' was added to this study due to the presence of survey transects within the city of Adigrat. Previous ETAP archaeological surveys were conducted in rural areas with relatively limited built obstructions to inspecting the ground. In the urban setting paved roadways, sidewalks, and large buildings obscure the ability to identify archaeological materials greatly. However, rapid development in Adigrat did present many areas with open excavations, exposed sediment roadways, and vacant lots making archaeological survey a practical endeavor, although likely yielding less intact archaeological remains.

Table 5 Landform classification scheme adopted from previous ETAP studies.

Class Name	Definition
Bedrock Slope	Areas of exposed bedrock from 10° to 90° slope that are at times partially covered by sediment, scree, and/or talus
Scree Slope	Areas of abundant angular clasts often of a low (<20°) gradient lying below prominent highland areas
Sediment Slope	Areas from 5° to 25°slope commonly used for farming and grazing that are often terraced
Sediment Plateau	Areas of less than 5° slope that are predominantly covered by soil and sometimes low terraces
Urban Area	Areas within cities covered with roadways, buildings, manicured vegetation, and subject to a high level of disturbance from development
Valley Bottom	Low lying drainage networks often carrying water in the rainy season and characterized by copious grass and other foliage

Modified from D'Andrea et al. 2008.

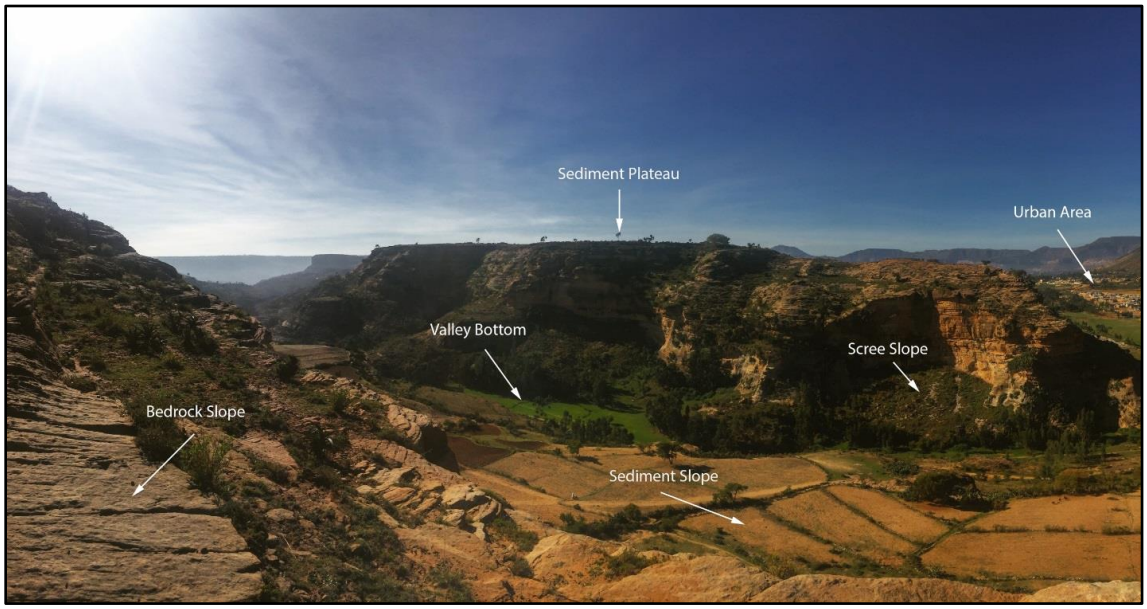


Figure 4 Photograph showing typical terrain within the study area and each landform classification.

The 100-sq. kilometer study area (the largest allowable study area by the ARCCH) was selected by continuing south from previous study areas of the same size which have been systematically surveyed by G-MAP (Gulo-Makeda Archaeological Project 2003-2006) and was selected by ETAP (2007-2015) as the next desirable area for archaeological investigation (Figure 5). ETAP is the result of the growth of the original G-MAP out of a smaller area, and into the larger region encompassing new administrative zones, such as Ghanta Afeshum. Fifty 100 m x 1 km survey transects were selected at random, using randomization software, for full coverage archaeological surface inspection (Figure 5). The location of these fifty survey transects both in terms of orientation (N-S or E-W) and where they fall within the 1 km x 1 km grid system were also randomly generated. Survey was conducted by 5-8 individuals, each spaced at a maximum of 20 m. Sites were recorded using Garmin GPS receivers, with an accuracy of approximately +/- 5 m. This level of accuracy is suitable for archeological survey inventory, further excavations at sites can make use of precise GPS and GIS software for high resolution spatial recording. Settlement sites and large artefact scatters were subject to collection squares to understand the density of archaeological materials present within the site. In each settlement site and large artefact scatter at least one 5 m x 5 m square was flagged and the survey team completed a systematic 100% recovery of all surface artefacts within the square. This study will not directly discuss density, but previous ETAP studies utilized this methodology (e.g., D'Andrea et al. 2008; Harrower

and D'Andrea 2014) and the same procedures were employed during this survey to make that data available for future publications. This collection method also lead to the identification of a variety of diagnostic materials which aided in dating the sites.

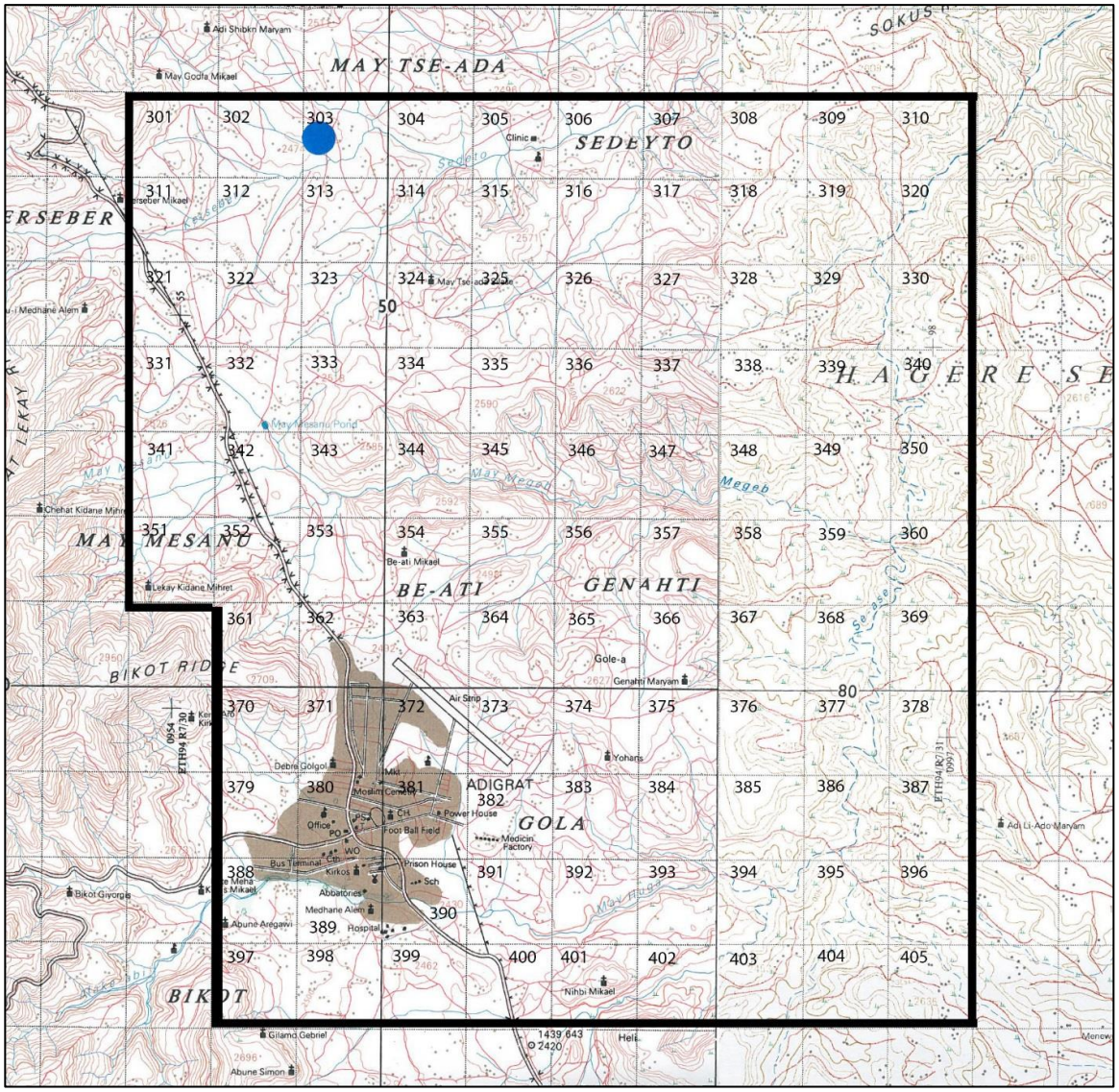


Figure 5 Study area outlined in black with city of Adigrat (dark brown) in the south-west corner.

Modified from Ethiopia Mapping Agency (1997).

The study area is part of ETAP and the Authority for Research and Conservation of Cultural Heritage's (ARCCH) ongoing priority to systematically survey areas for archaeological sites, and inventory archaeological resources in areas not intensively studied. Identifying newly recorded archaeological sites with Pre-Aksumite and Early Aksumite components will help inform further excavations, such as those at Mezber and

Ona Adi located by G-MAP which have yielded a remarkable amount of new information about the Pre-Aksumite and Aksumite periods in the region (D'Andrea 2011, 2013, 2014, 2015; Mekonnen 2019, D'Andrea and Manzo, in prep).

Archaeological sites were recorded using the same five categories as previous ETAP studies (D'Andrea et al. 2008, Harrower and D'Andrea 2014): settlements, artefact scatters, rock art, and findspots. The designation "settlement" refers to sites where the total surface area (typically greater than 1 ha), artifact density, exposed architecture, and/or the presence of architectural debris indicate a large village or town. "Artefact scatters" are sites typically no greater than 2 ha where the absence of architectural features and a lower density of artefacts indicates a small village, or short-term camp, however it does not exclude the possible existence of a settlement. "Findspots" denote a diagnostic isolated surface find lack a discernable surface extent and are not part of an occupation. Finally, "Rock Art" denotes sites with pictographs or petroglyphs, they may occur exclusively with images, or as part of a larger rock shelter site.

Survey transect forms were utilized during survey to record precise information such as: UTM location, landform classification, foliage, development, hydrological features, geology, biogeoclimatic conditions, and any information reported by residents regarding archaeological sites in the area. G-MAP/ETAP site forms were used when an archaeological site was encountered and captured information relating to artifact density, types of materials encountered, type of site encountered, along with all the information collected in G-MAP/ETAP landform transect forms (Appendix A & B). All information and GPS data was uploaded nightly using Access Database to organize and store data for further analysis.

3.4.1. Archaeological Survey in the Northern Horn of Africa

Archaeological surveys have been conducted in varying techniques in the Horn of Africa for over a century. The earliest archaeological surveys were opportunistic-reconnaissance in nature, conducted by early researchers such Francis Anfray (1967, 1968, 1973, 1990), largely focusing on local informant recommendations, and monumental architecture which was easily accessible from what limited transportation infrastructure existed in the region.

The first major systematic archaeological survey in rural areas was conducted by Michels in the 1970s, focusing on the Shire Plateau in Western Tigrai, around Yeha and Aksum, including lands to the southwest (1988, 1994, 2005). The survey focused on a 713-sq. km area, and was the first project to employ a stratified random sampling model in Ethiopia, using a nested grid system (Michels 2005). The study, like this thesis, was comprised of the random selection of 1000 m x 100 m transects for full coverage pedestrian survey, combined with opportunistic survey, and pedestrian survey to areas of known potential (Michels 2005). A huge 701 sq. km area was systematically surveyed over the duration of Michels survey project, encompassing 28% of the entire survey region, locating 216 newly identified archaeological sites, and revisiting 51 known sites, but was interrupted by the outbreak of civil conflict in 1972 (2005). Unfortunately, the study would not be fully published for over thirty years, until 2005, making the data inaccessible to researchers in the region, aside from small summary publications (1988, 1994). The inventory and relationship between archaeological sites identified during this survey would prove invaluable to researchers (e.g., D'Andrea et al. 2008; Fattovich 2010; Schmidt and Curtis 2001; D. Phillipson 2009, 2012). However, the focus on obsidian hydration and its use to provide absolute dates for sites is troublesome, as the use of this dating technique has proved to be controversial (Liritzis and Laskaris 2011; Rogers and Duke 2014; Stevenson et al. 2019). Michels work also lacks separation between sites identified through random sampling and sites identified from the immense amount of judgmental and opportunistic survey, making statistical analysis difficult. Also, it appears large areas (typically those with intense topographical relief, or in areas of Eritrean-Ethiopian conflict) were omitted, also adding to skewed results showing archaeological densities in certain areas, or on certain types of landforms (Michels 2005).

The next major archaeological survey in the region was conducted by Curtis and Schmidt between 1999 and 2003 in the highlands surrounding Asmara (2008). This project was a combination of regional inventory, excavation, and university field schools which focused on the intensive coverage of 90 sq. km of lands on the Asmara Plateau, to describe site formation processes in the region (Schmidt and Curtis, 2001, 2008; Schmidt et al. 2008). The area surveyed was divided into 1 km survey blocks with 15 to 25 m spacing between individuals (aided by gentle topography and very limited ground cover), with each 1 km survey block gaining 100% pedestrian survey coverage (Curtis

and Schmidt 2008: 69). Patterns in site formation were noted during survey, with over 300 newly identified archaeological sites recorded ranging in size from 50 m sq, to 10 ha (Curtis and Schmidt 2008). Ten unique “clusters” were identified based on size and density leading to theories of site occupation and social-complexity in the Asmara Plateau (Curtis and Schmidt 2008; Schmidt and Curtis 2001). The claim of 100% survey coverage in this study is misleading, as likely this amount of terrain was never systematically covered during pedestrian survey. Also, site clustering and density conclusions from this study are also open to question as many 1 km x 1 km survey blocks were omitted due to various reasons (within the city of Asmara, within a military base, within the city airport) making sites appear to be clustered when in fact the areas of investigation were clustered to begin with. Curtis and Schmidt do acknowledge some flaws in their work, and recommend future areas of investigation in the region to refine conclusions reached in their study (2008).

Another major archaeological survey was conducted by Finneran and Phillips in 2001, covering lands in the Western Shire region of Tigrai (2005). This survey was smaller than the previously discussed studies by Michels, Curtis, and Schmidt, relying on a 100-sq. km area, the maximum allowable for a single study by the ARCCH (Finneran and Phillips 2005). There is little mention of the actual survey methodology, however a focus on integrating heritage management recommendations and comparisons to the UK indicate that Finneran and Phillips was likely conducting work more akin to subjective field walking, rather than more objective randomized-systematic survey (2005). This study focused on ethnographic interviews with local farmers, and creating a chronology for lithic assemblages in the Shire region, but did little to shed light on the relationship between archaeological sites and their position on the landscape (Finneran and Phillips 2005). The subjective methodology of field walking to conduct archeological survey combined with the lack of specific spatial data along with the collection of diverse information relating to a variety of topics from ethnohistoric farming and lithics make this study difficult to compare to the others within the region, beyond an inventory of archaeological materials in the Shire region.

The most recent archaeological surveys conducted in the region have been conducted by the ETAP team (earlier GMAP) starting in 2005 through to this study (D’Andrea et al. 2008; Harrower and D’Andrea 2014). The project has conducted systematic archaeological survey within a 200 sq. km area just south of the modern-day

boundary between Eritrea and Ethiopia, north of the city of Adigrat, in Eastern Tigrai (D'Andrea et al. 2008). Previous ETAP studies utilized randomized-systematic sampling strategy, selecting at random 50 1 km x 1 km units, and within those units selecting at random the orientation of the 1000 m x 100 m survey transects (regarding N-S or E-W orientation and regarding the survey transects placement along the units X or Y axis). In addition to this minimum coverage, some judgmental survey was conducted informed by landscape characteristics or local informants. The major findings of these archaeological surveys indicated a higher density of archaeological sites in Eastern Tigrai, supporting previous observations by Anfray (1967, 1968; Harrower and D'Andrea 2014). In addition to survey units, and utilizing the same classification schemes for site designation described earlier in this chapter ETAP also studied artifact density at major settlement sites by employing 1 x 1 m, 2 x 2 m, 5 x 5 m and 10 x 10 m artefact surface collection squares (D'Andrea et al. 2008; Harrower and D'Andrea 2014). This continuing study utilizes both sound systematic methods for archaeological survey while also allowing for the inventory of archaeological sites in the region, informing future excavations at sites such as Ona Adi and Mezber, but also allowing for valid statistical analysis of archaeological site relationships due to the rigorous randomization process of each survey transect (Harrower and D'Andrea 2014).

Previous ETAP studies employed 'collection squares' within settlement sites, along with large artefact scatters, when conducting surface inspections at newly identified sites. This practice was also utilized by other researchers in the region (e.g., Michels 2005; Curtis 2008). One issue with this strategy is that the placement of the square is subjective, and previous studies did not agree on the exact size of the collection squares (e.g., 5 m x 5 m, 10 m x 10 m, etc.) (D'Andrea et al. 2008; Michels 2005). This thesis employed 5 m x 5 m collection squares, however, the data was not synthesized to make conclusions about density as the methods are too subjective and do not fit with the rigorous randomization, which is a focal point of all other areas of the study. Methodology should be developed in the future to randomize or standardize the placement of these squares both in terms of location and size to be able to make valid statements about density and occupation. The agreement of landforms classification within the study area is also an area which presented some minor problems during study. Some landforms are universally recognizable such as a scree slope, or bedrock slope, due to the defining characteristics (Table 4). However, the transition between

some landforms, such as the change from sediment slope to valley bottom, would sometimes be difficult to notice, and introduced a level of subjectivity based on the survey team and recorder. A more detailed discussion of the transition between landforms which typically do not have a readily noticeable change would aid in the gathering of high-resolution spatial data. The integration of specific flora, soils, and slope characteristics along with traditional knowledge from local informants would aid in the development of a more objective landform classification scheme.

3.5. Methods: Determining Continuous Site Occupation

Artefacts collected during survey provide the best evidence to determine the temporal occupation of archaeological sites. Without absolute dating methods such as radiocarbon dating included in this study the defined ceramic and lithic chronologies in the region provide the best way to ascribe relative ages to archaeological sites. As described in Chapter 2 many studies have been conducted in the northern Horn of Africa to create chronologies of ceramic and lithic assemblages from the Later Stone Age (LSA), through the Pre-Aksumite and Aksumite periods, into the Medieval and Ethnographic periods (Bard et al. 2014; D'Andrea et al. 2008; Fattovich 2012; Fattovich and Bard 2011). However, Eastern Tigrai has seen much less work defining specific chronologies, and what has been completed has shown Eastern Tigrai is different (D'Andrea et al. 2008; Harrower and D'Andrea 2014; Mekonnen 2019), showing more affinities with southern Eritrea, than Central and Western Tigrai.

For the discussion in this thesis the culture history will be split into three broad categories for analysis. The first category will encompass the Pre-Aksumite (~700BC - 50BC). The second category encompasses the Aksumite Period: Early, Classical, Middle, and Late (50BC - 700CE). The final category will include the Post-Aksumite Period and Ethnographic Period (700 CE onwards). These groupings are helpful as they show the development of social complexity in the first group, followed by the peak of political authority and economic stability across the Horn of Africa in the second group, followed by the general decline of trade, population density, and influence across the old world in the third group. This scheme also matches groupings utilized by Harrower and D'Andrea (2014) which allows for comparing this study's results with the results of that study, which will be addressed in Chapter 6.

3.6. Methods: Statistical Analysis

Statistical analysis of geospatial data collected during archaeological survey can provide insights into the formation, use, and relationship between archaeological sites of different functionality in Eastern Tigrai. The two dominant research goals that this study will investigate using statistical analysis are: (1) the relationship between landforms and archeological sites, particularly settlement sites, and (2) settlement patterning throughout time as an indicator of social complexity and political organization. Chi Square analysis will be utilized to provide a valid analysis of the relationship between archaeological site types and the landforms on which they occur, while Zipf's rank size analysis model will be applied to archaeological sites to discuss political history in Eastern Tigrai. The combination of these two statistical analyses will provide information which can be compared to previous ETAP studies (e.g., Harrower and D'Andrea 2014) and regional surveys (e.g., Harrower and Curtis pers comm), to discuss social complexity and the development of the earliest polities in Eastern Tigrai.

3.6.1. Chi Square Analysis

This first research objective of this thesis is to determine if there is a connection between landform type and settlement sites in study area. Detailed collection of spatial data using GPS receiver during fieldwork recorded the exact boundaries of landform types encountered during survey, in addition to site location and size. While simple inference could be used to draw conclusions regarding the type of landforms most used for settlement sites, a statistical approach is necessary for determining valid connections between landforms and settlement sites. To this end a chi square statistical analysis will be utilized to evaluate if site patterning is random regarding landforms. If sites are distributed at random across the landscape in respect to landforms, it would be expected that the proportion of sites in each landform class, excluding sites identified during judgemental or opportunistic sampling, to be equal to the proportion of that landform class encountered in the study area. Chi square analysis requires a random sample and raw counts rather than proportions. To conform with this requirement raw counts from sites falling within randomly selected survey units were used to complete the chi square analysis (D'Andrea et al. 2008).

3.6.2. Settlement Patterning

Settlement patterning is most commonly studied using rank-size analysis as a mathematical formula to determine the relationship between sites or areas of varying size (Savage 1997; Trigger 1967; Pearson 1980; Drennan 2004; Falconer and Savage 1995; Bevan and Conolly 2006). Modern day geographers, urban planners, and statisticians use rank-size analysis to analyze the relationship between homes, municipalities, and other features. Rank-size analysis was developed by Zipf (1949), and has been refined and debated for decades, improving upon the original statistical inferences with the aid of GIS programs and advances in computing (Conolly and Lake 2006). In its simplest form Zipf's formula postulates that the rank-size rule that second highest ranking example is 1/2 the size of the highest-ranking example, further the third highest ranking example is 1/3 the size of the highest-ranking example, and so on (1949). This creates a distinctive line when plotting these data on a graph using Log Size and Log Rank as the X and Y axis respectively, showing a straight-line trending downwards and to the right dubbed as 'Log-Normal' (Figure 6). This can be interpreted as a typical hierarchical model of state development in the archaeological record, with one site of the largest rank and size – a capital, occurring much less frequently than surrounding market centers, and further rural residences.

Application of this model over half a century generated other frequently occurring plots which deviated from the traditional rank-size rule. In addition to the Log-Normal plot, other plots became common when investigating cultural development and spatial relationships on the landscape including: 1) primate, 2) convex, 3) primo-convex, and 4) double-convex (Savage 1997). Each of these unique plots corresponds to a specific organization of sites on the landscape and their relationship to each other (Figure 6). For this study, the convex and primate plots are most relevant as they represent what previous ETAP studies have encountered during settlement patterning analysis (D'Andrea et al. 2008:156-157). This system of settlement patterning suggests a tendency towards concentration at large settlements indicating a level of economic and political centralization in the area (D'Andrea et al. 2018:157).

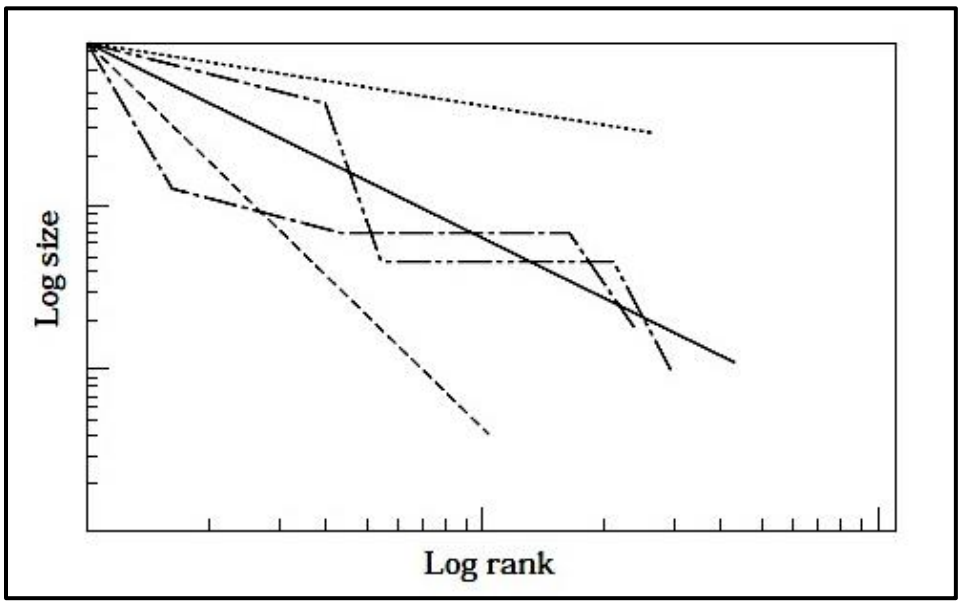


Figure 6 Examples of rank-size plots which do not conform to the expectations of Zipf's 1949 rank-size rule.
——: Log-normal; - - -: primate; ·····: convex; - · - · -: primo-convex; - ·· - ·· -: double-convex (from Savage 1997).

Rank-size analysis is an important tool in studying the formation of polities and the interaction of peoples over landscapes through time. The dichotomy of *hierarchical* versus *heterarchical* political organization has been debated in the formation of the earliest societies (Crumley 1995). More recent studies have shown that an atypical heterarchical organization of early societies in Africa, which goes against typical hierarchical and rank-size models developed in the mid-twentieth century (Connah 2006; McIntosh 1999; Scott 2017). The application of rank-size analysis is central to this study as limited excavations and fieldwork have taken place in the region resulting in insufficient data on the earliest polities in Tigrai. Utilizing data generated in completing the first two objectives of this study, landform usage and continuous occupation analysis, will also help to validate rank-size analysis as typically rank-size modelling benefits from the integration of dated sites from the archaeological record to strengthen conclusions.

For this study, the *RSBOOT* (Rank-Size Bootstrap) software will be used to conduct rank-size analysis for sites falling within the study area (Drennan and Peterson 2004). The RSBOOT program was developed by Robert Drennan, with software revisions as recently as March 2, 2019 (http://www.pitt.edu/~drennan/ranksize.html). This software provides calculations of the *A* shape coefficient for Rank-Size plots, with error ranges for specified confidence levels. The software is excellent both in terms of

plotting the raw data from a separate GIS system, while also allowing the user to select confidence levels between 99% and 66% for analysis. Following comparable ETAP studies rather than plotting settlement patterning of archaeological sites in general, sites will be evaluated in three groups: 1) Pre-Aksumite (800-50 BCE); 2) Aksumite (50 BCE – CE 700); and 3) Post-Aksumite and Ethnographic Periods (CE 700 to the present) (D'Andrea et al. 2008; Fattovich et al. 2000; Bard et al. 2003). The benefit of this comparison of settlement patterning in the same area, but over three chronological periods, is that it provides a more effective mode of analysis, as opposed to only comparing one regional settlement patterning plot to the log-normal baseline (Savage 1997, Drennan and Peterson 2004). As stated earlier, there is little reason to expect that data from any region would conform with a log-normal baseline (Johnson 1980, Harrower and D'Andrea 2014). Additionally, using the same methodology allows for higher resolution data between previous study areas, and integrating new archaeological survey and settlement patterning analysis in Central and Western Tigrai (Harrower pers. com; Curtis pers. com).

3.7. Chapter Summary

The theory and methods described here, when combined will serve to discuss the social complexity and political organization in Eastern Tigrai. Systematic randomized archaeological survey will be employed to collect data on the density and type of archaeological sites on the landscape in the study area. RSBOOT settlement patterning analysis provided by Drennan (2019) will be utilized to plot the relationship between archaeological sites. Chi-Square analysis goodness-of-fit analysis will be used to discuss the relationship between sites and the landscape they occur on, and to see if there are statistical grounds to validate the hypotheses of site-landscape relationships. This study will utilize the landscape categorization described to see if certain archaeological sites occur more frequently in some specific landforms, or if sites are distributed more uniformly across the landscape. The following chapter presents the results of archaeological survey and statistical analysis of the GIS data revealing trends in political organization and social complexity throughout time.

Chapter 4. Results

4.1. Introduction

This chapter presents the results of the archaeological survey, surface inspections at sites, chi-square analysis, and settlement patterning evaluation of the 100 sq. km area which is the focus of this thesis. In addition to the aforementioned results, this chapter considers the chronological and temporal continuity of artefact assemblages from each site located in the 2019 field study. Chapter 5 interprets these data and discuss what this information can tell us about political organization, polity formation, and the origins of the earliest polities in Eastern Tigrai.

4.2. Summary of 2017 Archaeological Survey

Systematic randomized archaeological survey was conducted in a 100 sq. km area encompassing parts of Gulo Makeda and Ghana Afeshum administrative zones in Eastern Tigray. Prior to this work, the area had not been subjected to any systematic archaeological survey. Exact methods for survey are discussed in Chapter 3, including rationale for specific methods and the combination of systematic and randomized methodology. Each 1 km x 1 km survey square, or sector, is numbered between 301 and 400, which represents a continuous number scheme from previous ETAP survey projects. All 50 randomly selected survey transects were surveyed, with 100% coverage, in a single field season (April-May 2017) with fieldwork assistance from archeologists with the Authority for Research and Conservation of Cultural heritage (ARCCH), Tigrai Culture Tourism Bureau (TCTB), and Adigrat University (Figure 7). All information noted during the survey was recorded on paper landform and site forms and later entered in to a project wide database using Microsoft Access software. Each survey transect of 1000 m x 100 m in size equals 100,000 m^2 or 10 ha. Complete survey coverage of these 50 randomly selected transect equals 500 ha, or 5% coverage of the entire survey area (500ha [surveyed area]/10000ha [project area]). In addition to the randomly selected systematic survey transects, opportunistic and judgmental survey was undertaken to bolster coverage and to aid in site inventory goals for local culture and heritage agencies (ARCCH and TCTB). Opportunistic survey most frequently occurred after information from local community members warranted visits to areas outside of selected survey

transects. In most cases these valuable tips led to the identification of archaeological sites. Opportunistic survey was also conducted as crews hiked in enroute from vehicle access points to reach survey transects. Some judgmental survey was conducted, albeit infrequently, typically only if an area of interest was very near to a planned survey transect, informant tip, or access to survey areas and warranted a brief surficial inspection.

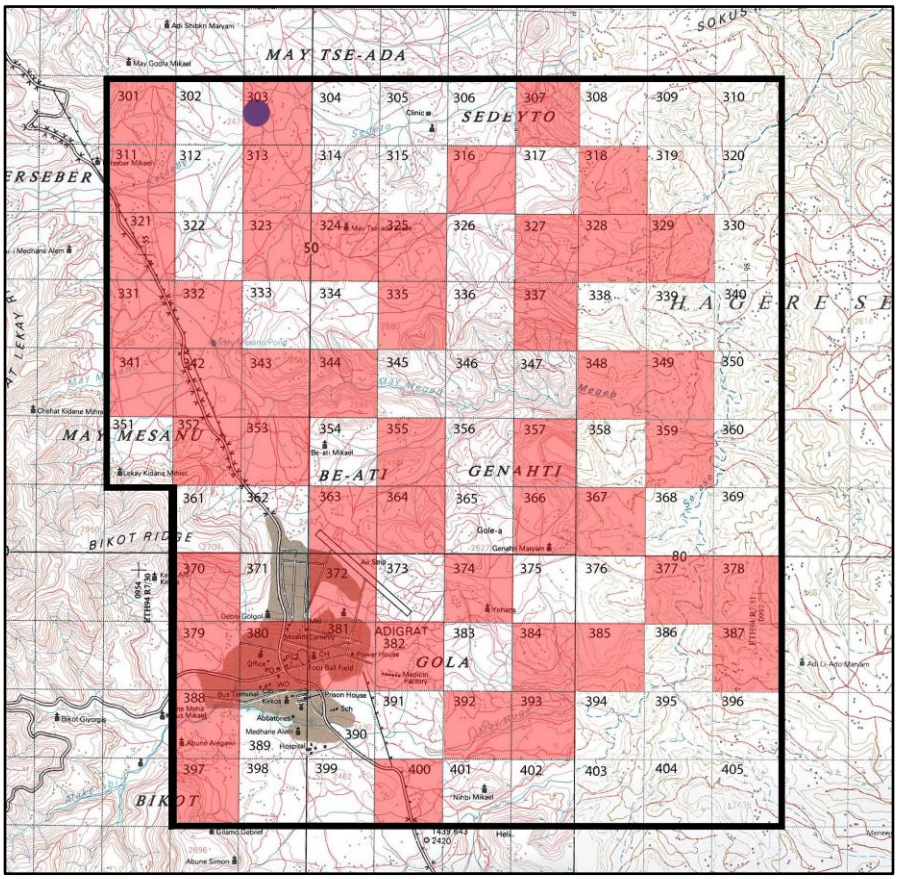


Figure 7 Survey area with 50 randomly selected survey blocks.
Study area outlined in black with the 50 randomly selected 1 km x 1 km sectors highlighted in red (modified from Ethiopia Mapping Agency 1997).

The combination of randomly selected systematic transects (5%), opportunistic survey, and judgmental survey increases the total coverage of the study area to 10% (Figure 8). For the purposes of statistical analysis of the relationship between sites and landforms, only sites located within randomly selected survey transects will be discussed, as not to skew the results from a subjective or judgmental approach to archaeological survey.

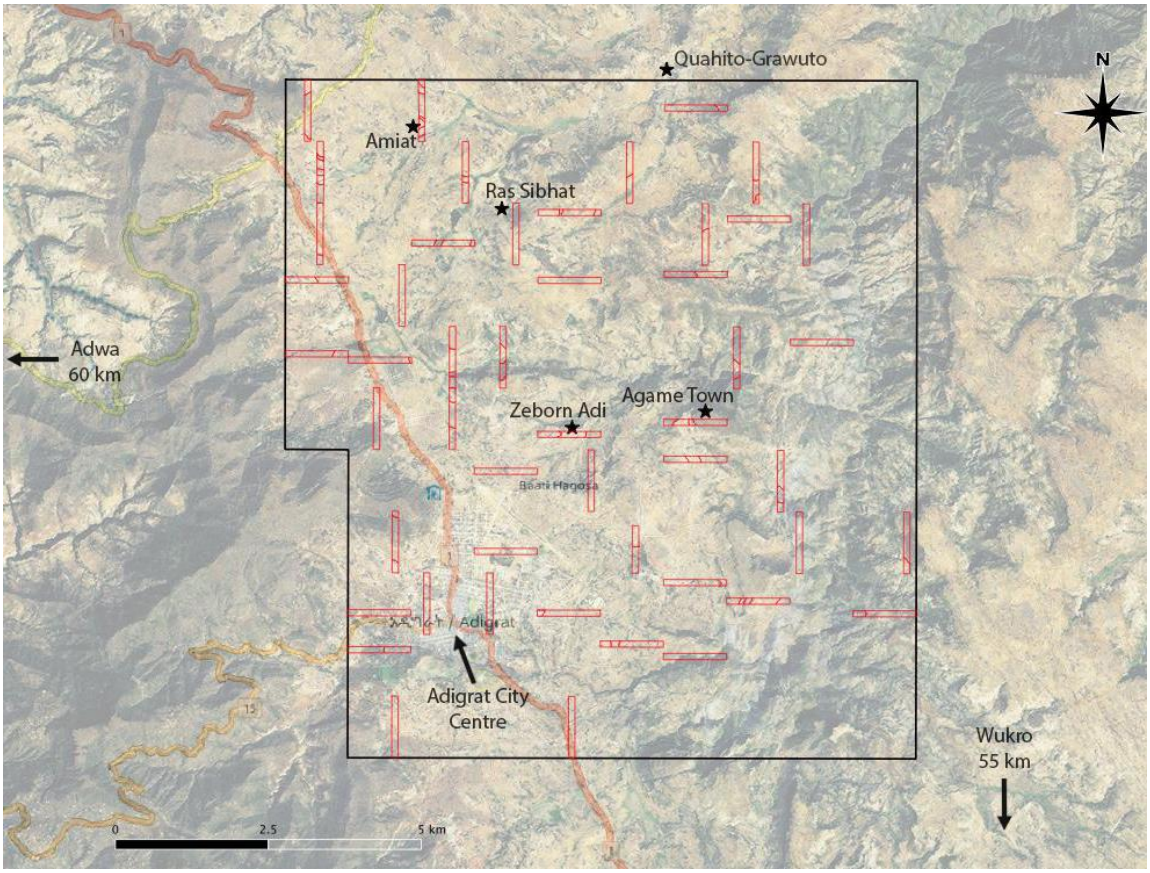


Figure 8 Location of each survey transect within the study area.

4.2.1. Archaeology Site Density

A variety of archaeological site types were identified during survey in 2017, both within and immediately outside of the 100-sq. km study area. A total of 56 archaeological sites were identified during the study, 50 of which are located within the study area (Table 6 and Figure 9). Of those 50 archaeological sites, 37 were identified within the 50 randomly selected 1000 m by 100 m survey transects. Those 37 sites were identified while investigating a total surface area of 5 sq. km (0.1 sq km per survey transect x 50 survey transects). That represents a density of 7.2 archaeological sites per square km. This density will be discussed, and compared to other surveys conducted in the region in Chapter 5. Sections 4.3 and 4.4 will explore the relationship between sites to the landscape and site size using statistical analysis.

Table 6 Sites identified during archaeological survey.

Site Number	*Site Name*	*Tabia*	*Site Type*	*Size (ha)*	*UTM Northing §*	*UTM Easting§*
301-001	Miebal Kohob Tsebah 1	Kerseber	Artefact scatter	0.54	1586814	547379
301-002	Miebal Kohob Tsebah 2	Kerseber	Findspot	0	1586751	547321
301-003	Miebal Kohob Tsebah 3	Kerseber	Findspot	0	1586628	547300
301-004	Miebal Kohob Tsebah 4	Kerserber	Findspot	0	1586592	547297
303-001	Amiat	Kohob Tsebah	Settlement site	10	1586238	549020
306-001	Quahito-Grawuto	Hagere Selam	Settlement site	40	1587170	553032
306-002	Tseratser	Hagere Selam	Artefact scatter	0.486	1586730	552928
307-001	Gra'awlie	Hagere Selam	Artefact scatter	0.145	1586564	553150
308-001	Adiwereto	Mai Tsaeda	Artefact scatter	0.159	1586466	554116
311-001	Bado	Kohob Tsebah	Artefact scatter	1.09	1585013	547237
311-002	Chekenta	Kohob Tsebah	Artefact scatter	0.87	1585803	547663
321-001	Koma Bado	Kohob Tsebah	Artefact scatter	0.11	1584942	547412
324-001	Ras Sibhat	Mai Tsaeda	Settlement site	1.25	1584908	550427
328-001	Enda-Hawariyat	Mai-mesanu	Artefact scatter	1.29	1584522	553992
331-001	Dekue 1	Mai-mesanu	Artefact scatter	0.08	1583705	547478
332-001	Dekue 2	Mai-mesanu	Artefact scatter	0.04	1583654	548818
333-001	Megab	Mai-mesanu	Artefact scatter	0.054	1583409	549752
341-001	Cheate	Mai-mesanu	Artefact scatter	0.93	1583263	547101
343-001	Erare	Megab	Findspot	0	1582714	549689
343-002	Ziban Beati 1	Beati	Artefact scatter	0.085	1582109	549743
344-001	Ziban Beati 2	Beati	Artefact scatter	0.073	1582180	550526
344-002	Endamichael 1	Beati	Artefact scatter	0.1		
344-003	Endamicheal 3	Beati	Artefact scatter	0.01	1582285	550504
344-004	Zeban-Beati	Beati	Artefact scatter	0.26		
354-001	Beati	Beati	Findspot	0	1581733	550015
355-001	Zeborn Adi	Golagenhati	Settlement site	4.01	1581359	551547
357-001	Agame Town	Golagenhati	Settlement site	10	1581626	553658
357-002	Ziban Adi	Golagenhati	Findspot	0	1581461	553305
357-003	Golagenhati 1	Golagenhati	Findspot	0	1581776	553670
363-001	Adigrat University	Golagenhati	Artefact scatter	2.15	1580659	550514
364-001	Ethio-Italian War Insc.	Golagenhati	Findspot (Historic Monument)	0	1580262	551803
366-001	Genahti Maryam	Golagenhati	Findspot	0	1580894	553589
374-001	Maintetabo	Golagenhati	Findspot	0	1579279	552550
374-002	Mainatabo	Golagenhati	Artefact scatter	0.356	1579344	552569
374-003	Sifera Ziban	Golagenhati	Artefact scatter	0.006	1579755	552564

Site Number	*Site Name*	*Tabia*	*Site Type*	*Size (ha)*	*UTM Northing* [§]	*UTM Easting*[§]
375-001	Golagenhati 2	Golagenhati	Findspot	0	1580005	552855
376-001	Beati Tehile	Golagenhati	Findspot	0	1579373	554052
377-001	Tserke	Golagenhati	Artefact scatter	0.96	1579525	555047
379-001	Bet-Michael	05 Kebele	Artefact scatter	0.8	1578378	548304
380-001	Medihanealem	05 Kebele	Artefact scatter	0.028	1578830	549284
380-002	Finote Birehan	05 Kebele	Findspot	0	1578444	549224
381-001	Amete Kirstos	02 Kebele	Artefact scatter	0.1	157861	550185
381-002	Enda Mision	02 Kebele	Findspot	0	1578593	550290
385-001	Mai-Awleh	Golagenhati	Artefact scatter	0.11	1578508	554971
386-001	Lee-Ado 3	Koma Subha	Rock art	0.042	1578243	555919
387-001	Lee-Ado 1	Koma Subha	Findspot	0	1578327	556475
388-001	End Mikael	06 Kebele	Artefact scatter	0.112	1577773	548020
392-001	Beati Maryam 1	Golagenhati	Findspot (Rock Cut Tomb)	0	1577973	552094
392-002	Beati Maryam 2	Golagenhati	Artefact scatter	0.013	1577833	552059
392-003	Genhati	Golagenhati	Artefact scatter	0.042	1577900	552728
[‡]*900-001*	Enda Mikael	Kerserber	Artefact scatter	0.5	1585772	546861
[‡]*900-002*	Debla Maryam	Kerserber	Artefact scatter	1.08	1584367	546554
[‡]*900-003*	Koma Subha 1	Koma Subha	Findspot	0	1578513	557954
[‡]*900-004*	Lee-Ado 2	Koma Subha	Artefact scatter	0.123	1579449	557047
[‡]*900-005*	Ba'ati Shulum	Koma Subha	Rock art	0.1	1578753	557299
[‡]*900-006*	May Be'ati	Bukot	Artefact scatter	0.49	1575886	549253

[§]UTM Northings and Easting (Zone 37N) are listed using the Adindan Datum from Ethiopian government created topographic maps.

[‡]Sites with 900 classification were located outside study area but within permitted survey area

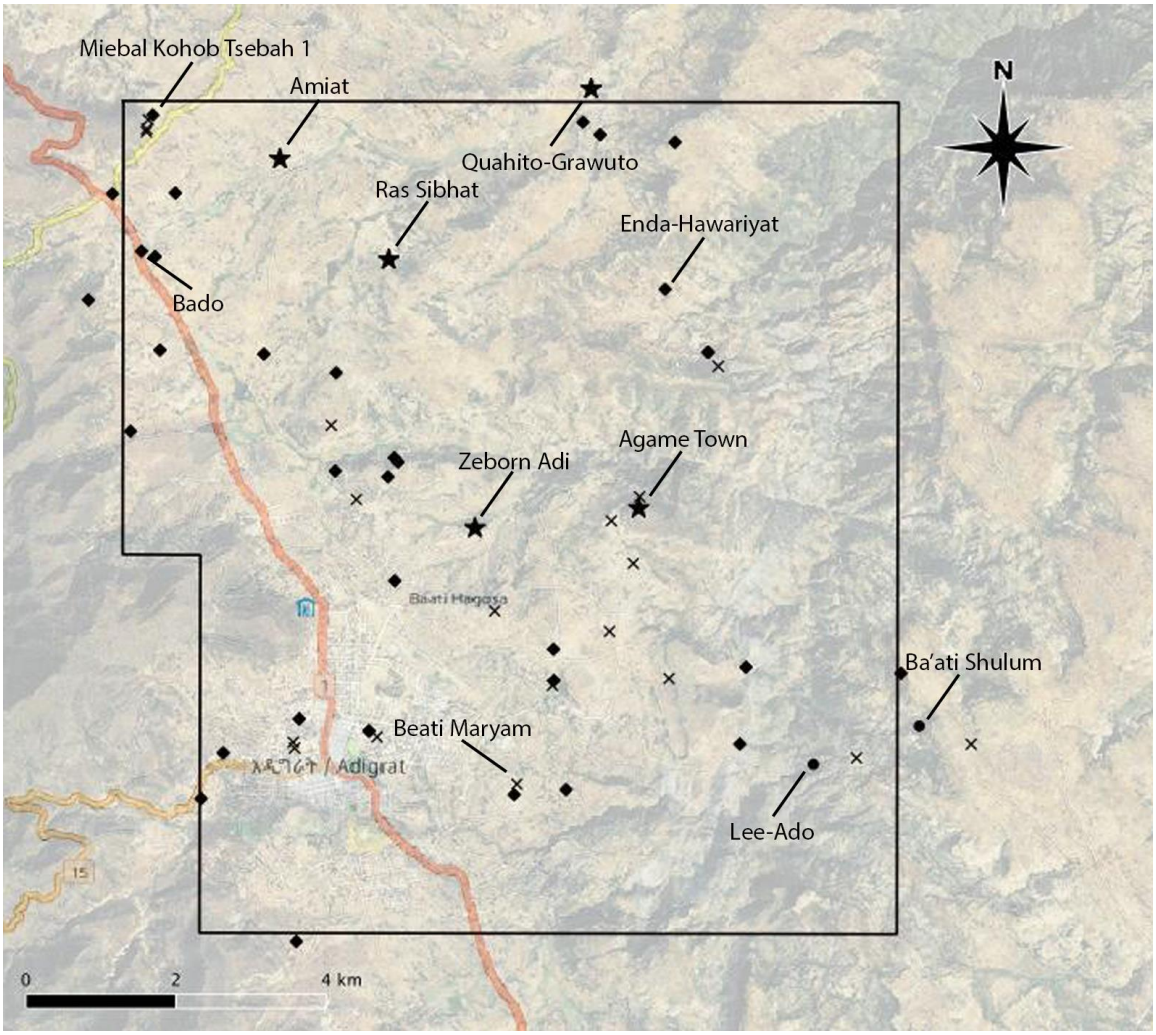


Figure 9 Archaeological sites identified during survey.
Study area in black with settlement sites (star), artefact scatters (diamond), find spots (x), and rock art (circle) sites. Sites discussed in that chapter are labelled.

4.2.2. Settlement Sites

Five settlement sites were identified, ranging in size from 40 ha to 1.25 ha. The settlement sites are mostly contained within the northern and central portions of the study area (Figure 10). The largest settlement site, located in sector 306, known as Quahito-Grawuto is approximately 40 ha in size, and comprises a large area of settlement slope terrain, overlooking the confluence of two valley bottom drainages to the south (Figure 11). Beyond the sheer size, what is interesting is the remarkably clear delineation of material types throughout the site showing some form of spatial craft

specialization. Lithic materials including chert and obsidian were identified with noticeable frequency in western portions of the site, and rarely located in other areas of the site. These observations give weight to the notion of this as a large settlement area, or regional center, with craft specialization (work centres) and social inequality throughout. The site also contains remnants of walls ruins and fallen architecture throughout (Figure 12).

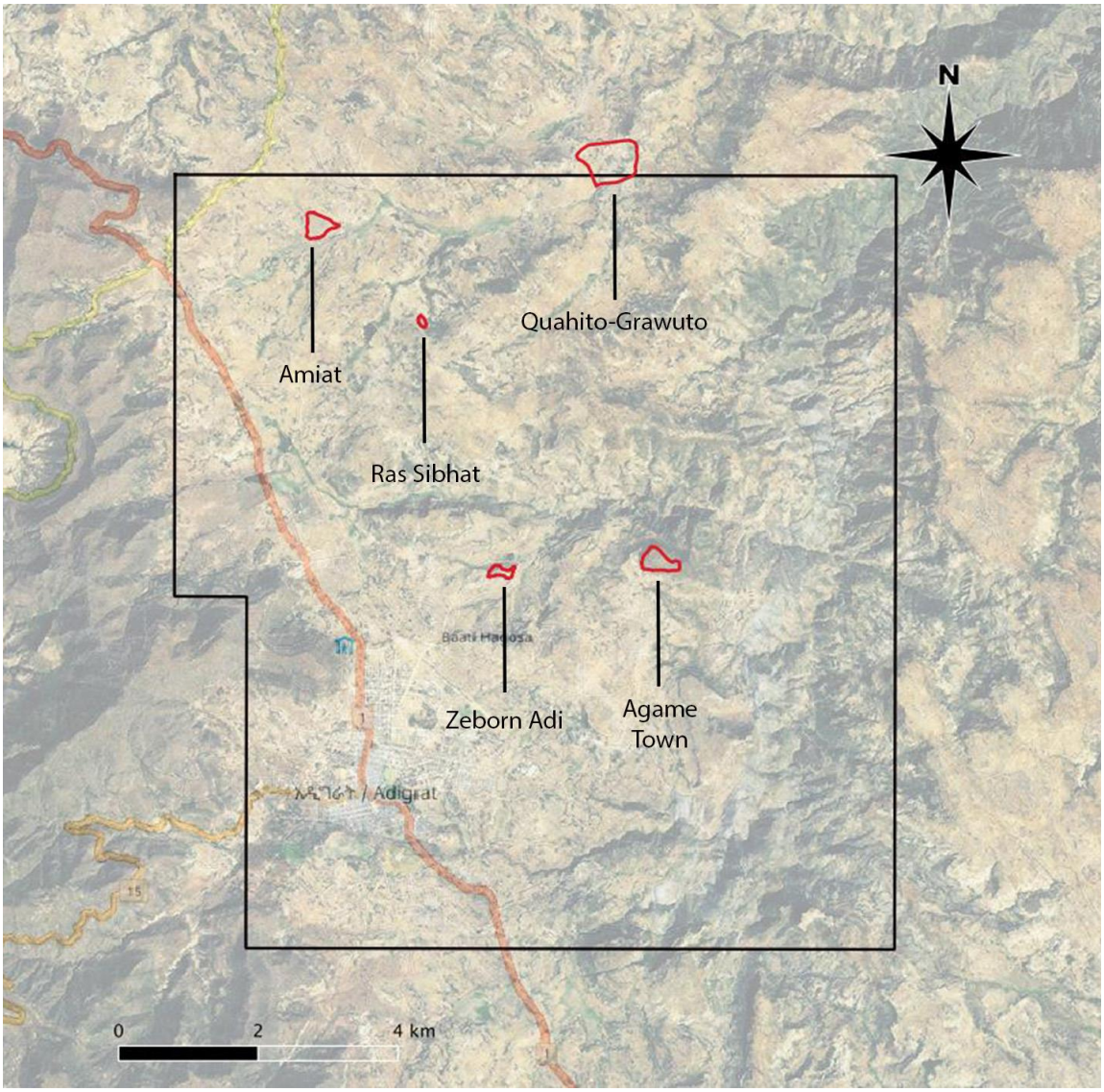


Figure 10 Overview map showing study area and settlement sites.
Study area outlined in black with settlement site boundaries outlined in red.

Figure 11 View east towards site 306-001, Quahito-Grawuto.

Figure 12 View towards remains of suspected Aksumite period wall within site 306-001, Quahito-Grawuto.

Another important settlement site located during this survey is situated in the northern portion of the study area, within sector 303, known locally as Amiat. It is approximately 10 ha in size, and comprised of a large mound or knoll, overlooking fertile valley bottom settings in all directions (Figure 13). Based on information obtained from local residents, this site was briefly visited by ETAP in years prior. A dense scatter of ceramics were located throughout the site, along with lithics including obsidian and chert, and limited remains of Aksumite period walls. A remarkable temporal variety of materials were located at Amiat, and types of ceramics indicate continuous occupation from the Pre-Aksumite through to the Post-Aksumite and Ethnographic periods. Many examples of elite goods were recovered and will be discussed in Section 4.4. One Aksumite coin was recovered during surface collections at the site (Figure 14). The preserved side of the silver coin features a cross motif centered with a small circular inlay of gold color material, surrounded by a circle of square and rectangular shapes, some of which are badly decayed. This coin's pattern and motif matches coins minted for Aksumite King Ioel, from the mid- to late sixth century (Figure 15), which also bear

close resemblance to coins minted by Byzantine Emperor Maurice 582-592 (Munro-Hay 1999).

Figure 13 View north from 303-001, Amiat settlement site towards fertile valley bottom setting.

Figure 14 A.) Coinage representing the reign of King Ioil, categorized as 'Ioel AR I'. B.) Coin collected during surface inspection at Amiat (303-001).

A.) On display in the British Museum (from Munro-Hay 1999)

Figure 15 Microscopic photograph of coin collected from site 303-001, Amiat. Coin likely dates to the reign of King Ioel, contemporaneous with Byzantine King Maurice. Note gold inlay in center of coin, reverse side is completely deteriorated.

The purported location of the ancient medieval town of Agame, from which the region gets its name, was located in sector 357 during this survey. (Figure 16). Agame is approximately 10 ha in size, and situated atop a large *amba* with excellent view corridors east towards the large river valley. The valley encompasses modern day Adigrat to the southwest, and further southwest towards the mountain ranges peaked by Alaqwa Mountain. This location would have provided one of the best vantage points in the region, overlooking important trade routes extending from the Afar to Aksum, and from the southern cities of Wukro, north to the Eritrean highlands. Standing architecture is the most prominent feature on the site's landscape, including well preserved ruins with features such as kitchens with large ovens, and dwellings with largely intact lower levels (Figures 15 and 18). Artefacts generally date the site to the Late Aksumite phase and the Post-Aksumite period; however, erosion within the site is very limited due to the *amba* being an ecological protectorate with no agriculture or modern day dwellings. The limited erosion and tilling at this site, in comparison to other areas of the project, may

result in the preservation of earlier dated artefacts, at a depth below that visible during surface inspection.

Figure 16 View south from 357-001, Agame settlement site towards river valley.

Figure 17 **View north towards main partially-standing structure within 357-001, Agame settlement site.**

Figure 18 View southeast towards possible kitchen/cooking feature/structure within site 357-001, Agame.

The remaining two settlement sites are smaller in size than those previously discussed; however, each share characteristics which indicate their function as settlements, not a single dwelling or short term camp. Ras Sibhat (324-001), located in sector 324, is approximately 1.25 ha in size and situated on a sediment slope overlooking valleys to the north and west. The most striking component is a 3-5 meter tall stone boulder-and-chink wall, which surrounds the entirety of the site (Figure 19). Within this walled compound, modern residents currently occupy a few dwellings, and others which appear to be much older have fallen into disrepair (Figure 20). It appears that a majority of these modern dwellings utilize the Ethnographic era ruins present across the site, many of which were likely built upon much older Late or Post-Aksumite architecture. Surface collections throughout the site located artefact types including obsidian, chert, and ceramics dating from the Pre-Aksumite, Early, Middle, and Late, and Post-Aksumite periods, and from the Medieval/Ethnographic eras.

Figure 19 View southeast towards wall surrounding site 324-001, Ras Sibhat.

Figure 20 View east towards standing architecture connected to wall surrounding site 324-001, Ras Sibhat. Residents and survey team in the foreground.

Zeborn Adi is a 4.01 ha settlement site located in sector 355, in the centre of the project area. It is situated just north of the city of Adigrat, and immediately east of the Adigrat University grounds. The site is located on a mid-sized *amba*, elevated above a valley bottom setting with view corridors in all directions along trade and travel routes. Many artefacts were located on the sediment slopes adjacent to the amba top, with some artefacts located on the sediment plateau above (Figure 21). Erosion has heavily affected this site, likely obscuring the location of artefacts, and yielding few areas with intact stratigraphic deposits suitable for excavation. A modern reservoir has been constructed on the east side of the amba utilizing the valley bottom setting, however it is not the remnant of a more ancient lake or reservoir based on data collected from core deposits (Power pers comm.). In addition, local informants recollect the construction of the reservoir during the Derg (A Marxist-Leninist military junta which ruled Ethiopia from 1974 to 1987) in Eastern Tigrai. Sediment within the reservoir yielded Aksumite era sedimentation immediately at the bottom of the reservoir, followed by earlier Post-

Aksumite era sediments (Power pers comm). These findings indicate recent colluvial erosion from the amba in an eastward direction which may contain site sediments from Zeborn Adi, into the area used for the modern day reservoir. The landform contains some interesting stone-cut features including two, pecked, teardrop shaped niches within a vertical sandstone face, possibly used for offerings or another purpose (Figure 22).

Figure 21 View west towards site 355-001, Zeborn Adi.

Figure 22 View east to teardrop shaped rock pecked feature at site 355-001, Zeborn Adi.

These five settlement sites span a diverse range of dates, culture history, artefact types and environments within the study area. The location of each within the classification scheme will be discussed in Section 4.2, and Chapter 5. The identification of these five settlement sites within the study area does not rule out the presence of other settlement sites based on the type of randomly systematic survey conducted. In Section 4.2.2 the spatially smaller archaeological sites will be discussed beginning with the most frequent type of archaeological site encountered on the landscape, artefact scatters.

4.2.3. Artefact Scatters

Artefact scatters are defined as discreet scatters of artefacts, mainly ceramic and lithic, which are typically less than one hectare in size, and lack visible architecture or wall features, which would indicate a more densely occupied area. A total of 28 artefact scatters, which accounted for 56% of all archaeological sites encountered during the

survey, were identified throughout the study area on almost every landform type (Figure 23). They may represent a homestead, single dwelling, camp site, or activity such as butchering, cooking, or harvesting outside of a settlement area such as a town, village, or city. Artefact scatters contain a wide range of artefact types, and span dates from the Middle and Later Stone Age through to the Ethnographic period. The following are three examples of artefact scatters which demonstrate the breadth of cultural materials and site composition throughout the study area.

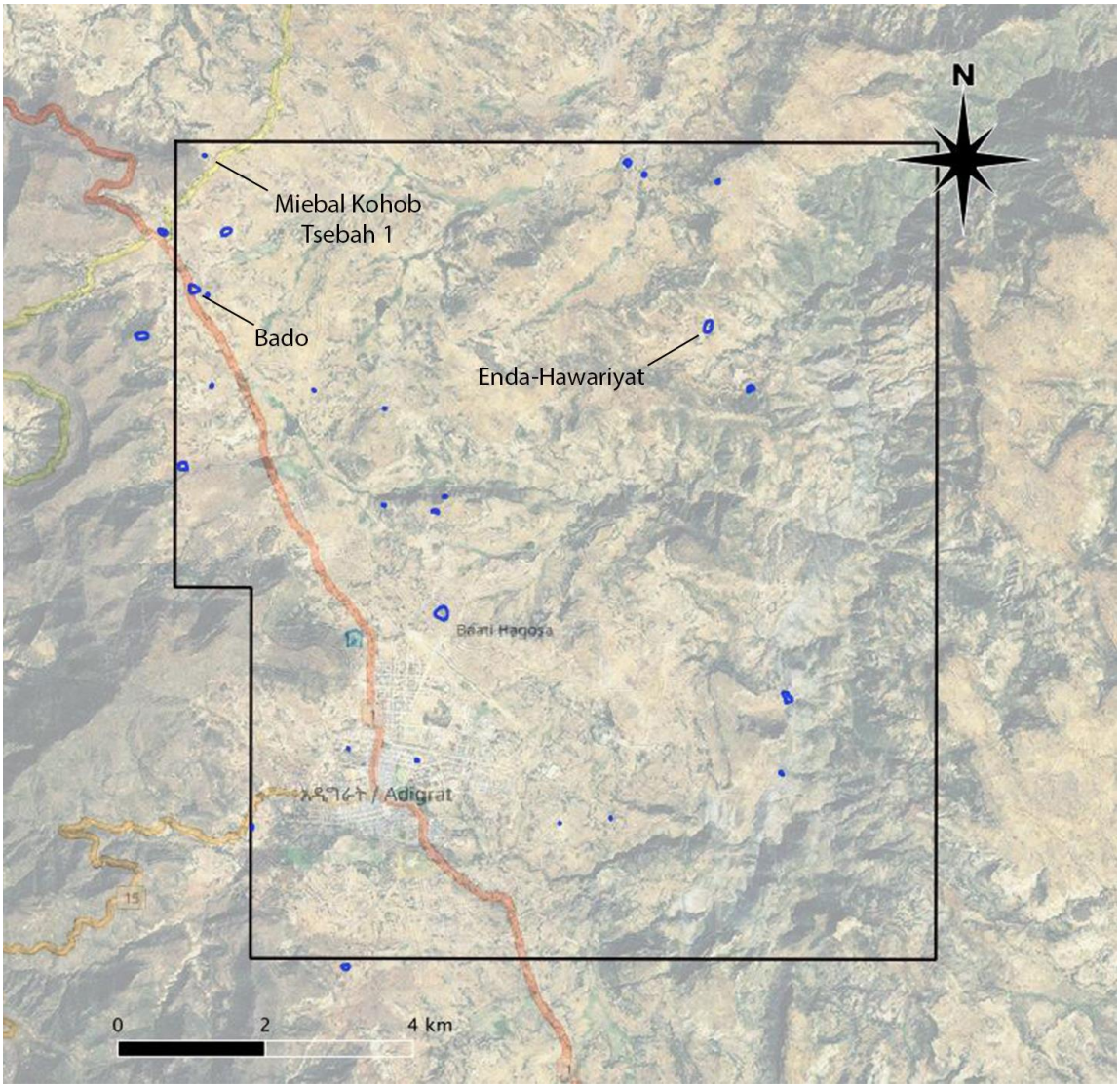


Figure 23 Artefact scatters identified within the study area.
Study area in black with artefact scatter boundaries in blue.

Artefact scatter Miebal Kohob Tsebah 1 (301-001) is 0.54 ha in size and located in the northwestern extent of the survey area, on a sediment slope overlooking the

modern church and community of Kerserber. The site is comprised of a mix of ceramics and lithics situated along the edge of a terraced sediment slope with an excellent view corridor in all directions along suspected travel and trade routes (Figure 24). Ceramic body sherds date this occupation to the Middle Aksumite period. An abundance of black basalt nodules were noted eroding from exposures adjacent to the site possibly representing part of the site's function as a lithic source or workshop.

Figure 24 View northeast towards site 301-001, Miebal Kohob Tsebah and valley beyond.

A large artifact scatter from the northwest portion of the study area is the site of Bado (311-001) which is 1.09 ha in size. This site is located on a gently sloping sediment slope landform which transitions to a valley bottom setting outside of the site boundary (Figure 25). The site was located while traversing from the access vehicle to the start of the survey transect in sector 311. Bado is one of the larger artefact scatters; however, no architecture or ruins were identified during intensive surface inspections. Ceramics collected during surface inspection are dominated by those representative of the Early, Middle and Late Aksumite periods. Some quartz, obsidan and chert lithics were

collected, however none were diagnostic in nature. This site is important both in terms of size, and temporal continuity through three Aksumite Periods indicating use spanning centuries.

Figure 25 View south at site 311-001, Bado.

Site Enda-Hawariyat (328-001) is a 1.29 ha artefact scatter located in the northeast portion of the study area. The site is located on the edge of an amba with artefacts eroding down onto the bedrock and sediment slopes below. It is characterized by a scatter of lithics and ceramics which have been subject to disturbance from agricultural activities and the construction of the adjacent Enda-Hawariyat Church (Figure 26). A remarkable array of artefacts was collected during surface inspection including ceramics, lithics, and an example of possible Roman glass. Lithics include an obsidian blade (Figure 27), and flakes and fragments of local chert and quartz. Ceramics recovered included a variety of vessel types including cups, bowls, and vases of various sizes. Analysis of these ceramics revealed that they included a wide date range, with specimens from the Pre-Aksumite, as well as from the Early, Middle and Late Aksumite periods. The span of dates indicating the occupation longevity, and the examples of

ceramic and glass elite goods, make this artefact scatter one that will be of note for further investigation.

Figure 26 View northwest across site 328-001, Enda-Hawariyat.

Figure 27 Obsidan blade collected from site 328-001, Enda-Haeariyat.

4.2.4. Findspots

Findspots denote a diagnostic isolated surface find which lacks a discernable surface extent and is not part of a settlement or occupation. A total of fourteen findspots were identified during the survey, one of which was identified outside of the study area but within the permitted area. Common types of artefacts that denoted a findspot were formed lithic tools such as scrapers or cores from sites Miebal Kohob Tsebah 2, Miebal Kohob Tsebah 3, and Miebal Kohob Tsebah 4 (301-002, 301-003, and 301-004 respectively). Another common type of artefact recovered from findspots was diagnostic ceramics such as a bowl, cup, or vessel. An example of this is a Classical Aksumite cup fragment from site Genhati Maryam (366-001). Two sites, classified as findspots but which do not fit the categories above are Beati Maryam 1 (392-001), and the Ethio-Italian War etched memorial (364-001). Both were categorized as findspots due to their unique characteristics, inability to fit into other categories, and clear function other than a settlement area, or possible small dwelling.

Beati Maryam (392-001) is a rock-cut tomb originally located and documented by ETAP in 2008. The site, at that time, was outside the ETAP study area (D'Andrea et al.

2008) and as such was not excavated. Looting had already resulted in the removal of the majority of the artefacts and damage to the tomb chambers. What artefacts were remaining were collected and placed in ETAP storerooms. Beati Maryam falls within this current study area, and as such, artefacts which had been stored in the ETAP repository (Figure 28) were analyzed. The tomb is located on a gentle exposed bedrock slope overlooking a valley bottom to the east (Figure 29). It is a rectangular shape cut directly into the bedrock, measuring 1.92 m long (northwest-southeast) by 0.75 m wide (northeast-southwest), and approximately 3.0 m deep. Two chambers extend off the northwest and southeast ends of the primary chamber, with an Aksumite Cross and wavy-line motif inscribed above the southeast chamber (Figure 30 and 31). The northwest chamber measures approximately 1.9 m long, 1.9 m wide, and 1.4 m tall. The southeast chamber measures approximately 2.3 m long, 1.4 m wide and 1.3 m tall. Further discussions of these artefacts, and exploration of shaft tombs in the region will be addressed in an upcoming publication.

Figure 28 View northwest to rock cut shaft tomb 392-001, Beati Maryam.

Figure 29 **Selection of artefacts collected from 2008 ETAP salvage excavation of 392-001, Beati Maryam.**

Figure 30 **View southeast to Aksumite Cross and wavy-line motif within rock cut shaft tomb 392-001, Beati Maryam.**

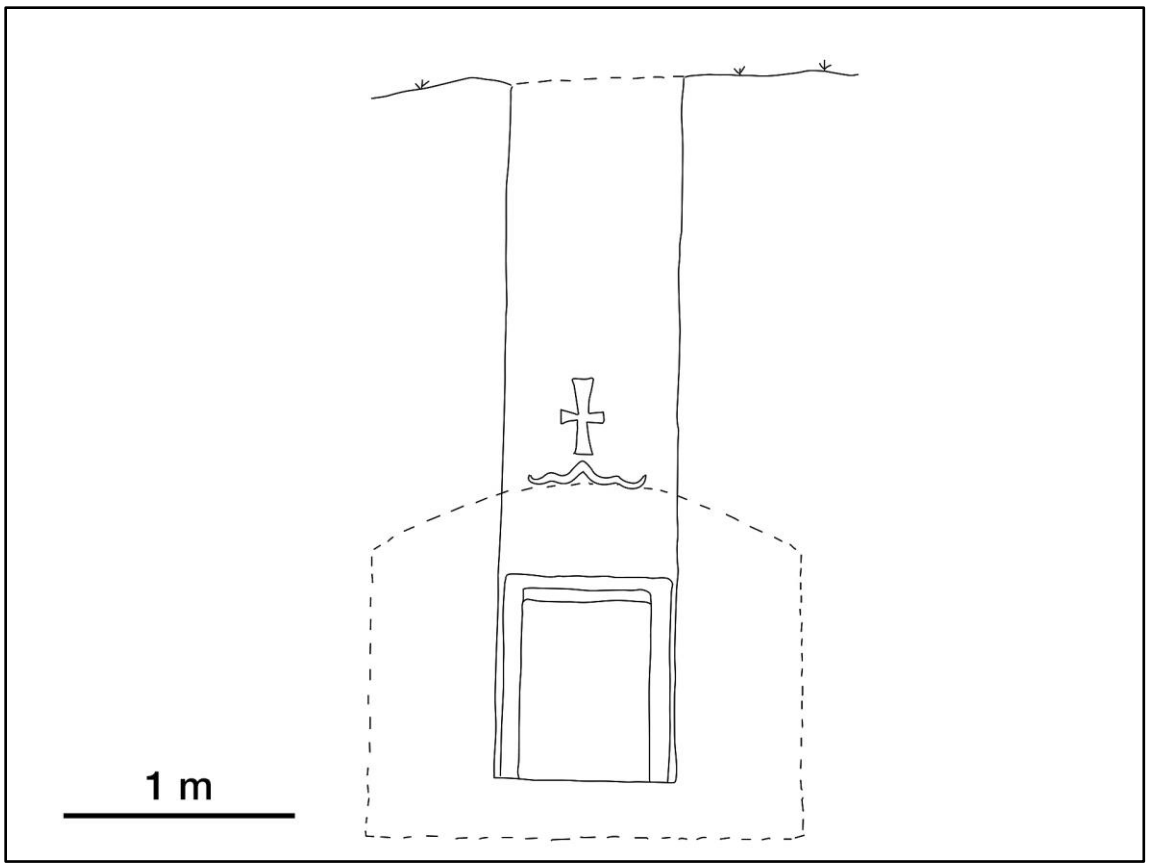


Figure 31 Scale sketch of tomb 392-001, Beati Maryam, view southwest.

The Ethio-Italian War etched memorial (364-001) is located on a bedrock face overlooking the City of Adigrat, with view north towards the Ethiopian-Eritrean international boundary, and south towards the town of Edaga Hamus. On the highest point of the amba associated with the bedrock face, is a current Ethiopian military installation. Across from the site on a lower sediment plateau with excellent view corridors, is a low walled structure which appears to have been used during the Ethio-Italian, or Ethio-Eritrean conflict. The memorial consists of an inscription which reads “Nazionale Ridotta 18-11-1935-A-XIV-WF” and also contains crossed arms and a bundled axe fascist motif (Figure 32). While not applicable to this study, due to both function and age, it is an interesting historical feature.

Figure 32 View east to 364-001, Ethio-Italian War Memorial Inscription.

4.2.5. Rock Art

Only one rock art site, Lee-Ado 3 (386-001), was located during survey. Lee-Ado is a rock shelter overlooking the river valley below, and steeply sloping terrain to the west (Figure 33). The rock art panel is covered with soot likely related to cooking activities which have occurred over the last century. D-Stretch software was utilized to better view the images obscured by the soot (Figure 34). The main motifs present in the image are cattle or oxen with some human figures; however, the full extent is difficult to discern because a local informant cleaned the soot from the panel to show the art to multiple site visitors prior to the survey team visit. After this site visit upon discussions with the land owner it was agreed upon to no longer use soap and water to ‘clean’ the rock face as it is rapidly removing the artwork.

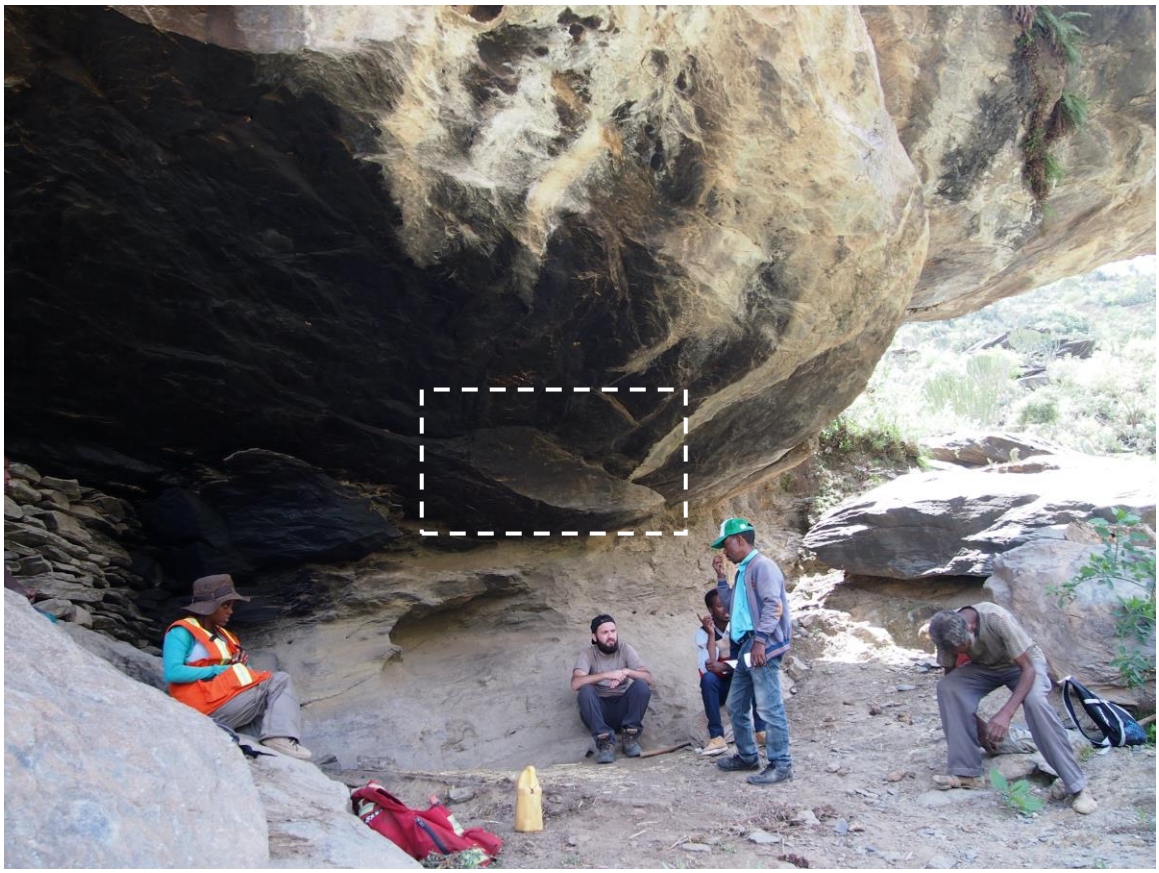


Figure 33 View northeast towards rock art site 386-001, Lee-Ado.
White box indicates rock art panel location.

Figure 34 View of rock art panel at site 386-001, Lee-Ado.
D-Stretch applied to show image more clearly (Harman 2019: https://www.dstretch.com/)

Rock art site Ba'ati Shulum (900-005), is located within the permitted area for this study, but outside of the 100 sq km survey area. The site was identified while traversing from Lee-Ado 3 to the access vehicle. It contains a remarkable array of images. It is located on a sheer sandstone bedrock face below an amba top, and above a steeply sloping scree slope, approximately 1.4 km from Lee-Ado 3. This site shows images of cattle, camels, symbols, and humans (Figures 35, 36, and 37). Both sites (Ba'ati Shulum and Lee Ado) are discussed in Getachew Meresa Nigus' MA thesis which explores and inventories rock art in the area (2006).

Figure 35 **View of survey crew inspecting rock art panel at site 900-005, Ba’ati Shulum.**

Figure 36 View of rock art panel at site 900-005, Ba’ati Shulum.

Figure 37 View of rock art panel at site 900-005, Ba'ati Shulum.
D-Stretch applied to show image more clearly (Harman 2019: https://www.dstretch.com/)

4.3. Landform Analysis

During the field program, an area of 500 ha was subjected to randomized systematic pedestrian survey; with a focus on the precise delineation of the various landforms that were encountered (Figure 38). Landform classifications are discussed in Chapter 3. The most frequent type of landform was sediment slope, which encompasses 52.3 % of all terrain encountered during survey (Table 7). Scree slopes and sediment plateau were the least frequently encountered landform types, which represent approximately 3% and 7% respectively. Based on these findings, Pearson's Goodness-of-Fit Chi-Square analysis will be used to determine if there is statistical significance to the number of archeological sites found in association with each landform type. Generally, if sites are located at random across the landscape the frequency of sites match the frequency of landforms in which they are located.

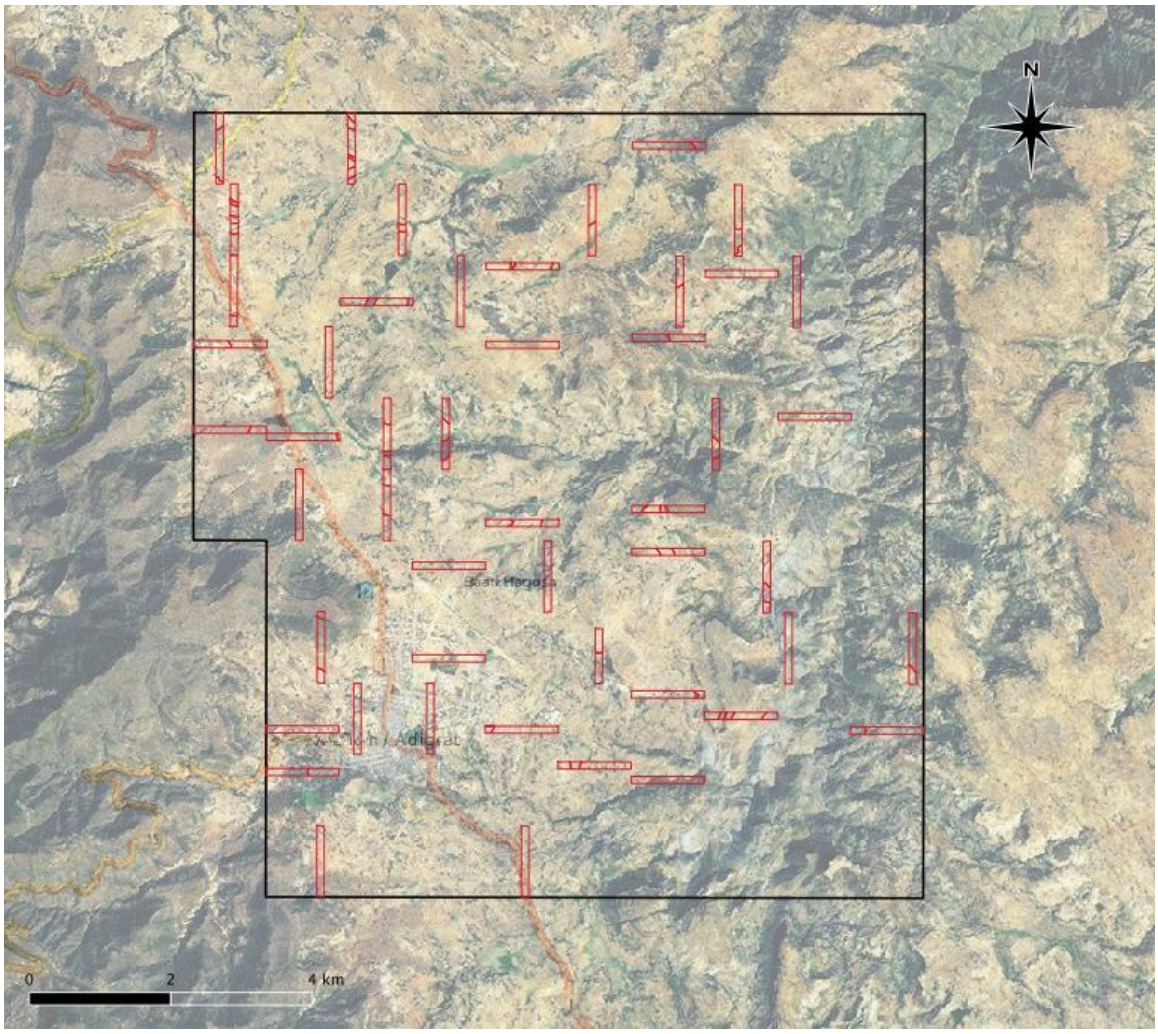


Figure 38 Study area with all survey transects and landforms.
Survey transects and changes in landforms shown in red, study area in black.

Table 7 Frequency of each type of landform encountered throughout archaeological survey.

LANDFORM	M²	HECTARES	PERCENTAGE OF TOTAL SURVEY
SEDIMENT SLOPE	2616506	261.6506	52.3
SEDIMENT PLATEAU	343053	34.3053	6.8
SCREE SLOPE	172679	17.2679	3.4
URBAN	602470	60.247	12.0
BEDROCK SLOPE	770979	77.0979	15.4
VALLEY BOTTOM	494313	49.4313	9.8

Chi-Square analysis was applied on the data from this field study, utilizing similar methodology and thresholds as previous ETAP studies for comparability which is discussed in Chapter 5 (D'Andrea et al. 2008, Harrower and D'Andrea 2014). However, comprehensive GIS analysis of the entire 100 sq km survey area using ASTER satellite bands to model the entire landscape, like in previous ETAP studies (Harrower and D'Andrea 2014) regardless of survey coverage was not conducted. For the purposes of this thesis, only sites located within survey transects were analyzed. Chi-square analysis for goodness-of-fit can utilize both raw counts and proportions. Table 8 illustrates the raw counts for each type of site in each landform category and their totals in terms of percentage.

Table 8 Site totals and percentages by landform

LANDFORM	SETTLEMENT	ARTEFACT SCATTER	FINDSPOT	TOTAL	TOTAL PERCENT
SEDIMENT SLOPE	2	9	5	16	44.4
SEDIMENT PLATEAU	1	3	1	5	13.8
SCREE SLOPE	0	2	1	3	8.3
URBAN	0	4	2	6	16.6
BEDROCK SLOPE	0	4	3	7	19.4
VALLEY BOTTOM	0	0	0	0	0

The null hypothesis (H_0) for this calculation postulates that the actual distribution of sites encountered will match the number of each landform encountered, as a result of a random distribution across each landform type. For example, in this study area where sediment slope landforms accounted for 52.3% of terrain covered, approximately 52.3% of all sites should be located on sediment slope, and the same applies for all other landforms. The alternative hypothesis (H_1) theorizes that the number of sites does not conform with the expected distributions. In the alternative hypothesis, sites are concentrated on certain landforms, possibly inferring a specific choice or preference by past peoples. The chi-square test used to evaluate goodness-of-fit that sites resulted in a chi square (X^2) value of 30, and a p value of 0.2243 at the 90% confidence interval. Due to the high p value, the result is that we cannot reject the null hypothesis (H_0). Therefore, it is statistically probable that the number of sites identified on each landform proportionately match the frequency of each type of landform encountered. In this case, the distribution of sites across the landscape did not significantly statistically differ from

expected. These results will be discussed and compared with the results of settlement patterning in Chapter 5.

4.4. Settlement Patterning

Settlement patterning is another statistical analysis that is utilized in order to understand political and social structure. For the settlement patterning analysis, only settlement sites and artefact scatters were included; findspots and rock art lack the surface area to make meaningful contributions to the relationship between site sizes. Including findspots and rock art sites would skew the data due to the fact that most of these sites measure 1 m square. Table 9 shows the 32 settlement sites and artefact scatters located within randomly selected survey transects, as well as known dates, split into the three chronological categories detailed in Chapter 3. Applying the same RSBOOT analysis conducted by previous ETAP studies (Drennan and Peterson 2004, D'Andrea et al. 2008, Harrower and D'Andrea 2014) to the sites identified during this study produced the results illustrated in Figures 39, 40, and 41.

Table 9 Settlement sites and artefact scatters identified during survey.

Site Number	*Site Name*	*Pre-Aksumite (~700 – 50 BCE)*	*Aksumite Period (50 BCE – 700 CE)*	*Post-Aksumite and Ethnographic (700 BCE onwards)*
301-001	Miebal Kohob Tsebah 1			
303-001	Amiat	X	X	X
306-001	Quahito-Grawuto		X	X
306-002	Tseratser		X	
307-001	Gra'awlie		X	
308-001	Adiwereto		X	
311-001	Bado		X	
311-002	Chekenta		X	
321-001	Koma Bado		X	
324-001	Ras Sibhat	X	X	X
328-001	Enda-Hawariyat	X	X	X
331-001	Dekue 1		X	
332-001	Dekue 2		X	
333-001	Megab			
341-001	Cheate	X	X	X
343-002	Ziban Beati 1		X	
344-001	Ziban Beati 2		X	
344-003	Endamicheal 3			
344-004	Zeban-Beati			
355-001	Zeborn Adi		X	
357-001	Agame Town		X	X
363-001	Adigrat University		X	
374-002	Mainatabo		X	
374-003	Sifera Ziban		X	X
377-001	Tserke			
379-001	Bet-Michael		X	X
380-001	Medihanealem			X
381-001	Amete Kirstos		X	X
385-001	Mai-Awleh			
388-001	End Mikael		X	
392-002	Beati Maryam 2		X	X
392-003	Genhati			X

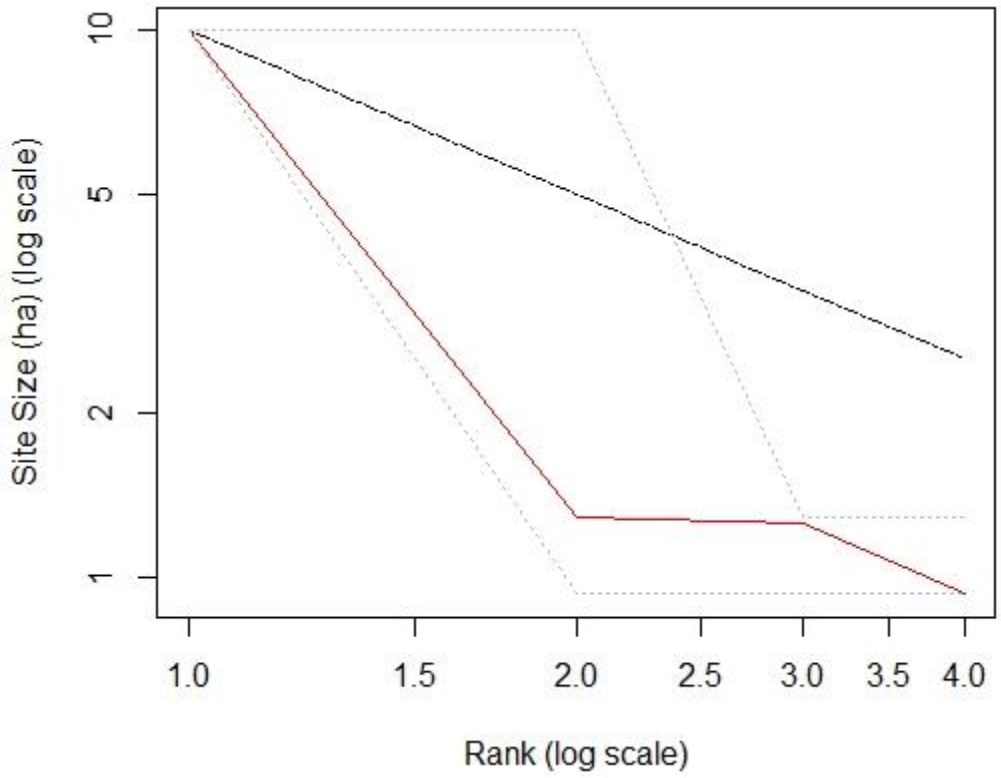


Figure 39 RSBOOT results from identified Pre-Aksumite sites.
Graph plotted with R Studio. Red line indicates plotted curve, black dashed line indicates Zipf's Rank-Size Rule, and grey dotted lines indicate confidence intervals to 90%.

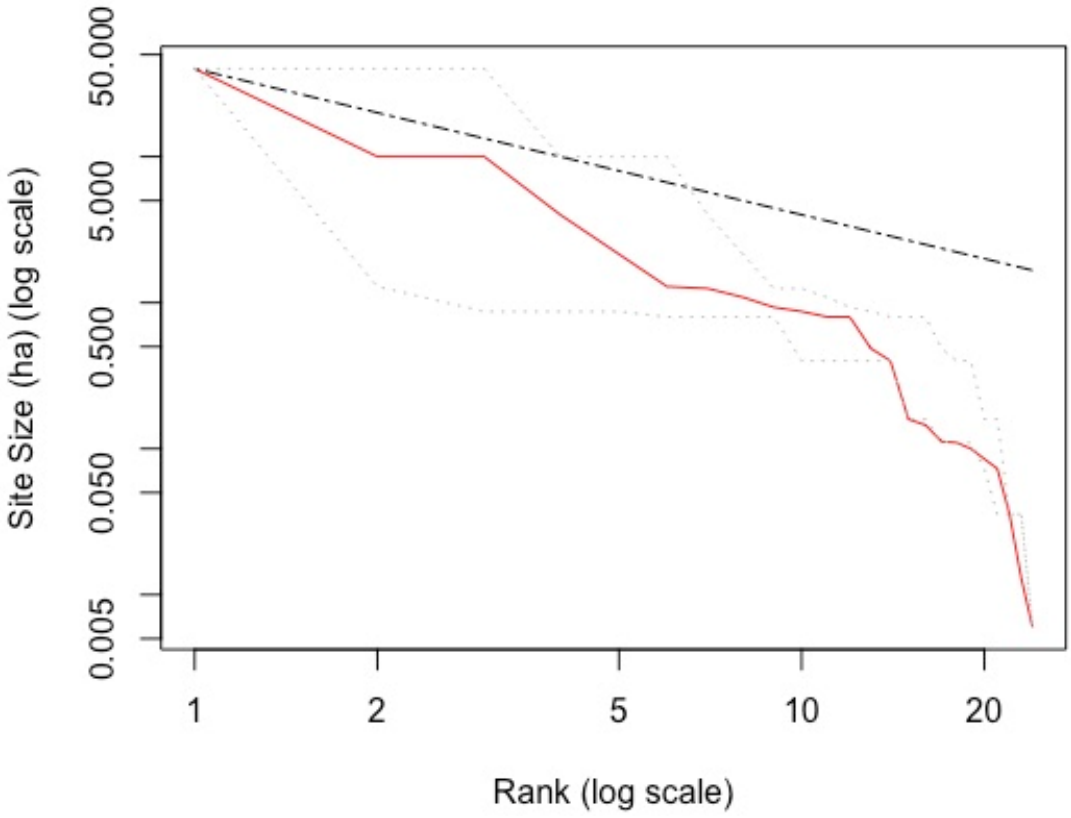


Figure 40 RSBOOT results from identified Aksumite sites.
Graph plotted with R Studio. Red line indicates plotted curve, black dashed line indicates Zipf's Rank-Size Rule, and grey dotted lines indicate confidence intervals to 90%.

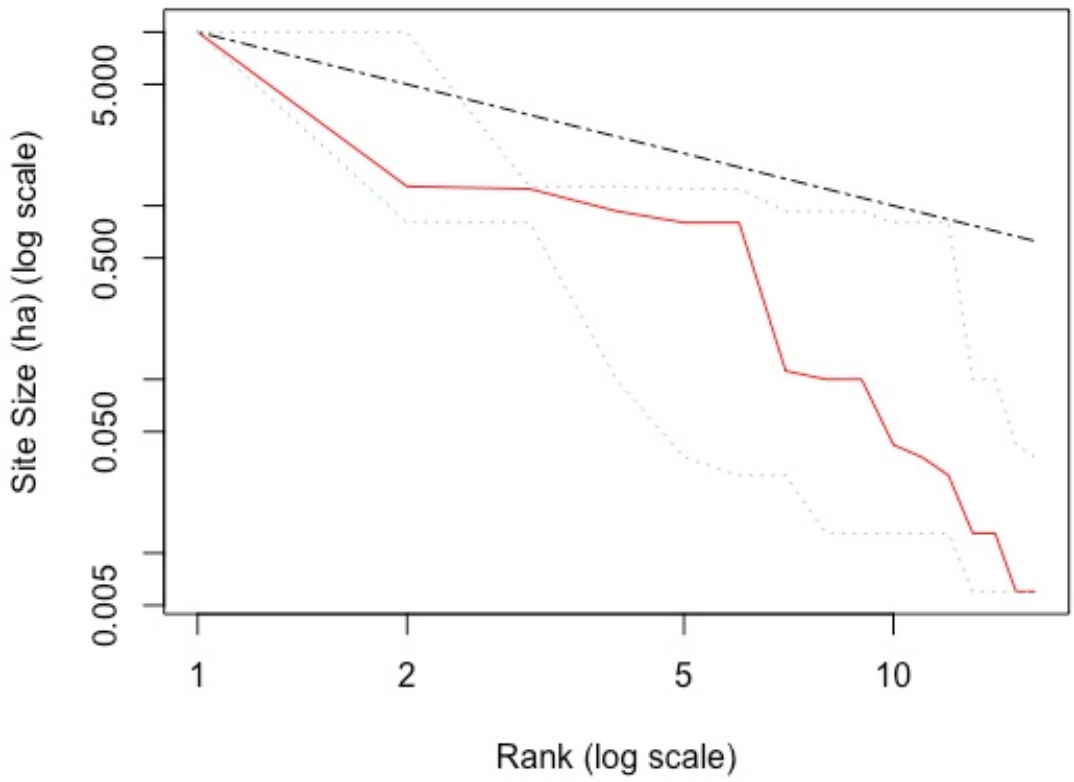


Figure 41 RSBOOT results from identified Post-Aksumite and Ethnographic sites.

Graph plotted with R Studio. Red line indicates plotted curve, black dashed line indicates Zipf's Rank-Size Rule, and grey dotted lines indicate confidence intervals to 90%.

The Pre-Aksumite period exhibits the Primate rank-size outcome while the Aksumite and Post-Aksumite/Ethnographic periods exhibit the Primo-Convex rank-size outcome from the RSBOOT analysis. The Primate curve indicates one large settlement dominating all others in the settlement system, or a simple economic and political development with a short history of urbanization (Berry and Garrison 1958, Savage 1997). However, this curve may reflect the sample size more than an accurate assessment of the region, as Johnson (1977) explains it may indicate the entire settlement system has not been identified in the sample. This is likely due to the low number (4) of Pre-Aksumite sites identified during survey. The Primo-Convex curve indicates a pooling of more than one settlement system (Johnson 1980, Savage 1997). This curve is interpreted by Falconer and Savage as the simultaneous operation of two distinct settlement systems in a single region or area (1995). This represents a centralized system (the Primate upper portion) superimposed on a more loosely integrated or central place distribution (convex lower curve) (Savage 1997, Falconer and Savage 1995). The two Primo-Convex periods vary slightly in the exact shape of curve,

as the number of sites in the Aksumite (24) are greater than the Post-Aksumite/Ethnographic (12). However, all three best match the Primate or Primo-convex curve, and do not reflect any of the other curves discussed by scholars (Convex, Double-Convex), and clearly do not conform to Zipf's (1949) Rank size Rule (Moore 1959, Berry and Garrison 1958, Smith 1975, Johnson 1997, Paynter 1983, Flaconer and Savage 1995, Savage 1997). Comparisons between the findings in this study area and other settlement patterns in the region will be discussed further in Chapter 5, along with a more in depth analysis of the implications of the Primate and Primo-Convex curves in terms of the development of political entities in the region from approximately BCE 700 onwards.

4.5. Artefact Analysis

Artefact analysis to determine the age of the materials collected during surface collection provides tangible information regarding the length of occupation in the area, and at each site. Ceramics are the most abundant and diagnostic artefact type found on the landscape. Chronologies developed by scholars such as Fattovich (e.g., 2012) and Mekonnen (2019) were utilized to determine site age. Studies undertaken by Dr. Habtamu Mekonnen Taddesse (2019) were used most as reference due to their focus on the region of Eastern Tigrai specifically, and his in-field presence during the study to analyze the artefacts. Lithic analysis was undertaken by Dr. Elizabeth Peterson, in addition to myself, in order to determine function and possible approximate age (Figure 42). Regional specialists including Dr. Alemseged Belados, Hewan Ayana, Getachew Almineh, and Yemane Meresa, provided additional insights into artefact function and age. Table 10 lists the age of sites located within survey transects, excluding findspots and rock art, while Table 11 presents more high resolution data regarding age of each site encountered.

Figure 42 Examples of flaked stone debitage collected during archaeological survey.

Table 10 All sites within study area and associated dates.

Site Number	*MSA/ LSA*	*Pre-Aksumite*	*Early Aksumite*	*Classical Aksumite*	*Middle Aksumite*	*Late Aksumite*	*Post-Aksumite*	*Ethno-graphic*
301-001								
301-002	X	X						
301-003	X	X						
301-004	X	X						
303-001		X	X	X	X	X	X	
306-001				X	X	X		
306-002				X	X	X		
307-001				X	X	X		
308-001					X			
311-001			X		X	X		
311-002	X					X		
321-001					X			
324-001		X	X		X		X	
328-001	X	X	X		X	X		
331-001					X	X		
332-001						X		
333-001								
338-001								X
338-002					X	X	X	
341-001	X				X	X		
343-001								
343-002					X			
344-001					X	X		
344-002								
344-003								
344-004								
354-001								
355-001			X	X	X	X		
357-001						X	X	
357-002					X	X		
357-003							X	X
363-001								
364-001								X
366-001				X				
374-001								X
374-002						X		
374-003				X	X	X		
375-001						X		
376-001								

Site Number	*MSA/ LSA*	*Pre-Aksumite*	*Early Aksumite*	*Classical Aksumite*	*Middle Aksumite*	*Late Aksumite*	*Post-Aksumite*	*Ethno-graphic*
377-001								
379-001								
380-001					X		X	
380-002					X			
381-001					X			
381-002								
385-001								
386-001					X			
387-001								
388-001	X				X	X	X	
392-001	X							
392-002								
392-003							X	

Plotting the data from Table 9, it is apparent that there is a small, but consistent number of archaeological sites from the MSA/LSA through to the Classical Aksumite Period, followed by a major increase in sites during the Middle Aksumite, continuation of the number of sites over the Late Aksumite, then a drop in numbers into the Post-Aksumite and Ethnographic Period (Figure 43). This trend appears to reflect a rise in population and material culture during the Middle and Late Aksumite in the region. Also, these data indicate a presence in the region since the MSA/LSA. Further discussion in regards to the causes of these trends, along with a more in-depth discussion regarding ceramic influences and the associated impact on the formation of the earliest political entities will follow in Chapter 5.

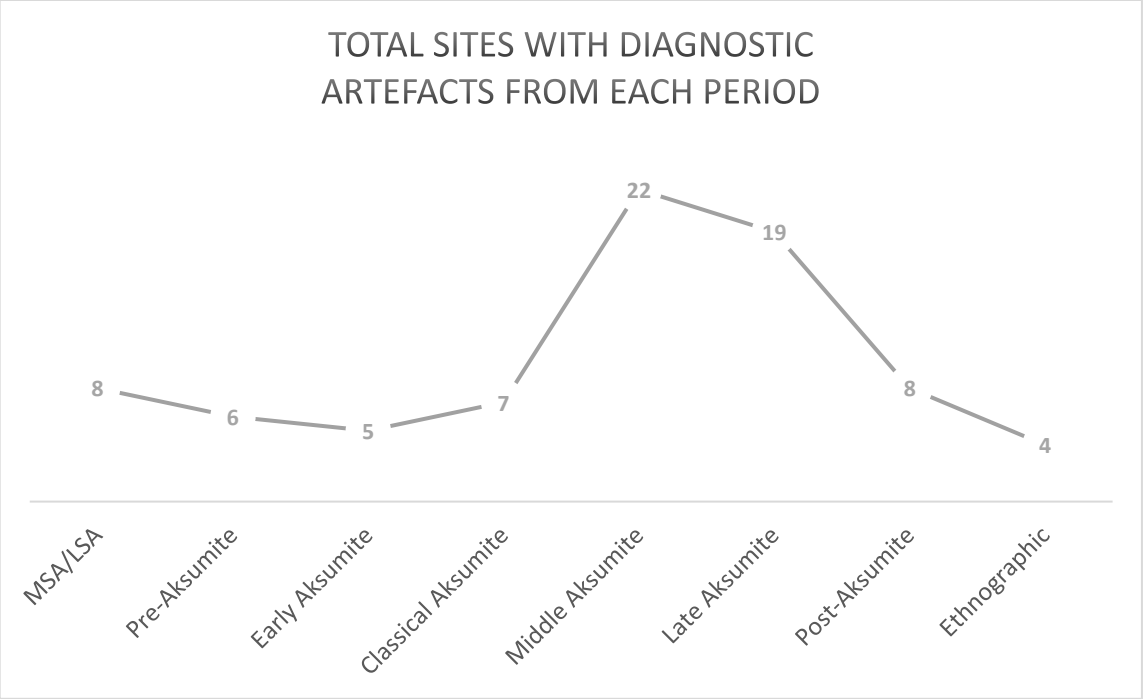


Figure 43 Distribution of all site types with diagnostic artifacts throughout time.

4.6. Chapter Summary

The findings from the archaeological survey and resulting analyses, conducted for this thesis, illuminate an interesting past within the study area, and generate questions for discussion regarding the development of past political entities within the region. The number of archaeological sites identified, along with projected density of archaeological sites within the study area is large, which shows a densely occupied area for millennia. Statistical Chi-Squared goodness-of-fit analysis indicate that there is no statistical basis to show that sites occurred more frequently on one type of landform given the total coverage of each type of landform during randomized systematic survey. However, the lack of archaeological sites identified on valley bottom landforms is interesting to note. Settlement patterning using RSBOOT software generated Primo-convex curves for each period showing a pooling of more than one settlement system throughout all three distinct chronological periods. This continuity of political organization is important to note, while the organization itself is another important topic which will be discussed in Chapter 5.

Artefact analysis provided precise dates for each archaeological site based on the developed lithic and ceramic seriations for the region. Chapter 5 will elaborate on the exact functions of certain artefact types, and how those traits reflect internal, and possible external, influences throughout time. Additionally, the juxtaposition of elite and common material culture will be discussed in Chapter 5 in order to better situate the study area within the region, and to explain political organization and the socioeconomic development from 700 BCE onwards. Chapter 5 will provide an in-depth discussion which will synthesize the results with background culture history, and relevant research, to explain the development of political entities in the study area.

Chapter 5. Discussion

5.1. Introduction

This chapter will discuss the results of the archaeological survey, chi-square analysis, and settlement patterning evaluation presented in Chapter 4. Previous work in the region will be compared with the results of this thesis, to understand socioeconomic and political themes that led to cultural developments from approximately 700 BCE onwards. Previous archaeological survey and statistical analysis from ETAP will be a primary focus, both due to its proximity to the study area, as well as similar methodology which will allow for valid numerical and statistical comparisons. A more detailed discussion of artefacts collected during archaeological survey will be presented in Section 5.4, with a focus on function, status, and external/internal influences and their implications on sociopolitical organization and development. Chapter 6 will serve as a conclusion for this thesis, highlighting important findings and providing a concise summary of the themes discussed throughout this chapter.

5.2. Site Attributes and Landforms in the Study Area

5.2.1. Site Size and Density in Eastern Tigrai

Archaeological sites identified during this study varied greatly in size, between 40 and 0.01 ha, which indicates a wide variety of functionality on the landscape. The average site size encountered (excluding findspots) was 2.05 ha. Comparably, the average site size (excluding findspots) from previous ETAP work in Gulo-Makeda (situated to the north) is 1.90 ha, (D'Andrea et al. 2008; Harrower and D'Andrea 2014). Based on these data, sites are slightly larger within this study area, compared to sites in previous ETAP study areas. This may be due to the nature of the landscape, because areas to the north studied by ETAP are significantly more rugged and sloped, resulting in smaller sites overall, due to smaller areas of preferred occupation (D'Andrea et al. 2008; Harrower and D'Andrea 2014; Wilson et al. 2014). However, the difference of 0.15 ha is relatively small, so both study areas contain sites of similar sizes on the landscape.

The density of archaeological sites located within this study area is 7.20 sites per square kilometer, compared to 5.88 in sites per square kilometer in neighboring ETAP

study areas (Harrower and D'Andrea 2014: 524). Extrapolating these data outward (7.20 x 100 sq. km), it suggests a total of approximately 720 archaeological sites per 100 sq. km within this study area, compared to 673 in the neighboring study areas. This is a 22.7% increase in sites within this study area, compared to previous study areas, demonstrating an increase in both archaeological sites, and likely, an increased density of population and settlement in this area. This site density can also be compared to Michels' survey of Western Tigrai (1979). The total survey area covered by Michels' was significantly larger (714 sq. km); however, the density of sites identified during this study, and previous ETAP studies (Harrower and D'Andrea 2014) are substantially greater than what Michaels encountered in Western Tigrai. This study further supports early research and reconnaissance by Anfray, which observed that Eastern Tigrai has more archaeological sites than Western Tigrai (1966, 1968, 1973). The density of archaeological sites indicates that the study area particularly, and Eastern Tigrai broadly, were not simply peripheral, sparsely inhabited, rural hinterland regions juxtaposed to a central Aksumite Kingdom based in Aksum or Western Tigrai (D. Phillipson 2012). The region, and study area, was densely occupied by past peoples for a sustained time, and this degree of occupation likely required a localized political oversight to manage the peoples and activities in the area.

5.2.2. Landform Selection for Settlement and Site Occupation

The results from the analysis of landforms encountered, and their relationship with archaeological sites, was detailed in Section 4.2 of Chapter 4. This study area was dominated by the sediment slope landform type, accounting for approximately 53% of all terrain surveyed. Based on the prevalence of this landform, it is not surprising that 44% of archaeological sites identified during the randomized systematic archaeological survey were also encountered on sediment slope. This landform type was also the most abundant for archaeological resources in previous ETAP studies to the north, and was statistically significant in terms of preference over other types of landforms encountered (D'Andrea et al. 2008; Harrower and D'Andrea 2014). All but one of the settlement sites identified during this thesis were also located on the settlement slope landforms. The one settlement site not located on a sediment slope was the purported medieval town of Agame, which contained no Pre-Aksumite or Aksumite period archaeological materials. This shows that although it was the most abundant landform type encountered, it was

also likely the preferred type of landscape for the construction of large settlement sites from the Pre- Aksumite through to the Post-Aksumite periods. This conforms with theories that prime pasture/agricultural lands existing in valley bottom, and level terrain were rarely exploited for settlement purposes. As settlements and dwellings were built on sloping terrain suitable for habitation, but not built on prime productive lands for grazing or agriculture (D'Andrea et al. 2008; Harrower and D'Andrea 2014). Another theory, however, is that floodplains were a preferred location for Pre-Aksumite sites, but not into the Aksumite period (Michels 2005).

In addition to agriculture, each ancient settlement site is in an area with beneficial view corridors of the surrounding terrain, and likely where trade routes are thought to have existed (Rauing 2004; Huntingford and Agatharchides 1980; Harrower and D'Andrea 2014). Reviewing least-cost modelling from ETAP's (D'Andrea et al. 2008; Harrower and D'Andrea 2014) previous work in the area it is apparent that sites in this study area are in beneficial positions to access and view these important routes. In addition, remaining relatively close to valley bottom settings would have provided ample water for the development of a large settlement (Harrower and D'Andrea 2014). Balancing hydrology, view corridors, and suitable land for settlement are not new criteria for settlement sites in the highland region (Curtis 2006, 2008; Harrower and D'Andrea 2014; Michels 2005; Sernicola 2015). The Agame site is the only settlement site located a distance from hydrology, but its location on an *amba* top with excellent view corridors may have served a more defensive purpose that other sites identified in the study. This may have been important during the Post-Aksumite and Medieval periods, which were characterized by a fractured socioeconomic and political landscape in the region (Anfray 1970; D. Phillipson 2019, 2012; Tekeste Negash 2006; Vantini 1975).

Although the Chi-Square goodness-of-fit test did not find a statistically significant factor to reject the null hypothesis that sites occur randomly based on the amount of each landform encountered there are some interesting trends from the resulting site distribution data. Evident in Table 11 is the complete lack of archaeological sites located within valley bottom landforms which accounted for 9.8% of all terrain covered in randomized systematic survey. Despite the incorporation of more data, in the form of sites that were not identified during randomized systematic survey, no archaeological sites are situated within the valley bottom setting. While this is statistically probable based on the amount of valley bottom covered in the survey area, it is unique given that

at least one kind of archaeological site was identified on all other landform types. Even loose scree slopes contained archaeological sites (likely the result of materials eroding from the original location above). This supports the theory that fertile valley bottom settings were rarely the place large settlements or dwellings were concentrated (Harrower and D'Andrea 2014; Philipson 2012; Michels 2005). Large, alluvial, erosional cuts through this fertile landform were present in most areas, along with modern excavations which gave survey teams the opportunity to inspect the possibility alluvial or colluvial processes had covered sites, but no sites were identified. In contrast, bedrock slopes (6.8 %) and scree slopes (3.4%) were encountered the least, but contained a total of 5 and 3 archaeological sites respectively.

Table 11 Relationship between sites and frequency of each landform surveyed.

LANDFORM	TOTAL NUMBER OF SITES	PERCENTAGE OF TOTAL SURVEY
SEDIMENT SLOPE	16	52.3
SEDIMENT PLATEAU	5	6.8
SCREE SLOPE	3	3.4
URBAN	6	12.0
BEDROCK SLOPE	7	15.4
VALLEY BOTTOM	0	9.8

5.2.3. Sample Size and Its Effect on Landform Analysis

Chi-Square goodness-of-fit analysis (Spaulding 1953) is an important tool to effectively reject or support, a hypothesis regarding two variables (Vanpool and Leonard 2011). In this case, the comparison of the expected (percentage of each landform encountered) and encountered (number of each site within a landform) were presented in Chapter 4. The Chi-Square statistic for this was 9.6767, with a DF=5 resulting in a P Value of 0.084932. Evaluated with a significance level of 0.05, this resulted in the assessment that there are not statistically significant grounds to reject the null hypothesis, that sites are distributed at random on the landscape and therefore are distributed equal to the amount of each landform encountered. The significance level of 0.05 means that the assessment can be made with 95% confidence. Many scholars argue this is the standard with which to test all relationships to make statistically valid statements regarding hypotheses (e.g., Spaulding 1953; Shennan 1988: 65-70).

However, testing the same data at significance level of 0.10, or 90% confidence, which is another range used by scholars for this kind of assessment, produces different results.

Conducting the same analysis with a significance level of 0.10, or 90% certainty, results in the same P Value of 0.084932. However, at this significance level, the result *is* significant, and in turn one can reject the null hypothesis, that sites are distributed randomly and proportionately according to the amount of each landform encountered. This is interesting, as a 90% confidence would appear to be enough to support the rejection of the null hypothesis; however, the number of sites identified (37) spread across the landform types (6) may produce this discrepancy between the 0.05 and 0.10 (90% and 95% respectively) significance levels. Researchers have theorized that a small sample size, and with most statistical formulae, can produce misleading results (e.g., Kocherlakota and Kocherlakota 1985; Baxter 2006). This is similar to the settlement pattern, for the Pre-Aksumite Period, presented in Chapter 4, and further discussed in Section 5.3, which is based on only four archaeological sites. Based on the small sample size only confidence intervals of a minimum of 0.05 (95% confidence) should be utilized in the discussion of landform and archaeological sites. Anything below this 0.05 significance level, combined with the relatively small sample size, exponentially skews the results, which presents problematic data which should not be used as a valid refute of the null hypothesis discussed earlier.

5.3. Utilizing Settlement Patterning to Explain Socio-Political Organization in the Study Area

Settlement patterning analysis conducted using RSBOOT software, and R in Section 4.3 of Chapter 4 indicated two types of patterns, Primate and Primo-Convex. When sites identified during random systematic survey and judgemental/opportunistic survey were combined, the Pre-Aksumite period yielded only four settlement sites and artefact scatters. This is significantly fewer sites that were encountered in previous ETAP study areas to the north. In those studies, 13 settlement sites and 7 artefact scatters were encountered in the 196 sq. km. area, which more than doubled the number of sites dating to that period. Based on the lack of Pre-Aksumite sites in this study, the settlement patterning analysis created a ‘Primate’ plot. A ‘Primate’ pattern usually indicates the presence of one very large site which dominates all others on the landscape. This in turn can be an indicator of certain socioeconomic conditions, such as

the availability of low-cost labor concentrated in the highest ranked place (Berry 1973, Savage 1997). Furthermore, this can reflect the presence of a high order sacred ceremonialist society, foreign diplomacy, macro-regional elite exchange, and war focusing in centers (Kowalewski 1982, Smith 1975). This could reflect what scholars postulate developed during the Pre-Aksumite in centers such as Yeha, in which a small group of Sabaean mercantile elites established settlements, and then disseminated control and socioeconomic influence outwards (Munro-Hay 1989; Fattovich et al. 2000). While these themes are enticing to explain the development of the first polities which developed in the region after the LSA, it is unlikely these reasons explain the settlement pattern observed in Chapter 4.

Instead, the small sample size (4) may be the reason that the 'primate' pattern was observed, as explained by Johnson (1977). The confidence interval of 90% set on the graph in Figure 44, further demonstrates this point by showing the graph could be either a Double-Convex or more extreme Primate pattern. Unfortunately for this reason, the settlement patterning of the Pre-Aksumite period cannot be used to discuss the development of the earliest polities in the region. With this conclusion, it is not valid to use the 'Primate' settlement pattern created from this study's results, to support the idea of the Pre-Aksumite periods being characterized by this theory of one major center dominating all others in the region. Furthermore, based on sample size, there is simply not enough data to support any hypotheses about social organization and political development from this period, solely from settlement patterning analysis within this study area.

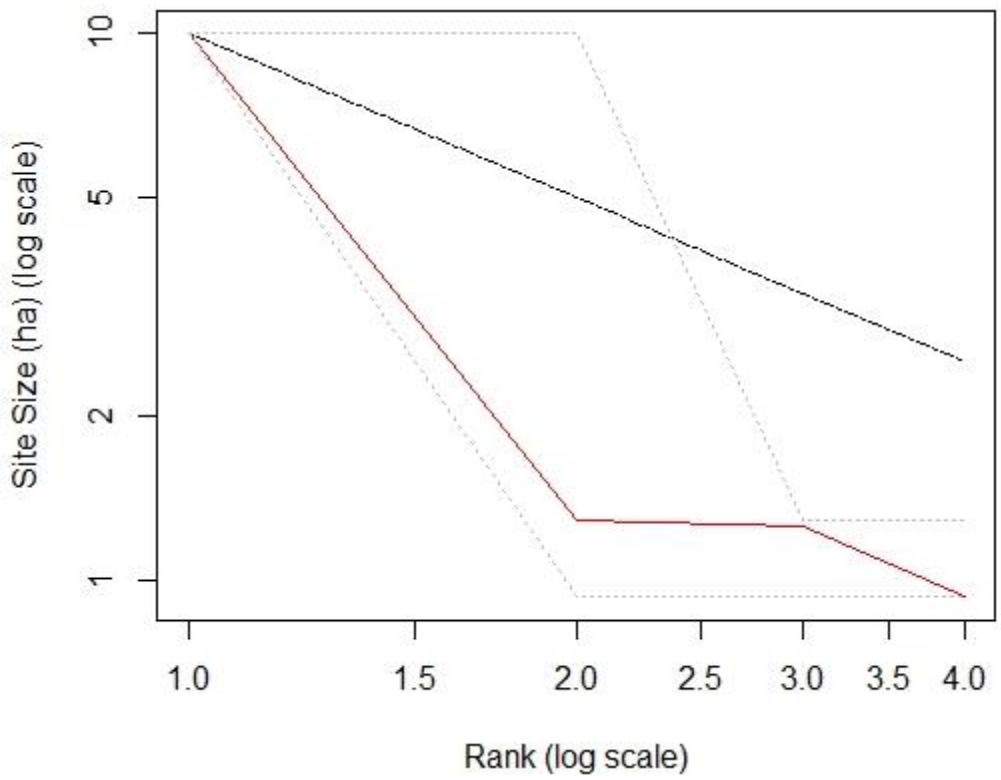


Figure 44 RSBOOT results from identified Pre-Aksumite sites.
Graph plotted with R Studio. Red line indicates plotted curve, black dashed line indicates Zipf's Rank-Size Rule, and grey dotted lines indicate confidence intervals to 90%.

While the Pre-Aksumite periods cannot provide insight into past political or social organization via settlement patterning analysis, the abundance of sites in the Aksumite and Post-Aksumite/Ethnographic periods does allow for more discussion of the relationship between site size, and how that might explain the development of these early polities. Both Aksumite and Post-Aksumite/Ethnographic periods exhibit Primo-Convex patterns which, as explained in Chapter 4, typically reflect a pooling of more than one settlement system (Johnson 1980, Savage 1997). Another explanation for this pattern is the simultaneous operation of two distinct settlement systems in a single region – the centralized system is represented by the Primate upper portion, and a more loosely integrated central place distribution is represented by the convex lower curve (Falconer and Savage 1995, Johnson 1980, Savage 1997). In this example, one could expect a major settlement in the north periphery, and possibly another large settlement in the south periphery of the study area (or in the east and west). These two settlement systems would be operating simultaneously in a relatively small area, and the results would reflect that the study area managed to capture both large regional centers, and

the peripheral area between the two. However, this is not present when the distribution of sites as shown in Figure 45 are examined.

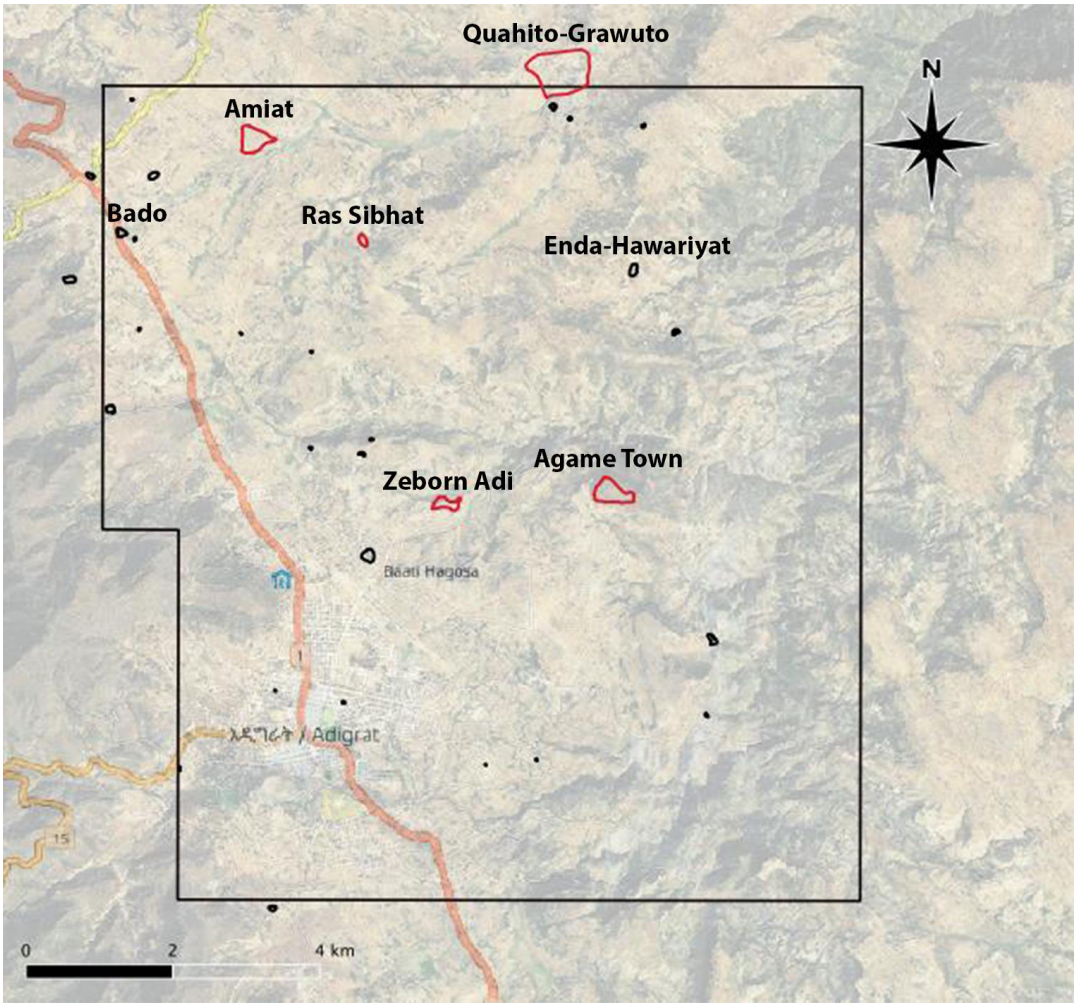


Figure 45 Settlement site and artefact scatter boundaries.
Settlement sites boundaries outlined in red and artefact scatter boundaries outlined in black.

At 40 ha in size, Quahito-Grawuto is the largest site of the study, by a large margin. If any site dominated the area it would have been Quahito-Grawuto. However, the next largest site in the study area, Amiat, which covers a surface area of 10 ha, is located only 3.5 km away. If the regional settlement system reflected two distinct settlement centers, with influence over the area, it would be very unlikely they are both situated so close together. Visually, the largest sites are constrained to the northern half of the study area, which also contradicts the idea that only two distinct settlement systems have been captured by this study area. Instead, it is possible that a heterarchical system is present, as discussed in Chapter 2. This suggests a pattern of

distributed political authority over the study area, rather than a ‘Primate’ pattern in which the single exceptionally large settlement site (Quahito-Grawuto) dominated all others. Additionally, there is no clear evidence of a site size hierarchy, in which sites are assorted into categories of different sizes or functions. These results appear to reflect ideas of atypical sociopolitical development in the region, similar to results from regions across sub-Saharan Africa (Crumley 1995; McIntosh 1999; Stahl 1999; Stevenson 1968). The chronology of the area, also supports this idea, combined with the attributes of the artefacts collected which will be discussed next in Sections 5.4 and 5.5.

5.4. Site Occupation and Occupation Trends within the Study Area

Site occupation can provide valuable information regarding settlement trends and socio-political occupation throughout time. The following subsections will explore occupation in the study area during the major phases and periods discussed in this thesis. Importance will be placed on the occupation at settlement sites and artefact scatters as they provided the most diagnostic artefacts from different periods. The size of these sites also indicate that they may have been used over time encompassing the different periods and phases. Surprisingly, some sites showed continuous occupation from the Pre-Aksumite through to the Post-Aksumite and Ethnographic periods, showing a continued presence in the area over millennia.

5.4.1. Site Occupation from the Pre-Aksumite to the Aksumite Period

Six archaeological sites within the study area were found to have indications of Pre-Aksumite settlement. The settlement sites of Amiat (303-001) and Ras Sibhat (324-001) contained diagnostic ceramics and lithics attributed to the Pre-Aksumite period, along with two other large artefact scatters – Cheate (341-001) and Enda-Hawariyat (328-001). The exact artefacts, attributes, and their implications for sociopolitical development will be discussed later in this chapter. What is important to note is that all Pre-Aksumite settlement sites and some artefact scatters have continuous occupation from the Pre-Aksumite through to the Aksumite period. This continuous occupation indicates a presence of large settlement sites in the study area prior to the Aksumite Empire rise to power. It is likely these settlement sites were exerting socioeconomic and political control within Eastern Tigrai due to site sizes and artefact variety. This trend is

similar to one identified in the previous ETAP study areas to the north, in which more Pre-Aksumite sites were identified (D'Andrea et al. 2008, Harrower and D'Andrea 2014). The continuous occupation from the Pre-Aksumite into the Aksumite period also indicated that Pre-Aksumite sites were not abandoned when the Aksumite Kingdom rose to power in the region. This is unlike some highland Pre-Aksumite sites in the Wukro region, or at Yeha, which exhibit a general decline in occupation and possible influence after the Pre-Aksumite period (Michels 2005; Fattovich 1990, 2004, 2012; Curtis 2004, 2005, 2008).

5.4.2. Site Occupation during the Aksumite Period

Most sites identified during this study date to the Aksumite Period, and due to the focus on this period in the region, a high-resolution chronology of ceramics and lithics allow for the subdivision into four widely agreed upon phases within the Aksumite Period. These phases are the Early Aksumite (50BCE-100CE), Classical Aksumite (100-400/450CE), Middle Aksumite (400/450-500CE), and Late Aksumite (550-700CE). As the names allude to, and as discussed in Chapter 2, the Early and Middle Aksumite phases coincide with the formation and initial growth of the Aksumite Kingdom, while the Classical Aksumite phase coincides with the pinnacle of power and size of the Aksumite Empire. The Late Aksumite phase, typically reflects the decline of the Aksumite Kingdom towards its eventual demise, in approximately 700 CE. The results from this study, combined with other results from studies in Eastern Tigrai do not fully conform to this narrative (e.g., D'Andrea et al. 2008; Harrower and D'Andrea 2014).

This study identified five archaeological sites which contain Early Aksumite artefacts, and seven archaeological sites which contain Classical Aksumite artefacts (Figure 46). This fits with the findings of previous ETAP studies in Eastern Tigrai, in so much as population and site occupation trends remain consistent throughout this time, and do not immediately spike upon the formation of the Aksumite Kingdom, as demonstrated in Aksum itself (D'Andrea et al. 2008). The number of sites at the beginning of the Aksumite Kingdom (5) in this study area is similar to the number of Pre-Aksumite sites in the region (6). Based on the number of sites this supports the idea that the study area saw relatively small changes in settlement during the early phases of the Aksumite Period, and elite groups in the area continued trade with places such as Aksum and Matara as they did in Pre-Aksumite times (D'Andrea et al. 2008; Harrower

and D'Andrea 2014; Mekonnen 2019). This contrasts with other areas which saw political and environmental conditions change rapidly, which lead to rapid site abandonment as well significant population movement during this time (Michels 2005, D'Andrea et al. 2008).

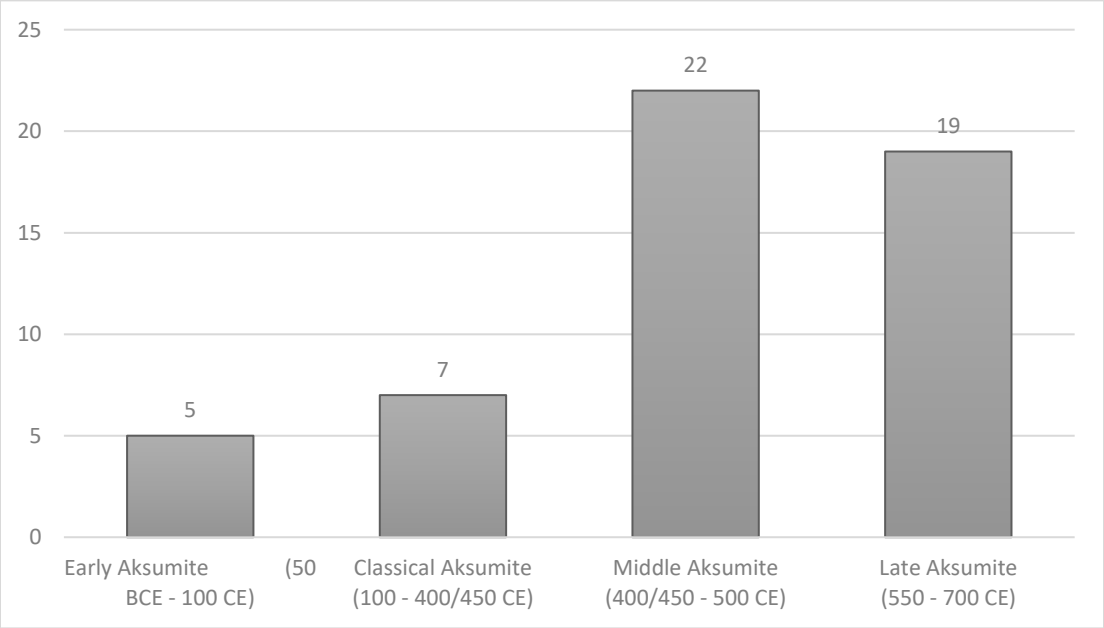


Figure 46 Number of archaeological sites per Aksumite phase, in the study area.

Between the Classical and Middle phases, the study area saw a marked increase in sites, from 7 to 22 (Figure 44). This tripling of archaeological sites happened at a time when the Aksumite Kingdom, in the Horn of Africa, rapidly grew across the region, and drastically increased regional and international trade (Phillison 2012; Munro-Hay 1991; Kobishchanov 1979). The placement of this study area on important trade routes, between Kohaito and Mekele, as well as its proximity to the border with the Afar region, as noted by several scholars, may have led to the increase in settlement and population as trade increased dramatically during Aksumite times (Anfray 1973; Fattovich 1990; Munro-Hay 1993; D'Andrea et al. 2008). The increased population, combined with the settlement patterning data, indicates that rather than a rural base purely contributing goods to Aksum in the west, this region contained unique settlement systems, with control over trade and agricultural production, each with its own set of elites in relative proximity. This is similar to findings from ETAP study areas further north, where elite settlement sites were located proximal to each other, and lack a clear hierarchy in site size (D'Andrea et al. 2008). Based on these findings, and the exponential increase in the

number of archaeological sites during the Middle Aksumite Phase, it is likely that the study area specifically, and Eastern Tigrai generally, saw increased wealth and power during the Middle Aksumite phase combined with population growth and site densification.

The transition from the Middle Aksumite to the Late Aksumite phase is interesting, as the declines noticed in other areas of the Northern Horn of Africa during the fall of the Aksumite Kingdom are not as well-defined in the study area (Phillipson 2012; Munro-Hay 1993). The number of archaeological sites dating to the Late Aksumite phase (550-700 CE) only fell by 3, from 22 sites in the Middle Aksumite to 19 during the Late Aksumite. This is remarkable, as it is still almost triple the number of sites during the Early and Classical Aksumite phases. This may indicate that Eastern Tigrai was insulated from the fall of Aksumite Kingdom, due to a level of geographical and economic autonomy from the central powers in Aksum (D'Andrea et al. 2008; Harrower and D'Andrea 2014; Mekonnen 2019; Phillipson 2012). However, it is still unknown exactly what these atypical settlement systems represented in Eastern Tigrai. Some have postulated that cities and towns in Eastern Tigrai served as administrative, trade, or agricultural centers (Anfray 1974; Munro-Hay 1991). However, the relative stability in terms of archaeological sites identified between these two phases, indicate stability in the study area, and echoes results from previous ETAP studies (D'Andrea et al. 2008; Harrower and D'Andrea 2014).

5.4.3. Site Occupation from the Aksumite Period to the Post-Aksumite and Ethnographic Periods

After the collapse of the Aksumite Kingdom in approximately 700 CE, the northern Horn of Africa transitioned into a fractured set of regional polities. The number of archaeological sites identified in this study area decreased dramatically from 19 Late Aksumite phase sites, to 8 Post-Aksumite sites. This indicates that the study area was subject to the same decline in population and economic control, after the dissolution of the Aksumite Kingdom (Phillipson 2012; Munro-Hay 1991; Fattovich 1990; Kobishchanov 1979). The number of archaeological sites, however, does not drop below the number of sites in the Pre-Aksumite or Early Aksumite, which indicates that the area was still occupied, and not completely abandoned during the Post-Aksumite period. The location of the area on important trade routes from the coast, the salt trail from the Afar,

and agriculturally productive lands made it valuable in the Post-Aksumite period, even if the overall decrease in population and trade affected growth in Eastern Tirgai (Harrower and D'Andrea 2014; D'Andrea et al. 2008; Phillipson 2012).

One of the more interesting settlement sites identified during survey was Agame Town (357-001) due to the age and location of the site. This settlement contained artefacts and structural remains from the Post-Aksumite and later Ethnographic periods. This is unlike any other settlement site in the study area because of the absence of occupations dating to the Pre-Aksumite and Aksumite periods. The location of the site on an amba top, with excellent views of the north-south trade routes through the study area (Figure 47) also differs from other settlement sites in all previous ETAP studies, which are almost exclusively located on sediment slopes (D'Andrea et al. 2008; Harrower and D'Andrea 2014). Agame Town is elevated well above the surrounding terrain, which provides both defensive advantages and view corridor benefits, for monitoring activities in the study area. This fits within the narrative that a more fractured political system was present during the Post-Aksumite and Ethnographic periods, and a settlement such as Agame, which is purported by oral accounts to be the capital of the region in the Ethnographic period, would have attempted to centralize political control over the immediate vicinity (Phillipson 2012, 2009; Finneran 2007). However, all other settlement sites within the study area contain artefacts from the Post-Aksumite and Ethnographic periods, which indicates that multiple settlements interacted in the study area, to enact a system of sociopolitical control in a politically fractured period.

Figure 47 View southwest from settlement site 357-001, Agame Town, towards trade routes, and modern city of Adigrat.

The number of sites dating to the Post-Aksumite and Ethnographic periods may be greater than what was identified during survey, however, the similarity between modern ceramics and those from the Ethnographic period make it difficult to succinctly differentiate between archaeological materials and modern refuse. Simple, coarse, black earthenware ceramics are commonly utilized by residents throughout the study area, and the location of this archaeological study near homes and farms make the ability to identify materials as archaeological difficult (e.g., Mekonnen 2019). However, there is a marked decrease in the number of archaeological sites from the Aksumite Period to the Post-Aksumite and Ethnographic period. Scholars agree that there has been relatively little study of the Post-Aksumite and Ethnographic/Medieval periods in the northern Horn, which makes discussion of the implications of these trends difficult (Finneran 2007; D. Phillipson 2012, 2009). A focus on monasteries and rock-hewn churches, with their importance both spiritually and socio-politically, have been discussed by some scholars, however the lack of any monasteries or rock-hewn churches in this study area

do not allow this study to contribute to that hypothesis (e.g., D. Phillipson 2009; Finneran 2007).

5.5. Material Culture Interpretations

5.5.1. Ceramic Assemblages from the Study Area

Ceramic artefacts provide the most secure, and easily observable, high resolution dates for sites within the study area (aside from the one radiocarbon date obtained from human remains discussed later in this section). As discussed in Chapter 2, much work has been undertaken in the region to develop ceramic typologies and chronologies, which integrate function and style with radiocarbon dates from excavations, primarily in the central and western parts of Tigrai (Fattovich 2009, 2012; Mekonnen 2019).

A globular jar (Figure 48-1) was identified at Cheate (341-001), which is typical of the Eastern Tigrai/Agame tradition from the Middle Aksumite phase (Mekonnen 2019, Figure 6.39; D'Andrea et al. 2008, Figure 9). Jars such as this one were identified in previous ETAP study areas to the north of this study area (D'Andrea et al. 2008, Figure 9) and during excavations at Mezber (D'Andrea and Welton in prep) and Ona Adi (Mekonnen 2019, Figure 6.37). The ceramic featured in Figure 48-2 was collected from the site of Ras Sibehat (324-001), and this vessel shape is characterized by a thick rim, with notches on the top of the lip, and usually decorated with wavy line incisions below the rim within its internal surface (Mekonnen pers com). This is the primary typical marker of the PA-A transition at Ona Adi (Mekonnen 2019, Table 8.9). This shape is also very common in Aksum and Yeha areas (e.g., Phillipson 2000, Figures 283 and 284). In Eastern Tigrai, this open bowl shape is almost always associated with the middle and end of the 1st millennium BCE (D'Andrea et al. 2008, Figure 8; Mekonnen 2019, Figure 8.5). However, in Central Tigrai, especially at Beta Semati (Harrower et al. 2019), this form is present in Early Aksumite contexts as well. The specimen in Figure 48-3 is from Cheate, and this form is a common shape in Western Tigrai (Aksum and Yeha areas) associated with Pre-Aksumite contexts (Mekonnen 2019, Figures 6.37 and 6.38). However, generally, this form is rarely found in Eastern Tigrai (D'Andrea et al. 2008) and is especially rare at ETAP excavations at Mezber (D'Andrea and Welton in prep) and Ona Adi (Mekonnen 2019). When this example was identified in Eastern Tigrai in

previous ETAP study areas, these ceramics were always connected to the Pre-Aksumite period (D'Andrea et al. 2008; Harrower and D'Andrea 2014; Mekonnen 2019).

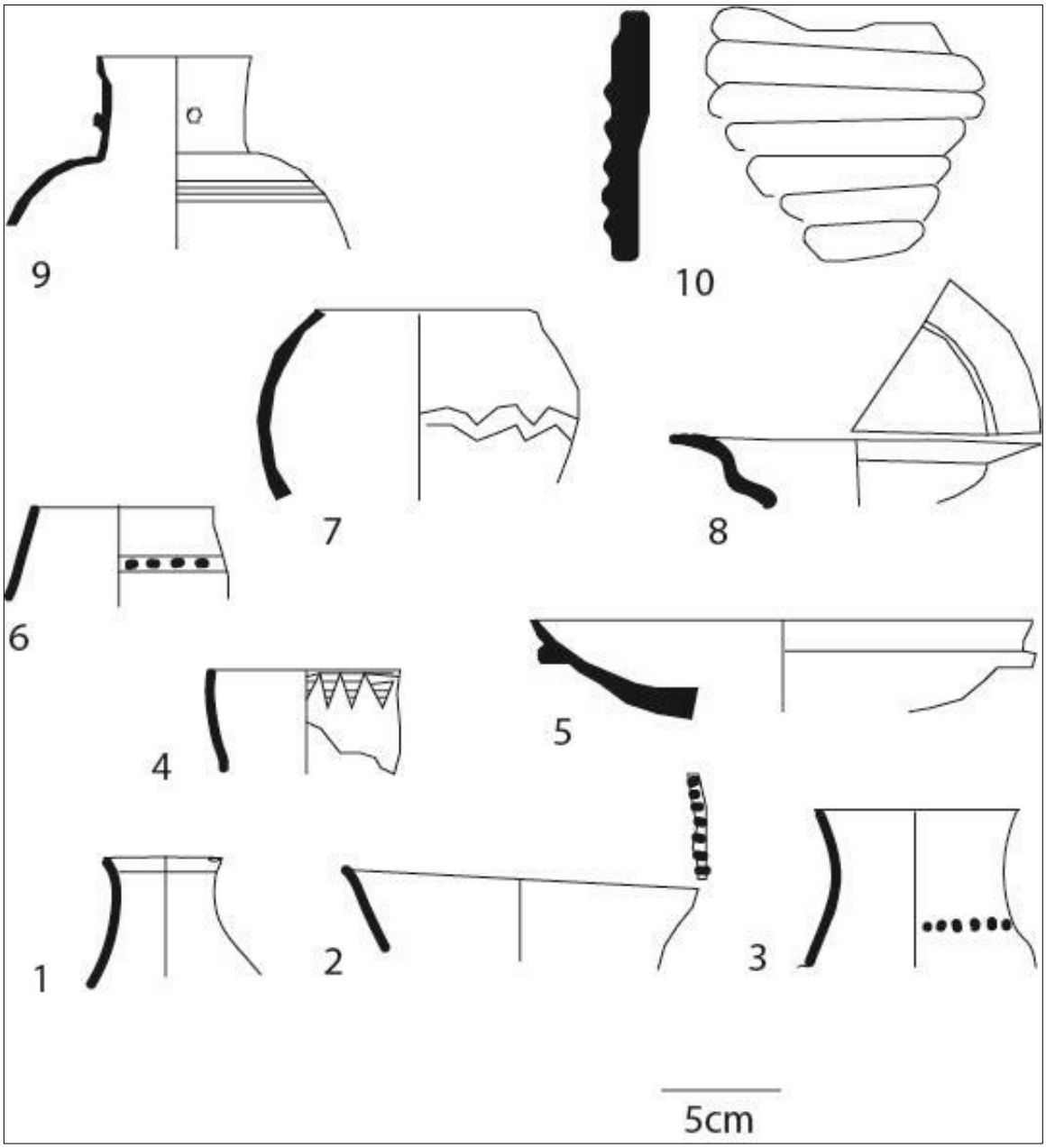


Figure 48 Ceramic artefacts identified within the study area during survey.
(1) Eastern Tigrai/Agame tradition Globular Jar; (2) Wavy-lined notched rim; (3) Pre-Aksumite ceramic; (4) Small Pre-Aksumite bowl; (5) Early-Aksumite bowl; (6) Middle-Aksumite ceramic; (7) Late-Aksumite ceramic; (8) Early-/Middle-Aksumite carinated bowl; (9) Late-Aksumite jar; and (10) Aksumite period imported amphora. Credit: Illustrations by Dr. Habtamu Mekonnen Taddesse.

Another Pre-Aksumite small bowl was collected from the site of Ras Sibehat (Figure 48-4). This example is a common Pre-Aksumite shape in many archaeological sites of northern Horn of Africa including Aksum, Yeha (e.g., Anfray 1966 Figure JE3608), Mezber (e.g., D'Andrea and Welton in prep), Matara (e.g., Anfray 1966 Figure 45), and Adi Akawih (e.g., Schmidt et al. 2008, Figure 6.52). Figure 48-5 shows an Early Aksumite bowl from the site of Amiat (303-001). This type of ceramic has also been identified from well-defined Early Aksumite contexts at Ona Adi (Mekonnen 2019, Figure 6.35 and Figure 6.35), Adi Ahoune (D'Andrea et al. 2008, Figure 6), Matara (Anfray 1966, Figure 44), and was similar styles were described in the area surrounding Aksum (Fattvoch 1990; Anfray 1968; Chittick 1974; Sernicola 2015). Figure 48-6 is a ceramic sherd recovered from surface collections of the exceptionally large settlement site of Quahito-Grawuto (306-001). It is a typical Middle Aksumite shape which has also been identified at Ona Adi (Mekonnen 2019, Figure 6.1.9). The specimen in Figure 48-7 was collected from Cheate (341-001). This example is a Late Aksumite shape and decorative style ubiquitous to many Late Aksumite Eastern Tigrai sites. In several instances this shape usually depicts cross motifs in its upper body (Mekonnen pers com). The ceramic featured as Figure 48-8 is a carinated bowl from the site of Amiat, typical of the Early and Middle Aksumite Period, which has been found in both Early/Middle Aksumite contexts at both Ona Adi (Mekonnen 2019, Figure 6.35; D'Andrea et al. 2008) and Sobea (Mekonnen pers comm.).

A Late Aksumite jar from Cheate (Figure 48-9) is a typical Late Aksumite shape found in both Eastern and Western Tigrai (Mekonnen 2019, Figure 6.3.8). Example 10 (Figure 48) is an amphora fragment from Amiat, which is a common imported ceramic vessel in both Eastern and Western Tigrai, usually identified in Early, Middle and Late Aksumite Phase archaeological sites (Mekonnen 2019, Figure 6.24; Anfray 1966 Figure JE3608; Wilding 1989; D. Phillipson 2000). The presence of this artefact indicates long distance trade networks in the area, and the presence of elite level goods as this is not a common utilitarian style of ceramic (Mekonnen 2019; D. Phillipson 2012).

This diverse range of archaeological materials indicates that the study area was home to a complex socio-political assemblage of settlements and archaeological sites. The combination of utilitarian and elite goods indicates that this area requires more study to better understand the more specific socio-poltical and economic conditions which would have characterized the area over the past three millennia. Additionally, the

presence of certain stylistic characteristics makes the region unique in comparison to other areas to the west in the Ethiopian Highlands (Mekonnen 2019, D'Andrea et al. 2008). The ubiquitous interior and exterior surface scraping techniques found on many ceramic examples indicate a connection to the Nile valley region, north of the study area, dating to as far back as the 6th millennium BCE (Mekonnen 2019; Fattovich 1990; D'Andrea et al. 2008). Local mica and quartz tempers, and high quality red clay was identified in many Classical and Middle Aksumite ceramic examples in this study, especially items which appear to be of a higher status (more carefully decorated and shaped), whereas this temper is mostly absent from ceramic examples in the Late Aksumite and Post-Aksumite/Ethnographic periods. These later examples identified throughout the study area are typically made of a simple, local, black-fired clay, with few examples using mica temper. This observation seems to indicate that during the height of socioeconomic wealth in the region (Classical and Middle Aksumite phases), higher quality ceramics were prepared which likely incorporated regional trade for raw materials (e.g., Mekonnen 2019; Manzo and Gaudiello in prep), whereas during the decline of the Aksumite period, and during the Post-Aksumite and Ethnographic periods, more focus was placed on easily available and functional temper (cf. Lyons 2014). Further, many of these later ceramic examples identified were in a much more fragmentary, and fragile state.

5.5.2. Lithic Assemblages in the Study Area

Lithic assemblages are far less studied in archaeological contexts across the northern Horn of Africa, compared to ceramic artefacts. This is likely due to the abundance of pottery across the landscape, readily visible differences across culture periods, and the relative abundance in archaeological contexts to create relatively high resolution chronologies within geographic regions (e.g., Brandt 1986, 1996; Brandt and Fattovich 1990, 1978, 1990; L. Phillipson 2000). While there is an abundance of lithic artefacts across the region, the subtle differences in lithic toolkits are less understood, and harder to succinctly ascribe to the tight chronological periods or phases discussed in this thesis. Brandt, Fattovich, and Peterson have conducted the most comprehensive lithic studies in Eastern Tigrai (e.g., Brandt 1996; Fattovich 1990; Peterson 2017; D'Andrea et al. 2008). In general, there is an abundance of lithic artefacts and specific toolkits which were used for processing-related tasks in the Pre-Aksumite and PA-A

periods; however, during Aksumite times (in particular near Aksum) there is a steady decline in the use of lithics for most tasks. This decline may be in part due to the explosion of international trade which brought alloys and metals which were utilized instead of chipped stone tools (Peterson 2017; Brandt 1996; Fattovich 1997; D. Phillipson 2009, 2012). This trend is also apparent within this study area, as earlier sites yielded much greater amounts of lithic artefacts, and more diversity of material type and suggested function.

An example of early lithics identified during this study is displayed in Figure 49-1. This is a chert flake, possibly pressure-flaked for further use, which was collected as a findspot, Finote Birehan (380-002). This type of flake is commonly found through Pre-Aksumite and Early Aksumite contexts in Eastern Tigrai (Peterson per comm. 2017). Another typical lithic artefact identified in Eastern Tigrai is the scraper, one of which was recovered at findspot Beati (354-001). The scraper is characterized by its bulky shape, and made from orange-brown chert, which are abundant in the area (Figure 49-2). This type of scraper has been identified in Middle Aksumite contexts from Ona Adi, and is frequently located on ground surfaces in both this study area, and in previous ETAP studies (Peterson 2017, Figure 4.8; D'Andrea et al. 2008, Figure 10). Chert is the most abundantly recognized material type in Eastern Tigrai, and appears in local geological formations, resulting in modern communities utilizing the tool to this day (Wilson et al. 2014; Peterson 2017; Brant and Weedman 1997).

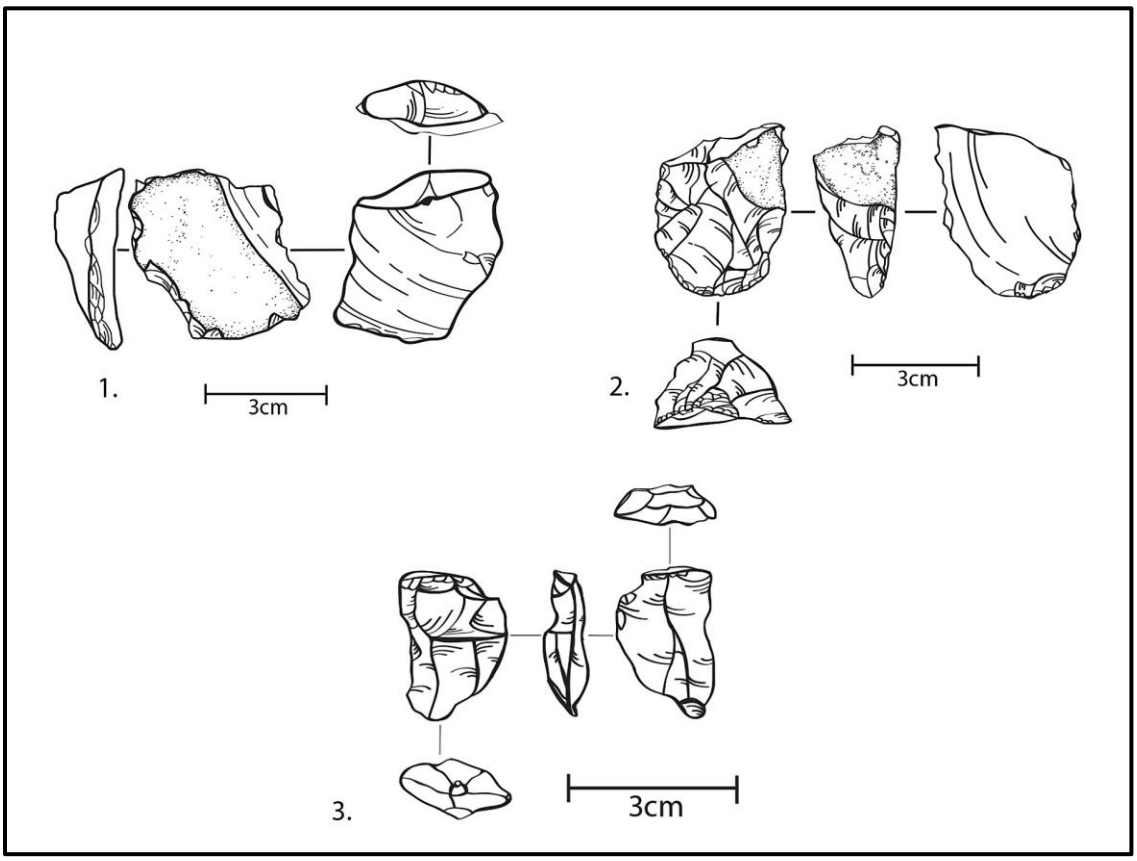


Figure 49 Lithic artefacts identified during survey, within the study area.
1) A chert flake from Finote Birehan (380-002; 2) A chert scraper from Beati (354-001); and 3) An obsidian bipolar core from Ras Sibhat (324-001). Credit: Illustrations by Dr. Elizabeth Peterson.

Another material type which appears in archaeological contexts is obsidian, which it is still valuable and highly sought after in modern local communities for its sharp flaked edges (Peterson 2017). Most obsidian identified during this study was in the form of micro-debitage, or tertiary flakes. This seems to indicate the repeated use, and/or rejuvenation of tools made of the valuable material, resulting in the presence of small, fragmentary pieces in the archaeological record. There are no volcanic sources in the immediate vicinity of the study area, so it is likely that obsidian was traded in from the nearest volcanic sources in the Danakil Depression to the east in the Afar, or from sources to the south, or in the Red Sea region (Wilson et al. 2014; Mohr 1966; D'Andrea 2005; D'Andrea et al. 2008; Peterson 2017). The inability to gather source samples for portable X-Ray Fluorescence (XRF) analysis (due to regional security issues) means there is no published geological sourcing to date. However, many researchers are currently working on this with hopes of exploring the obsidian trade in the northern Horn (Harrower pers com; Zarins 1990, 1996; D'Andrea et al. 2008; Wilson et al. 2017; Cann

1983). One of the more remarkable lithic artefacts identified during this study is a 5.5 cm obsidian blade, collected from the artefact scatter Enda-Haeariyat (328-001) (Figure 27). Another obsidian artefact identified was a small bipolar core, collected from the settlement site Ras Sibhat (324-001) (see Figure 49-3). Beyond the noted significance in terms of long distance obsidian trade, this bipolar core is similar to ones collected further west near Aksum, and identified during archaeological surveys near Yeha, which demonstrate connections to Western and Central Tigrai (e.g., Harrower et al. 2019; Fattovich 1987, 1997; D. Phillipson 2009).

Lithic toolkits, like ceramics, reflect local forms with stylistic characteristics linking the Later Stone Age to the Pre-Aksumite and Early Aksumite times (Fattovich 1978; 1990; 1997; 2004; Phillipson 1998; Curtis 2004; D. Phillipson 2000). This theme of continuity relating to much of the material culture, provides further validity to the idea of autochthonous sociopolitical development in Eastern Tigrai (Fattovich 2004; Schmidt and Curtis 2001; Curtis 2004; Schmidt et al. 2008; D'Andrea and Welton in prep). However, the presence of obsidian artefacts, and lithic stylistic influences from outside of Eastern Tigrai indicate that the region was receptive to influences from neighbors, and beyond. The presence of toolkits which share similarities with Western and Central Tigrai, as well as regional (and likely international) trade for raw materials undoubtedly would have incorporated other ideas to develop the material culture traditions present in Eastern Tigrai (Harrower et al. 2019; Peterson 2017; Fattovich 1997; D. Phillipson 2009).

5.6. Atypical and Heterarchical Political Development in Eastern Tigrai

The combination of settlement patterning, site density, site size, and artefact analysis all illuminate the unique socio-political organization within the study area, specifically, and Eastern Tigrai, broadly. As discussed in Chapter 2, the typical schemes for political development do not usually fit within what was encountered when studying the past in sub-Saharan Africa (McIntosh 2009; Southall 1970, 1996; Fortes and Evans-Pritchard 1940; Parkin 1990). Many models including terms such as 'chiefdom' and 'state' have loaded implications in terms of social organization and political authority, and have been applied, at times incorrectly, to African societies, past and present (McIntosh 2009; Southall 1970, 1996, 1988; Rowlands 1989). In addition to the issues with

implying North American, South American, and Polynesian-developed anthropological models for social organization and political development, some argue terms such as 'chief' and 'tribe' have been used for decades as a way to enforce centuries of colonialism and racism across sub-Saharan Africa (Southall 1970, 1966). Due to the complications in using these specific terms, the word polity is used herein to describe the socio-political organization within the study area.

The settlement patterning conducted for this study revealed a Primo-Convex pattern during the Aksumite and Post-Aksumite/Ethnographic periods, which indicates that sites did not conform to Zipf's (1949) rank-size rule of political hierarchy, but also did not conform with Primate models, which indicate one large regional center dominated all others (Johnson 1997; Savage 1977). This result fits with previous conclusions from ETAP surveys north of this study area; that there is a scatter of settlement sites, all interacting with each other, in a heterarchical or horizontal organization, rather than strictly hierarchical or vertical (D'Andrea et al. 2008; Harrower and D'Andrea 2014). Horizontal organization has been a recurring theme in the study of African archaeology, as more and more studies are carried out which focus on the time between the LSA and colonial expansion in sub-Saharan Africa (e.g., Fortes and Evans-Pritchard 1940; Brown 1951; Kaberry 1957; Ottenburg 1971). Scholars such as McIntosh (2009), have argued that Africa challenges deeply embedded evolutionary notions of complexity, as the political hierarchization, particularly the focus on centralized individual power and the economic strategies utilized by these individuals to maintain and expand power. In these examples, numerous instances exist of horizontal, or 'cross-cutting' associations exist, such as age sets, cult groups, title societies, and secret societies which are important in the creation of complex political structures beyond routine lineages (Brown 1951; Kaberry 1957).

This horizontal or heterarchical model present in Eastern Tigrai, especially in periods outside of definitive Aksumite control, could also be reflective of a more acephalous society (Fortes and Evans-Pritchard 1940; Horton 1971; McIntosh 2009). Horton (1971) indicates that in addition to lineage systems, other forms of more complex organizations exist: one is a dispersed territorially defined community consisting of a large confederacy of lineages of mixed origin built together by politically focused cult organizations; a second is a large compact village in which a substantial population aggregation is horizontally integrated by a variety of cults, associations and societies

(e.g., Forde 1964). Based on research in this study area, the latter of these ideas would seem to best fit the Aksumite and Post-Aksumite/Ethnographic periods, particularly the large compact villages, and horizontal integration of these within a relatively small study area, with similar patterns within the broader ETAP study area (D'Andrea et al. 2008; Harrower and D'Andrea 2014). However, more work is necessary in order to fully develop this hypothesis through excavations at these centers, to better understand and illuminate these societies, associates, and cults, especially in the Pre-Aksumite, PA-A transition period and Early Aksumite Phase. It is evident that Christianity is a socio-political focus in later periods, especially the Ethnographic period, with saints and holy places serving as regional centers (typically monasteries or churches) with special cult or politico-ritually specific functions (Phillipson 2012; 2009; Finneran 2007). However, the same themes or heterarchical organization are present throughout this time, rather than a strict hierarchy of control across the northern Horn of Africa, which radiates from a specific center in the region (D. Philipson 2009; Finneran 2007).

This mix of associations is evident in the archeological record, within one settlement in this study providing many different examples of diverse material culture, that indicate the interaction of the different socio-political layers described earlier. The largest settlement site, Quahito-Grawuto (306-001), contains a wide breadth of material culture. Due to its size of 40 ha, and the organization of specific artefact types across the site (work sectors), it certainly can be ascribed as a large compact village with substantial population aggregation (Horton 1971; Forde 1964; McIntosh 2009). One of the more remarkable artefacts identified during surface collections within the site, is a groundstone figurine, possible similar to the bull-head cult offering identified by Curtis and Schmidt (2008, Figure 12.5) in Ancient Ona sites on the Asmara Plateau (Figure 50). The presence of this object may indicate ties to the Asmara Plateau for trade, and the transfer of ideas, such as this votive offering. However, in the same site there are many examples of ceramics with clear ties to Christian influences from Aksum, including cross-motifs. This juxtaposition of two different associations within the same site indicate a horizontal integration and likely reflects similar integration within the larger study area. This further illuminates the atypical heterarchical organization at a smaller level within the study area at a site level.

Figure 50 Groundstone bull-head figurine, collected from site 306-001, Quahito-Grawuto.

Based on the evidence from archaeological survey, and subsequent data and artefact analysis it is apparent that the Aksumite and Post-Aksumite/Ethnographic period settlement system within the study area does not fit a typical hierarchical model of socio-political organization, and best fits within the idea of a horizontal or heterarchical organization. These data conform with previous ETAP conclusions from the study areas immediately north of this study (e.g., D'Andrea et al. 2008; Harrower and D'Andrea 2014), while also reflecting trends in settlement studies in regions across sub-Saharan Africa (McIntosh 2009). Hierarchical organization within Eastern Tigrai appears to contradict the idea of a capital-hinterland hierarchy between Aksumite's capital and Eastern Tigrai (D. Phillipson 2012; Finneran 2007). Based on this atypical socio-political development and the unique culture history influences in Eastern Tigrai some scholars have questioned if Eastern Tigrai was a simple regional state, or a conquered and tax paying hinterland to the capital in Aksum during the Aksumite period (e.g., Phillipson 2012; D'Andrea and Welton in prep; Mekonnen 2019; Harrower and D'Andrea 2014).

Based on the findings of this study, it is apparent that this remains a valid question, and the political structure of Eastern Tigrai within the Aksumite Kingdom should be open to discussion and further study.

5.7. Chapter Conclusion

Based on landscape analysis it appears that there is a preference for large settlement sites on sediment slopes, with sediment plateaus providing another desirable location. Valley bottoms are uniquely absent in terms of representation in the archaeological record, possibly due to their prime agricultural and grazing characteristics, or an effort to keep settlement away from these areas for another functional or socio-political purpose. The data from this study provides more insight into settlement patterning and archaeological site formation, and provide new lines of questioning, but does not contradict any findings from previous archaeological surveys in areas immediately to the north. Heterarchical socio-political organization within this study area also mirrors findings in the northern ETAP study areas, and areas across Sub-Saharan Africa (e.g., D'Andrea et al. 2008; McIntosh 2009). This heterarchical model of political development is important as it indicates the region of Eastern Tigrai had a more complex relationship with the ruling Aksumite Kingdom in the past two millennia, which may not conform with previous ideas of a hierarchical kingdom-hinterland relationship (D. Philipson 2012).

Chapter 6. Conclusion

6.1. Introduction

The development of the earliest political entities in the study area of this thesis, within Eastern Tigrai, between 100 BCE and 700 CE presented an atypical heterarchical organization throughout time. Data from the Pre-Aksumite period (700 BCE–100 BCE) is currently insufficient in the study area to draw conclusions about socio-political organization. Settlement patterning analysis conducted within the study area suggested a Primo-Convex relationship between archaeological sites, indicating the operation of two or more distinct settlement systems within the study area. It did not conform with Zipf's (1949) rank-size rule, or present a curve suggesting a typical hierarchical relationship between archaeological sites. Landform analysis concluded that there are no definitive statistical grounds for concluding that certain landforms were more likely to contain archaeological sites; however, in the study area, valley bottom settings were completely devoid of archaeological sites and the majority of sites that were identified, were located on sediment slopes. Diagnostic archaeological materials identified during this study suggest continuous occupation throughout the study area since the Pre-Aksumite period, and most settlement sites were inhabited for long periods, from the Pre-Aksumite through to the Post-Aksumite and Ethnographic periods. Material culture indicates influences from the Nile Valley, Sudanese lowlands, and limited influence from Western and Central Tigrai, while also exhibiting some indigenous characteristics unique to Eastern Tigrai.

6.2. Research Objectives

Within the framework of landscape archaeology, this thesis provides an important stage in the investigation of settlement patterning and archaeological site formation, highlighting the critical role it can play in examining the development of the earliest political entities in Sub-Saharan Africa. This study, with roots in archaeological survey, remote based GIS analysis, and settlement patterning, provides insights into further research relating to the formation of societies and political entities in the archeological record. The goal of this thesis was to integrate multiple lines of archaeological and statistical investigation in order to document and understand the formation of the earliest

polities in the northern Horn of Africa between 1000 BCE and 700CE. This goal was accomplished by addressing the three research objectives detailed below.

6.2.1. Objective 1: Understand the association of landforms and settlement sites in Eastern Tigrai.

After completing archaeological survey, and the chi-square goodness-of-fit analysis this study identified settlement sites, the landforms which they occupy, and tested the relationship to see if certain landforms are preferred for settlement. This investigation into the relationship between landforms and sites relied upon randomized-systematic archaeological survey of 50 1000 m x 100 m survey transects within the 100 sq km study area to identify archaeological sites, and document the percentage of each of the six landform categories (sediment slope, sediment plateau, scree slope, bedrock slope, valley bottom, and urban) encountered. Most settlement sites, and likewise archaeological sites in general, were identified on sediment slope landforms; however, this was also the most frequent type of landform encountered in the study area. Sediment plateaus also contained many archaeological sites, and one settlement site. Valley bottoms were completely devoid of archaeological sites, while still representing a meaningful portion of landscape covered with systematic and opportunistic archaeological survey.

The null hypothesis set in this study postulates that sites are randomly distributed across the landscape, and therefore should generally conform with the frequency of each landform encountered within the study area. Chi-square goodness-of-fit analysis did not provide a *p* value with enough significance to reject the null hypothesis; therefore, the theory that sites are distributed at random, generally conforming to the amount of each landform encountered is statistically valid. However, the complete lack of archaeological sites in valley bottom settings is worth noting. The total coverage of survey was satisfactory for making these statistical analyses, but more survey coverage within the same study area, or a comparison of these numbers to previous ETAP study areas, with the same methodology would inevitably strengthen the statistical validity of these hypotheses, and could lead to new conclusions.

6.2.2. Objective 2: Assess regional continuity of occupation from the Later Stone Age (LSA) and Pre-Aksumite periods through to the Classic Aksumite, and Post-Aksumite times.

After analysing archeological survey surface collections undertaken at identified sites, and a review of the literature of diagnostic artefacts in the northern Horn of Africa, these sites were assigned established time periods discussed in Chapter 2. Chronological provenience for each period, and subsequent phase where applicable, allowed for a high-resolution representation of changes in occupation and density both within sites, and within the study area generally. The study area has limited archaeological remains from the Middle and Later Stone Ages, but a definitive occupation in the region starting in the Pre-Aksumite period. The study area shows stable, continuous occupation through the Pre-Aksumite period, PA-A transition, and Early Aksumite phase. The Middle Aksumite phase exhibits a significant increase in the number of archaeological sites, effectively tripling the number in a short time. Near the decline of the Aksumite Kingdom there is a decrease in sites back to the number present in the Pre-Aksumite period.

The Late Aksumite phase exhibits a relatively large number of archeological sites, and the continued number of sites in the Post-Aksumite remains much greater than the number of sites compared to the Pre-Aksumite period, PA-A, and Early Aksumite phase. Settlement sites within the study area demonstrate an occupation history which is remarkably continuous, with many sites showing occupation from the Pre-Aksumite phase, through to the Post-Aksumite phase with diagnostic artefacts present from each adjoining phase or period. This longevity of occupation in the region demonstrates a continued presence of peoples in the study, and although population density in each period fluctuates, the area remained a relatively densely-occupied region over the past two millennia. This occupation throughout time shows that the area may have been less impacted by regional fluctuations, and socio-economic changes emanating from the capital of Aksum, and the port city of Adulis.

6.2.3. Objective 3: Characterize and quantify settlement patterning in the study area using rank-size analysis.

After utilizing settlement patterning rank-size analysis software, the relationships between site size within each time-period, and across all time periods was examined.

RSBOOT software developed by Drennan at the University of Pittsburgh (2019) was used to process the raw survey data. The results were plotted using R Studio software. The plot for the Pre-Aksumite and PA-A transition periods show a Primate curve, which typically would be indicative of one very large settlement that dominates all others in the region. However, further analysis indicated that this plot can be the product of a very small sample size, rather than a reflection of the type of settlement system present. The small sample size of only four Pre-Aksumite/ PA-A transition sites may be the cause of this plot, rather than it representing an accurate reflection of the settlement system present in this area.

The Aksumite period and Post-Aksumite/Ethnographic period presented Primo-Convex curves, which indicate the capture of two distinct settlement systems within the study area. However, the location of most large settlement sites in proximity to each other in the northern sectors of the study area, combined with a lack of large settlements in geographically opposite sectors, indicate that this is unlikely the case. The most likely interpretation is that there is an atypical heterarchical combination of multiple organizational systems within the study area, which has resulted in the observed settlement patterns. This heterarchical or horizontal organization of multiple socio-economic and political groups is representative of many regions across Sub-Saharan Africa (McIntosh 2009). This heterarchy is also similar to the results of settlement patterns observed by previous ETAP studies in the areas directly north of this study area (e.g., Harrower and D'Andrea 2014; D'Andrea et al. 2008). The results of this patterning can be applied to other areas both regionally, and abroad, in order to explore the development of political entities, and changes in archaeological site organization over time.

6.3. Eastern Tigrai: More than the Aksumite Kingdom's Hinterlands

Previous studies in the northern Horn of Africa have primarily focused on archaeological sites near Aksum, and secondarily on limited monumental architecture in sites across highland areas (D. Phillipson 2012; Finneran 2007). Based on the intensive study of monumental architecture and elite archaeological sites in the region, an incomplete picture about the settlement history has emerged. The idea of an Ethio-Sabaean polity was furthered by the intensive study of limited Pre-Aksumite elite sites at

centres such as Yeha (Phillipson 2012; Finneran 2007). This led to conclusions regarding the roots of political entities, and social development which attribute these origins to South Arabian, immigrant, mercantile, elites occupying the region (Bent 1893; Glaser 1895; Conti Rossini 1928; Sergew Hable Selassie 1972; Ullendorff 1973; Japp et al. 2011; Gerlach 2012, 2015). With further investigations, a more complex picture has emerged as a result of studies conducted in the Eritrean highlands, Western and Eastern Tigrai (e.g., Curtis 2008; D'Andrea et al. 2008; Schmidt 2009; Harrower et al. 2019). Modern research has demonstrated that complex socio-economic, and political systems were present in the Southern Red Sea area, with influences from as far north as the Nile Valley in Egypt, the Sudanese Lowlands in addition to an abundance of indigenous developments unique to each part of the Ethiopian Highlands (D'Andrea et al. 2008; Harrower and D'Andrea 2014; D'Andrea and Welton in prep; DiBlasi 2005; Curtis 2008; Schmidt 2009).

Research in Eastern Tigrai has revealed distinct traits present in the archaeological record of the area, compared to the rest of the Horn (e.g., D'Andrea et al. 2008). Artefacts identified from surface collections, along with excavations at the sites of Mezber and Ona Adi, have indicated that Eastern Tigrai contains unique ancient cultural elements (i.e., the Eastern Tigrai/ Agame Ceramic Tradition) and that the Pre-Aksumite period may begin much earlier than expected (Mekonnen 2019; Peterson 2017; D'Andrea and Welton in prep; D'Andrea et al. 2008). This builds upon research by scholars in the northern Horn, which indicates the region was not as culturally homogenous as expected, prior to the Aksumite Kingdom, during its reign of economic dominance in the region, and after its collapse (e.g., Curtis 2008; Scmidt 2009; Harrower et al. 2019).

Understanding the discrepancies in cultural homogeneity within the timeframes mentioned earlier is a relatively recent theme in northern Ethiopian archaeological research (D. Phillipson 2012; Finneran 2007). In addition to cultural materials, the results of this thesis and other research in Eastern Tigrai demonstrate that this is one of the most densely occupied areas in the northern Horn of Africa (e.g., D'Andrea et al. 2008; Harrower and D'Andrea 2014; Michels 2005). The density and continuity of occupation in Eastern Tigrai generates questions about the complex economic, social and political relationship with the Aksumite Kingdom, and its international trade partners (D'Andrea et al. 2008; D. Phillipson 2012). Settlement Patterning indicates that a heterarchical system

of socio-political organization is present in this study area during the Aksumite and Post-Aksumite/Ethnographic periods, and similar organization is present in previous ETAP studies, contrasting typical ideas of hierarchical political organization (e.g., D'Andrea et al. 2008; Harrower and D'Andrea 2014). The exact socio-political and economic systems present in Eastern Tigrai, and specifically the study area is still not known; however, it is evident that more research is needed within Eastern Tigrai and the Northern Horn of Africa, generally, to understand the trajectories of these early polities.

6.4. Research Potential

Due to the time constraints of this research, combined with the difficulty of access in many parts of the study area, this thesis provides a focussed examination of the landscape and relationship between identified archeological sites in Eastern Tigrai, Ethiopia. To understand the relationship between archaeological sites, and the implications these sites have on the understanding of socio-political development over the past three millennia, much more systematic archaeological survey is required in the region. Eastern Tirgai, as with much of the northern Horn of Africa, has seen limited systematic archaeological survey projects over the past century. To this day, many surveys are opportunistic or reconnaissance in nature; based on previously held assumptions about the landscape and where sites should be located. More intensive work is required for all landscape strata, not merely areas researchers have received information about, or those to which they have easy access, which can create bias in the understanding of where sites are on the landscape. While most survey coverage within this current study would help create higher resolution data within the study area, the vast areas of Eastern Tigrai that have never been systematically surveyed would be better suited to exploration (systematic archaeological survey), and comparison to areas which have already been studied.

Archeological excavation, however, could be focussed at some of the sites identified during this survey to better understand the socio-political and economic conditions in Eastern Tigrai. In particular, the settlement sites of Quahito-Grawuto (306-001) and Amiat (303-001) contain a wide array of archaeological materials from different time periods, and may help to better the understanding the transition between different periods and phases. The settlement site of Agame Town, with its relative abundance of standing structures from the Post-Aksumite and Ethnographic period, could provide

useful in further exploration in understanding the sparsely known socio-political and economic characteristics of the Post-Aksumite/Ethnographic/Medieval historic periods in Eastern Tigrai. The artefact scatter of Enda-Hawariyat (328-001) is unique as it contains Later Stone Age artefacts along with Pre-Aksumite period and Aksumite period artefacts. While this site is not a settlement, it may be suitable for excavation in order to better understand the relationship between the transitions from LSA to Pre-Aksumite, and then Pre-Aksumite to Aksumite periods.

Some methodological variations could also be beneficial in the identification of archaeological sites in Eastern Tigrai. Shovel testing in certain areas could be advantageous to understanding the impacts of geological events and erosion over time, and to investigate whether surface scatters of artefacts reflect subsurface conditions. Soil probing or augering within fertile valley bottom settings could help identify erosional and geological processes, while also prospecting for cultural sediments in order to ascertain if buried sites are present. Unfortunately, rocky soils and current land-use practices make these invasive methods of investigation difficult, if not impossible, in some areas. However, further non-invasive research and archaeological survey is needed to better understand one of the least known, major, economically powerful regions of the ancient world. As more research is being conducted within sub-Saharan Africa, including the Horn, one can better understand the atypical political trajectories which characterized these polities, and how they influenced the rise and fall of ancient civilizations.

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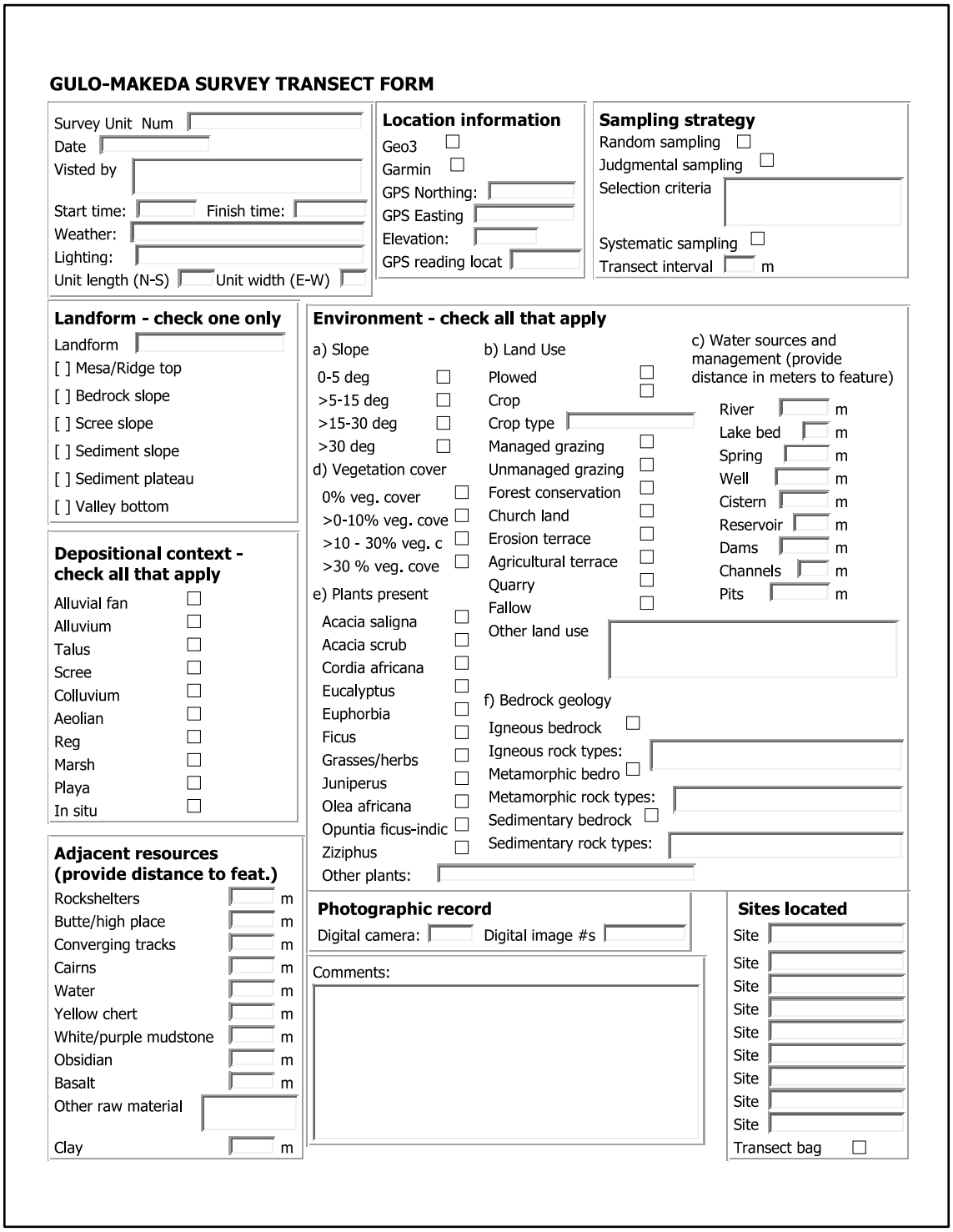
Appendix A. Landform Recording Forms



GULO-MAKEDA SURVEY TRANSECT FORM

Survey Unit Num
Date
Visted by
Start time: Finish time:
Weather:
Lighting:
Unit length (N-S) Unit width (E-W)

Location information
Geo3 ☐
Garmin ☐
GPS Northing:
GPS Easting
Elevation:
GPS reading locat

Sampling strategy
Random sampling ☐
Judgmental sampling ☐
Selection criteria
Systematic sampling ☐
Transect interval m

Landform - check one only
Landform
[ ] Mesa/Ridge top
[ ] Bedrock slope
[ ] Scree slope
[ ] Sediment slope
[ ] Sediment plateau
[ ] Valley bottom

Depositional context - check all that apply
Alluvial fan ☐
Alluvium ☐
Talus ☐
Scree ☐
Colluvium ☐
Aeolian ☐
Reg ☐
Marsh ☐
Playa ☐
In situ ☐

Adjacent resources (provide distance to feat.)
Rockshelters m
Butte/high place m
Converging tracks m
Cairns m
Water m
Yellow chert m
White/purple mudstone m
Obsidian m
Basalt m
Other raw material
Clay m

Environment - check all that apply

a) Slope
0-5 deg ☐
>5-15 deg ☐
>15-30 deg ☐
>30 deg ☐

d) Vegetation cover
0% veg. cover ☐
>0-10% veg. cove ☐
>10 - 30% veg. c ☐
>30 % veg. cove ☐

e) Plants present
Acacia saligna ☐
Acacia scrub ☐
Cordia africana ☐
Eucalyptus ☐
Euphorbia ☐
Ficus ☐
Grasses/herbs ☐
Juniperus ☐
Olea africana ☐
Opuntia ficus-indic ☐
Ziziphus ☐
Other plants:

b) Land Use
Plowed ☐
Crop ☐
Crop type
Managed grazing ☐
Unmanaged grazing ☐
Forest conservation ☐
Church land ☐
Erosion terrace ☐
Agricultural terrace ☐
Quarry ☐
Fallow ☐
Other land use

c) Water sources and management (provide distance in meters to feature)
River m
Lake bed m
Spring m
Well m
Cistern m
Reservoir m
Dams m
Channels m
Pits m

f) Bedrock geology
Igneous bedrock ☐
Igneous rock types:
Metamorphic bedro ☐
Metamorphic rock types:
Sedimentary bedrock ☐
Sedimentary rock types:

Photographic record
Digital camera: Digital image #s

Comments:

Sites located
Site
Site
Site
Site
Site
Site
Site
Site
Site
Transect bag ☐

Appendix B. Site Recording Forms

Gulo-Makeda Site Record Form

Site Code: Site name: Dat Tabia Survey unit no.:

Site length m Site width m Site size: ha Elevation Slope direction Slope grade:

Estimated age: Recorders:

Camera Digital Images GPS GPS loc'n GPS N GPS E

Lithics ☐ Ceramics ☐ Bone ☐ Metal/MW debris ☐ Other Collections made ☐

Land Use

Plowed ☐	Managed grazing ☐	Church land ☐	Erosional terrace ☐	Fallow ☐	
Crop ☐	Unmanaged grazing ☐	Residential ☐	Agricultural terrace ☐		
Crop type	Forest conservation ☐	Quarry ☐	Other land use		

Plants

Acacia saligna ☐	Eucalyptus ☐	Grasses/herbs ☐	Opuntia ficus-indica ☐	
Acacia scrub ☐	Euphorbia ☐	Juniperus ☐	Ziziphus ☐	
Cordia africana ☐	Ficus ☐	Olea africana ☐	Other plants:	

Vertisol ☐ Cambisol ☐ Andisol ☐

Artefact Collection Units (sketch location overleaf)

	Dimensions	Camera	Image numbers	SW corner GPS N	SW corner GPS E	Comments
Collection Unit A						
Collection Unit B						
Collection Unit C						
Collection Unit D						
Collection Unit E						

Other Artefact collections - describe location and nature of collection for each bag collected

Collection 1	
Collection 2	
Collection 3	
Collection 4	
Collection 5	

Monuments and standing buildings

	Number	Camera	Image numbers	Comments
Walls				
Pillars				
Column bases				
'Thrones'				
Statue bases				
Foundations				
Fruit presses				
Isolated blocks				
Misc. rock-cut features				

Informant description (Oral history, place names, special agricultural products, local crafts, market tow

General description and comments Site typ