The Role of Obsidian in the Afro-Arabian Interchange Circuit in the First Millennium BC in Ethiopia and Yemen.

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Abstract

This thesis examines the impact of obsidian on the first millennium BC Pre-Aksumite culture of Ethiopian Tigray. Archaeological evidence indicates that the increasing exchange of obsidian from Ethiopia to South Arabia was a contributory factor in the development of social complexity in Tigray ca 800 BC. The exogenous influence of South Arabian material culture significantly shaped the Pre-Aksumite character during the first and second millennium BC. The exchange process indicates that there was a movement of people undertaking the challenging journey between the Ethiopian Tigray highlands and the Yemen Tihamah.

The focus of the thesis is the Tigray highlands of Ethiopia, specifically the first millennium BC site of Yeha, and the Yemen Tihamah site of Al Midaman. Midway between these sites is the Nabro volcano, the source of obsidian and a regional economic driver ca. 800 BC. This research is a synthesis of published and unpublished data from archaeological sites in Ethiopia and Yemen. The research uses Remote sensing to demonstrate that the routeways established by the interconnectivity of the obsidian trade, as early as 5000 BC, have remained in use, and that many of the modern roads in the region are now still using the same routeways. Remote sensing indicates that the topography of the region is such that, in most cases, there is little choice of where a journey can be made.

The research examined the data to consider the impact of the obsidian trade on the social complexity of Tigray and its influence on Yemen Tihamah. The presence, and sometimes absence, of obsidian, indicates nature the relationship taking place in the region. It also highlights anomalies in the Pre-Aksumite narrative and how these may contribute to future research in both countries.

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Acknowledgements

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Huge thanks especially to my supervisor Dr Daryl Stump who saw the project through three years of twists and turns, a pandemic, and a civil war in the Ethiopian Tigray area, which was an extreme curveball and not something a supervisor usually deals with in the course of a student's PhD dissertation. When it was apparent that I would not be able to undertake the Ethiopian fieldwork as planned, he stood by my decision to take a significant new route through the landscape, and helped it along to its conclusion.

Thanks to my Thesis Advisory Panel (TAP) in the Department of Archaeology - Dr Stephanie Wynne-Jones, Dr Louise Cook, and D Daryl Stump - for their positive support and suggestions, and for keeping things on the straight and narrow (ish). The pandemic and Ethiopian civil war necessitated a significant left-turn fifteen months into the project, but my TAP panel supported that decision even when it was not entirely clear to them which direction I was going in.

Huge thanks are due to Carl Phillips for reading chapter three and for his invaluable comments, corrections, suggestions, and general feedback regarding Yemen. Carl has also allowed me to use some of his photos and images here, thanks Carl. I had already arrived in Yemen in the late 1999 when Carl invited me to join his excavation at Al-Hamid, without which Yemen would not be part of this PhD. A significant portion of my fieldwork expenses in Yemen then were covered by the Seven Pillars of Wisdom Trust (London), for which I am grateful.

Thanks to Dr Cathy D'Andrea, Simon Fraser University, Vancouver BC, for inviting me to join her in Ethiopia at her site, Ona Adi, Tigray, in 2019, which, considering the later 2020 conflict, made a significant difference to my knowledge and experience of the Tigray highlands. Cathy also provided me with access to the unpublished fieldwork reports of ETAP – the Eastern Tigrai Archaeological Project - directed by her and written for the Ethiopian Authority of Research Conservation and Culture (ARCCH).

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Dr Clive Oppenheimer, at the Department of Geography, University of Cambridge, kindly supplied me with a selection of his images of Nabro volcano and gave me permission to use them here, primarily in chapter four.

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Thanks also to Dr. Helina Woldekiros for her permission to use images of her salt trail research in the Danakil Depression, Eritrea.

Impact of COVID-19 and Ethiopian military conflict on the research

The initial proposal for this PhD research was based on an archaeological survey of the Kerseber valley, in the Ethiopian Tigray highlands. The area had been selected based on a suggestion by Dr Catherine D’Andrea, who I had invited me to join the ETAP fieldwork project in May 2019. Dr Daryl Stump and I visited the Kerseber valley during our visit to Tigray and decided it was a suitable landscape in which to carry out this PhD research. Following the COVID-19 pandemic in March 2020, initially perceived to be a short-lived event that would be resolved within the year, it was proposed that this fieldwork could be undertaken in the spring of 2021. In November 2020 a military conflict began in Tigray which impacted northern Ethiopia, and from which it has barely recovered. This precluded any possibility of fieldwork taking place. Following a discussion with my supervisor, Dr Daryl Stump, in December 2020, I took the decision to change the direction of this research, due to the impossibility of being able to undertake the fieldwork within the timeframe available for this PhD. Since then, whilst peace talks are being conducted, low level atrocities still continue, but phone lines, internet, and some infrastructure, are gradually being reinstated. Whilst a number of alternative options were discussed for this research the best option appeared to be to maximise the work already begun. This meant developing the PhD into a desk-based synthesis investigating what is already known of the Pre-Aksumite in Ethiopian Tigray and how it was impacted by South Arabia, and the obsidian trade. The conclusion is a series of outcomes for future research in the area when it becomes accessible once again. Fortunately, I had been able to make two preliminary visit to Tigray in 2018 and 2019 meaning that I had at least visited the area and was familiar with some of the archaeological sites and the landscape, without which this PhD would not have been possible.

Authors Declaration

I declare that this thesis is a presentation of original work and that I am the sole author. This work is the result of my own research, except where explicitly stated otherwise in text. No part of this thesis has previously been presented for an award at this, or any other University. All sources are acknowledged as references.

Chapter One

1 Introduction

This thesis investigates the impact of obsidian on the relationship between Ethiopian and Yemen during the first millennium BC. It summarise and assess the sites in each country that are dated to the first millennium BC and have obsidian in their material culture. Significant quantities of obsidian, that is sourced in the Horn of Africa, was being transported overseas to the Yemen Tihamah, and as far away as Egypt. During the first millennium BC there is specific growth in the quantity of obsidian and the interconnectivity with the greater Red Sea region. This is particularly visible in the influence of the Yemen Sabeaen culture on the Ethiopian Pre-Aksumite culture (800-400 BC), vis-à-vis the obsidian trade, but also in the Sabaean presence in Tigray at sites including Yeha, and Meqaber Ge'awa.

In defining the Pre-Aksumite-Sabaean relationship the evidence indicates a longer Pre-Aksumite chronology than previously recognised. It also points to greater regional activity in the second millennium BC, again with links to the obsidian trade and the Sabaean presence in Tigray. It also suggests that the regional polity, known as D'mt (Da'amat), was a larger entity than previously understood.

The thesis takes a theoretical landscape archaeology approach, using phenomenology, to investigate and understand how the challenging landscapes of Tigray and Tihamah were perceived and navigated three thousand years ago. By going beyond the archaeological evidence it is argued that this was both a physical and a sacred landscape characterised by a unique resource, and a link to an ancestral Sabaean past.

The thesis maps the routeways and journeys linking the sources of obsidian, with archaeological sites in Ethiopia, Yemen and the region. I use Google-Earth PRO and ArcGIS-PRO to create detailed maps showing the routeways linking the Temple of Yeha, with the Danakil depression obsidian sources, and across the Red Sea to the site of Al-Midaman, and Al-Kashawba, in the Yemen Tihamah. This unique research draws on the regional picture rather than a local one, bringing together African and Arabic data to demonstrate the relationship taking place across 600km from the Temple of Yeha, in Ethiopian Tigray, to Al-Hamid on the Yemen Tihamah.

Figure 1. Some of the main sites of archaeological significance in Ethiopia, Eritrea and Yemen discussed throughout this chapter.

The mountainous landscape of Tigray, altitude 2790m, is a defining element in the settlement, trade and movement within the area, impacting on every aspect of life there and reflected in the archaeology and our interpretation of it. Finding modern approaches for the ancient landscape both Woldekiros (2019) and Franklin (2020) present useful frameworks with which to interpret Tigray and Tihamah. Franklin's (2000) research on the medieval (13-15th century AD) Silk route is a parallel landscape of long-distance movement, and Woldekiros (2019) Danakil research on the modern salt trail in the Danakil depression enables a contemporary analogy for past activity. The term "Meshworks" (Ingold 2011, 79) describes the interconnectivity of the trans-Red Sea relationship whilst Hodder's entanglement (2012) becomes an "intercultural entanglement" (Creasman 2019, 361). It is an entanglement of cultures that we are witnessing, a "meshwork" (Ingold 2011, 79) of partnerships created by the interconnectivity of people, places and ideas, as discussed throughout this thesis.

I initially visited the Tigray highlands in 2018, a trip from which this research proposal originated. A preliminary reconnaissance survey in Ethiopian Tigray during 2019 was funded by the University of York 'Rapid response fund for ODA-compliant research and activities' awarded to Dr Daryl Stump. This visit was at the invitation of Dr Catherine D'Andrea of the Simon Fraser

University, British Columbia, Canada who generously assisted with accommodation and local travel. The 2019 visit was a specific research trip to join the Eastern Tigray Archaeology Project (ETAP), in the Gulo Makeda region, at the excavation of Ona Adi, one of the most important sites in Tigray (800- 400 BC). This was an ideal opportunity to experience first-hand the archaeology of a definitive early first millennium BC Pre-Aksumite site, its architecture and material culture.

Ona Adi is located on what would have been the primary north-south route through Tigray, a junction to other parts of the region. ETAP concluded that the Gulo-Makeda region was an "important regional centre" (D'Andrea et al. 2008, 17) connecting Aksum and Yeha with the Red Sea and beyond. Ona Adi is one of the key sites in this study, and around which activity in the first millennium BC pivoted.

The fieldwork at Ona Adi was followed by a reconnaissance survey where Dr Stump and I were joined by Dr Phillipa Ryan, Research Fellow at Royal Botanic Gardens, Kew. A week's survey explored the Tigray highlands, west of Ona Adi, researching potential sites and locations for future fieldwork. One of these areas was the 22-mile long Kerseber valley, as suggested by Dr D'Andrea, which had not previously been archaeologically investigated. The Kerseber valley, to the west of Ona Adi, was selected for this PhD as we immediately identified a number of previously uninvestigated archaeological sites during a walkover survey of the valley. Quite often these sites were associated with Christian churches that potentially mark the location of earlier archaeological activity. At the western head of the Kerseber valley is the Debre Damo monastery a significant locale landmark, built on one of the highest amba's in the area (Flat topped, steep sided mountain).

The proposed fieldwork at Kerseber valley was unable to be carried out due to the COVID-19 pandemic and the later 2020-2022 military conflict in Tigray. The methodology of the PhD then became a desk-based synthesis using remote sensing to access the landscape being investigated. In light of the COVID-19 pandemic and the Tigray military conflict in 2020, the two visits that I made to the region now seem even more valuable than I perceived them to be at the time. Significantly they provided direct experience of both the archaeological sites and the landscapes of the region without which this research would have been considerably more difficult to achieve.

Between 1999-2006 I was involved with fieldwork in Yemen, with project director Carl Phillips, University College London, without which the research presented in this Phd would not have been possible. The fieldwork took place on the Yemen Tihamah specifically at the site of Al-Hamid, and later at Al-Kashawba. Survey work was also undertaken at Waqir, and Al-Mohandid, as discussed through this thesis. The fieldwork experience, and the familiarity with the landscape, was an invaluable basis for this PhD and without which the chapters discussing remote sensing and movement, specifically, would not have been possible. Walking through the desert and mountainous landscapes helped me in no small part to assess what was possible for the population living there three thousand years ago, and make informed decisions about movement and routeways across Yemen, the Red Sea, the Danakil depression, and Ethiopian Tigray.

1.1 Ethiopian Tigray

Archaeological research in Ethiopia has been, and is still, a protracted evolution due to the impact of the regional military conflict that has made working in Tigray, specifically, an occasionally prohibitive landscape. This is as true now as it was at any time since Anfray (1968) first excavated there sixty years ago and started to develop an archaeological narrative for Tigray. Hence the archaeological record is far from being as well formulated as it is in Egypt for example. Archaeology has focussed on the monuments, Yeha temple (Anfray 1973, 1972) (Fig. 2), or the Aksum stela (Phillipson 1998) (Fig. 3) for example, the artefacts and material culture, but has overlooked the impact of the landscape, and how obsidian, specifically, contributes to the emerging social complexity in Tigray.

The nomenclature Pre-Aksumite was applied because it was, and still is, unknown who the people and culture of this area were, beyond their well-established presence prior to the Aksumite period. Therefore I do not use the term Ethio-Sabaean (Anfray 1968; Gerlach 2012) as Finneran (2008) perceived to be erroneous. The Tigray region, potentially defined as D'mt (Da'amat) was autonomous, but it had a strong exogenous trade relationship with the Sabaeans (discussed in chapters one and two). The Tigray region was not an Ethio-Sabaean kingdom. This relationship , whether it is one of colonisation or acculturation, will be discussed further (page 47).

Figure 2. The facade of the Grat Bael Gebri palace, Yeha, Tigray highlands, northern Ethiopia. Photo Richard Lee, 2018.

The geopolitics of the region exemplified by the Ethiopian-Eritrean border has created artificial boundaries that as archaeologists, and specifically for this thesis, we have to look beyond. The so-called Pre-Aksumite has previously been viewed from a local perspective (Phillipson 1998; Fattovich 1990a; Anfray 1968) understandably, whereas a broader regional view without those limitations is necessary. A cultural interchange was taking place during the first millennium BC in the Horn of Africa of which Tigray and its regional relationships was an integral component. This PhD addresses interconnectivity and how only with a clear, and regional, understanding of it can we correctly interpret the Pre-Aksumite.

Figure 3. The Aksum Stela park with the largest of the fallen stela, one of 120, laying across the site, 300-500 AD. Photo Richard Lee, 2018.

1.2 The Pre-Aksumite (800 – 400 BC) in Ethiopian Tigray

The term pre-Aksumite has been used to define the period from 800-400 BC (Table 1) in northern Ethiopia (Phillipson 1998; Fattovich 1990a; Anfray 1968). As with many aspects of the still developing archaeological record here, the term Pre-Aksumite is now questioned (Gerlach 2012; Fattovich 2009; Phillipson 2000) for what it actually represents. An earlier definition of the first millennium BC termed it the Ethio-Sabaean (Anfray 1968), a reference to the relationship between the Ethiopian Tigray region, and the South Arabian/Yemen Sabaean culture by which it was recognised. As with many early chronological definitions, labels are initially used that later come to be discarded, as is the case in Tigray. We know that the timeframe 800-400 BC is prior to Aksum (Munro-Hay 1989) but what its character is, exactly, is still being defined. Fattovich (2012b), in his most recent synthesis of the Pre-Aksumite period, acknowledges that we still have far more questions than answers. In the meantime, however, we have at least, a framework on which to develop the narrative, and that this thesis can contribute to.

Chronology (Fattovich 1990a)		**Mezber chronology** (D'Andrea et al. 2018)
	1600 BC	Initial Pre-Aksumite
	1200 BC	Early Pre-Aksumite
Prehistory	900 BC	Middle Pre-Aksumite
Early Pre-Aksumite I	800 BC	
Middle Pre-Aksumite II	700 BC	
	600 BC	Late Pre-Aksumite
Late Pre-Aksumite III	500 BC	
Proto-Aksumite	400 BC	
Early Aksumite	50 BC -150 AD	

Table 1. The Pre-Aksumite chronology (Fattovich 1990a; D'Andrea et al. 2018). The discussion in this PhD uses the nomenclature of the Fattovich chronology (1990a) unless otherwise stated.

The chronology that will be used throughout this PhD, unless otherwise stated, is that of Fattovich (1990a) (Table 1). Although D'Andrea et al. (2018) present an extended Pre-Aksumite chronology at Mezber the terminology is as yet unchanged. There is now a difference however between describing the early Pre-Aksumite, meaning 800-700 (the shorter chronology) , and the Early Pre-Aksumite, as used by D'Andrea et al. 2018) which indicates 1200-1000 BC (the longer chronology). The culture that is known as the Pre-Aksumite period, or phase, in the Tigray region (Table 1; Fig. 4) is demarcated, approximately, by the modern city of Mekele to the south, the Qohaito plateau, Eritrea, in the north, and the site of Yeha in the west. These are the archaeological sites where the pre-Aksumite can be archaeologically identified (Table 2) by the ceramics, temples, and inscriptions, as discussed in chapter two. The archaeological sites of both Qohaito and Matara are located in Akkele Guzay some 30km north of the Tigrayan pre-Aksumite heartland in what is now Eritrea.

Chronological period	**Tigray sites**	**Eritrean sites**	**Exogenous evidence**
Early Pre-Aksumite I	Yeha I, II. Obsidian. Gulo-Makeda sites.	Matara & Keskese obsidian & ceramics (Eritrea).	South Arabian ceramics. Ancient Ona culture.

			Ceramics from Gash delta.
Middle Pre Aksumite II	Yeha III- Temple, Grat el Gebri palace. D'mt polity. Stone buildings, writing.	Keskese site	Strong Sabeaen influence, and inscriptions.
Late Pre Aksumite III	Yeha, Hawelti and Melazo. Yeha destruction.	Akkele Guzay sites	Small quantity of Nubian ceramics. South Arabian influence disappears.
Proto-Aksumite	Wakarida sites. Pre-Aksumite-Aksumite period (the PA-A transition)		
Early Aksumite	Kingdom of Aksum		

Table 2: These are the key characteristics of the first millennium BC Pre-Aksumite (Fattovich 1990a).

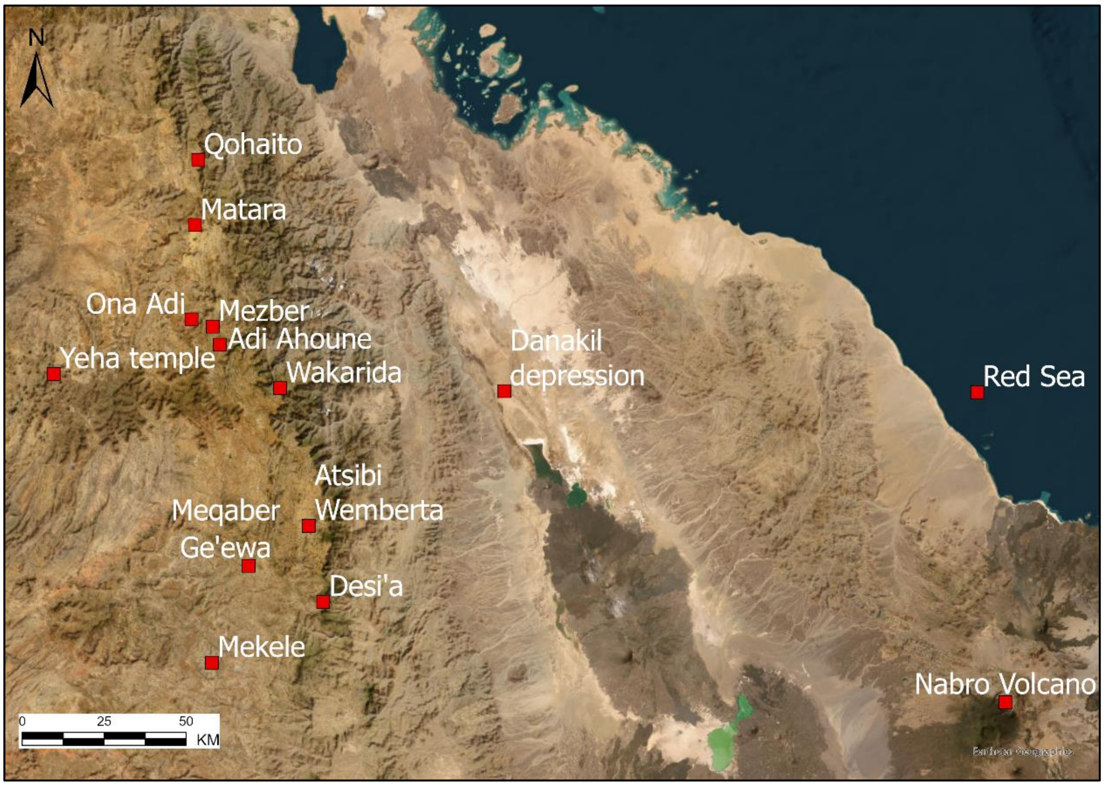

Figure 4. Map of the main first millennium BC sites in Tigray, and southern Eritrea. The Desi'a pass connects Tigray and the Danakil depression.

There are a number of what might be termed 'core' publications that are essential contributions to this archaeological research in the Tigray region. Following Anfray's pioneering research (1967), since the early 1990s the work of Fattovich (1990a, 1990b, 2012b), Phillipson (2009b), Michels (2005), D'Andrea et al. (2008) and Harrower et al. (2014), specifically, have advanced research strategies in Tigray. Although Michels extensive survey work in the Yeha hinterland was undertaken in the 1970s, his excavation volume was not published until 2005. It is still a momentous, and core work, however and many of the sites that he recorded *still* invite excavation, perhaps most notably Enda Gully, a potential settlement site close to the Yeha temple that could also be highly informative for the temple itself. Whilst Fattovich and Phillipson's work was pioneering at the time, recent research, notably D'Andrea et al. (2018), is expanding the Pre-Aksumite beyond the earlier suggestions made for it and interpreting a new narrative for the Tigray region.

1.3 The D'mt polity and the Temple of Yeha

The archaeological evidence during 800-700 BC in Tigray is still relatively limited (DiBlasi 2005), hence some of the generalised statements regarding the Pre-Aksumite and D'mt which define the current discourse on the topic. The term, or name, D'mt (pronounced Da'amat), was found on seven stone Sabaean inscriptions discovered across Tigray. None of these were in situ, and exactly what constitutes D'mt, discussed in chapter two, is uncertain. D'mt (*Daʿamat)* was initially recognised as the polity of the Pre-Aksumite period in Tigray with Yeha temple as its capital (Phillipson 2009b; DiBlasi 2005; Fattovich 2004). The development of Tigray's archaeological record is only slowly advancing our understanding of D'mt. Whilst D'mt has been described as a "regional polity" (Fattovich 2004, 54), and a "short-lived entity" (Phillipson 2009b) we are still no closer to being able to define or recognise it as the regional polity, with Yeha as its capital, based on the epigraphic evidence. D'mt remains elusive awaiting further archaeological or epigraphic evidence to affirm its character. D'Andrea et al's (2018) new pre-Aksumite chronology at Mezber (Table 1) raises the potential that D'mt might in fact extend into the late second millennium BC.

The evolving discussion of the Pre-Aksumite and D'mt is divided in part by the degree to which, in yet another developing discourse, a South Arabian influence contributes to its cultural epithet. This has developed from being a South Arabian "colonisation" (Fattovich 2014, 95) of Tigray, to a process of "acculturation" (Di Blasi 2005, 6; Michels 2005) as part of a "state mode of political organisation" (DiBlasi 2005, 6) to which Phillips agrees but with "limitations…….to our understanding of its permutations" (2004, 80). Significantly for this PhD's research objective, Curtis (2004) urges a need to move beyond thinking of "dominant foreign colonists in the development of socio-political complexity" (Curtis 2004, 59). The potential appropriation of South Arabian symbols of authority by the Pre-Aksumite elite may simply be to legitimise their rule. Jacke Phillips stresses the "political' (Phillips 2004, 84) as opposed to the cultural influence, but allows that it is simply a veneer over the indigenous elite culture, virtually invisible to the non-elite elements of society. The Temple of Yeha suggests that the Sabaean influence is more culturally embedded than a veneer would allow. As part of the German team excavating at Yeha, Japp (at al. 2011) sees D'mt as a process of *both* colonisation *and* acculturation and that one need not exclude the other as both Ethiopians and South Arabian populations are a part of its rubric. This is a significant statement in the discussion which might be accurate but is yet not fully evidenced. Fattovich (1997a, 1996) sees it as an "Afro-Arabian cultural complex" (1996, 395), which he also refers to as the "Tihama Cultural Complex" (1996, 398) extant, should it have existed, during the second millennium BC. D'Andrea et al. (2008), echoing Fattovich, suggests that Pre-Aksumite Tigray had stronger continuity with its local predecessors than was previously understood with only small numbers of immigrants from southern Arabia having arrived in Tigray. In 2023 the still unresolved issues discussed here are at the heart of the objectives that this PhD research will address.

1.4 Southern Arabia and the Yemen Tihamah.

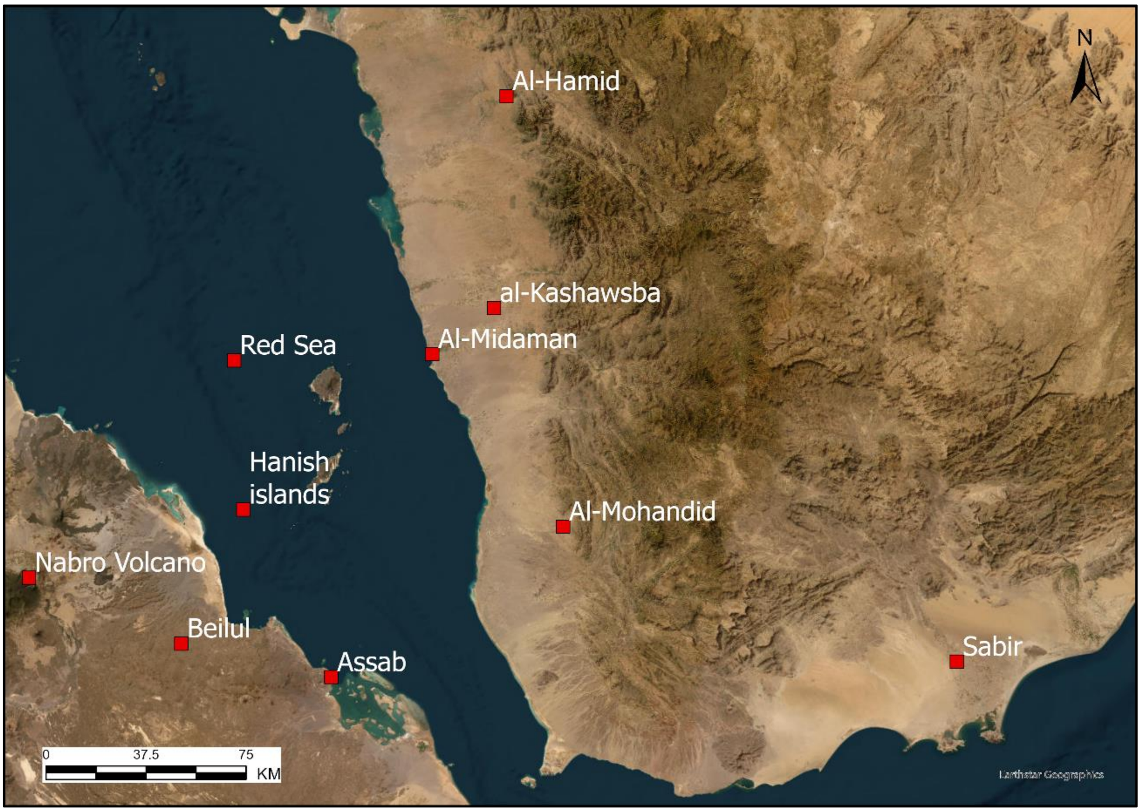

Figure 5. The Yemen Tihamah and the main sites discussed in this research in relation to the

Nabro volcano and the Red Sea coastline.

Whilst researching the trade and movement of obsidian it has become clear that there was a significant link between Tigray and the Tihamah (Fig.5). Archaeological obsidian can be traced to a source in the Afar desert (Oppenheimer at al. 2019) from where it was also moved west into Ethiopian Tigray and east across the Red Sea onto the Yemen Tihamah (Oppenheimer at al. 2019) which I will discuss in chapter four. This relationship has only been recently documented, as research into the presence of obsidian had not being explored in the early assessments of the Pre-Aksumite (Phillipson 2009; Fattovich 1990). This is due to the research focussing on either Tigray or the Tihamah without either establishing links across the Red Sea which has almost functioned as an academic, as well as physical, barrier. It is now clear that South Arabia played a central role in shaping first millennium BC Tigray, the question is to what degree is that influence felt there and what form did it take. At the temples of Yeha and Meqaber Ga'ewa, two of the most important sites in Tigray, there are examples of Arabian, potentially Sabaean, inscriptions and ceramics. Excavations at Yeha (Robin and de Maigret 1998) retrieved South Arabian style ceramics from the earliest stratigraphic levels at the temple (Yeha phase I). Central to the discussion of South Arabian influence in Tigray is that of "cultural transfer" (Gerlach 2009, 260) and whether acculturation or migration are a part of that equation, which I will discussed in chapter two.

Recent excavation at the Ethiopian site of Meqaber Ga'ewa, (Wolf and Nowotnick 2010), 80km south-east of Yeha, indicates an early first millennium BC temple, albeit a smaller structure than Yeha, but with many, if not more, of the same cultural characteristics. The Sabaean God Almaqah has a dedication here alongside cult objects and installations, yet again highlighting the exogenous influence (Manzo 2009). This temple is the most southerly architectural Sabaean evidence in Tigray which may be significant in establishing ancient routes between Tigray and the Red Sea coast (Keall 2004). The discovery of this temple raises the question that, given its size, smaller than Yeha, could other similar structures still be awaiting discovery which would enhance our knowledge of the South Arabian presence in southern Tigray, and with further ramifications for the definition of D'mt. Indeed, the style and size of Meqaber Ga'ewa, a site as important as Yeha, it might be suggested, might find a closer parallel with Al-Hamid temple on the Yemen Tihamah (Phillips 1997) than the Tigrayan Yeha temple, discussed in chapter two.

Figure 6. The floor of the Danakil depression through which it is necessary to travel through to reach Nabro volcano. Photo A. Savin, WikiCommons.

On the east periphery of the Tigray highlands excavation around a cluster of sites known as Wakarida (Benoist et al. 2020; Dugast and Gajda 2012) demonstrates a lack of Sabaean influence in an area where its presence might be anticipated. The sites around Wakarida are the most easterly Pre-Aksumite sites in Tigray but, the evidence indicates, were scarcely occupied during the earlier Pre-Aksumite period which could only be attested to at Alakile Daga in the 8th century BC. This makes it a strategically important location in the trade of obsidian between Tigray and its source in the Danakil depression. The site is close to what appears to be one of the primary routeways from Tigray into the Afar depression (Fig. 6), the source of obsidian. Benoist's research (Benoist et al. 2020) is the first evidencing occupation on the western edge of the escarpment, expanding Pre-Aksumite knowledge and suggesting that a route did indeed pass through here into the Danakil (discussed in chapter five).

1.5 Egypt, Nubia and Punt

Whilst Tigrayan "Prehistory" is prior to 1600 BC (D'Andrea et al. 2018) (Table 1), in Egyptian chronology this is the Second Intermediate Period (1650-1550) followed by the New Kingdom (1550-1069 BC) (Shaw and Nicholson 2004). One of Egypt's trading relationships, as documented in the hieroglyphic inscriptions at the Temple of Hatshepsut, at Thebes, is with the Land of Punt, with representations of both people, items of trade but not, alas, an exact location. In this context Punt is a mythical historical place which it has not been possible to locate with any certainty. Many voices (Fattovich 2018; Meek 2003; Jacke Phillips 1997; Kitchen 1993) have attempted to locate Punt in many different places in Africa and the Middle East. Kitchen (1993, 2004) writes authoritatively that Punt could be sailed to, down the river Nile or via the Red Sea, or possibly visited overland via the Nile valley, and suggests its location as being east of the Khartoum Blue Nile, encompassing all of Eritrea, northern Ethiopian Tigray and potentially the Tihama coast of Yemen. Excavation at the Egyptian Red Sea harbour at Mersa Gawasis (Bard, Fattovich & Ward 2007) confirmed the location, probably the departure point, for journeys to Punt as indicated in Egyptian hieroglyphic texts (Kitchen 1993). Despite many well-argued theories, for example Meek (2003), Kitchen's identification of Punt is closest to being a representation of the description offered in the Egyptian annals (Kitchen 2004, 1993).

The location of Punt may best be understood (Dixon 2004) by the resources obtained there, hence the name may be a general definition for any location with myrrh, frankincense, ivory and gold, rather than being a specific geographic or political entity. If we accept Kitchen's (1994) and Phillips (1997) suggestion for Punt's location, then it would appear that the Ancient Ona culture located in northern Eritrea (Fig. 7), and most or all of Tigray, was a part of Punt therefore, and an aspect of the Horn of Africa's elusive second millennium BC prehistory. What is missing from any assessment of Punt's location is evidence from the place itself, both name and place, which would help corroborate the Egyptian evidence.

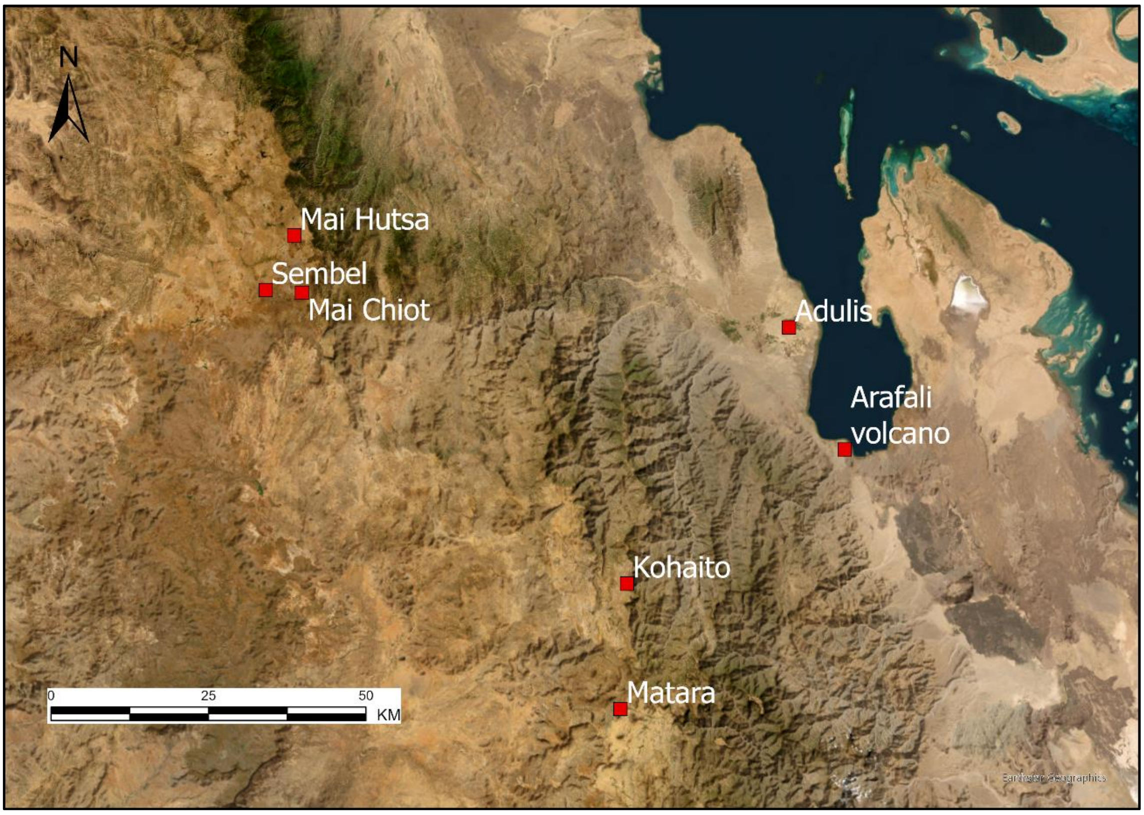

Figure 7. Sites of the Ancient Ona culture in northern Eritrea, Mai Hutsa, Mai Chiot, Sembel and other significant sites in the area.

Assuming the Egyptian hieroglyphic inscriptions to be representative, and Kitchen's hypothesis as accurate, then the new Pre-Aksumite Mezber chronology (Table 1) (D'Andrea et al. 2018) places northern Tigray within Punt's proposed geographical extent. Being familiar with the relevant Punt literature is necessary in understanding, for example, Fattovich's Red Sea cultural complex (1997b) and where the Tigray region belongs within it.

With the rise to prominence of both the pre-Aksumite and Nubian cultures in the first millennium BC one would anticipate strong evidence between these close neighbours. It seems logical to expect evidence of second and, especially, first millennium BC Nubia (Manzo 2009) would be visible in the Tigray archaeological record. At Yeha temple ceramics from Jebel Mokram (Fattovich 1989; Gerlach 2021) are minimal evidence however for an exchange between the two but may imply a trade route connected them. Jacke Phillips (2004) suggests that being at the apex of its political power (1000-300 BC), and paralleling the Pre-Aksumite kingdom, the few Nubian Napata imports found at Yeha and Hawelti must have passed through Aksum on the way to their destination (discussed in chapter six). The route from Aksum through Shire is suggested as being the shortest route from the Nile valley to the Red Sea (Phillips 2004; Finneran et al. 2003) where pre-Aksumite material has been found at Mai Adrasha (Philips 2002). A possible Pre-Aksumite connection with the Shire region, west of Tigray, is a lesser known one in the archaeological record but is an area that will be discussed in chapter two.

It is uncertain whether Nubia's absence in the Tigrayan archaeological record is because it was not present, or whether archaeological excavation has not yet located it. As with other aspects of the Pre-Aksumite there are still important sites to be discovered and the Nubian lacuna may be one of those knowledge gaps. D'Andrea's et al.'s (2018) extended Mezber Pre-Aksumite chronology (Table 1) also has implications for Nubia's place and role in the region. Both Shinnie (1994) and Manzo (2012a) have researched trade routes in second millennium BC Nubia, information that directly intersects the revised Pre-Aksumite chronology at Mezber with implications for the relationship between them.

1.6 Summary

For the rest of this chapter I present an overview of the themes that have arisen from the literature analysis and will be addressed in the main body of this thesis (chapters two-seven). Obsidian, its source, and its presence at archaeological sites in both Tigray and Tihamah, is a central factor defining the trans-Red Sea relationship. The impact of this resource has only become fully recognised in the last decade (Oppenheimer et al. 2019; Gimenez et al. 2015; Khalidi 2010, 2009) but is reshaping and developing regional knowledge across the late prehistory of the region. In this thesis I will discuss how the presence of obsidian has influenced both Tigray, Tihamah and their interconnectivity. Settlement and agriculture in Tigray takes place in a semi-arid mountainous landscape that, 3000 years ago, may have been experiencing fluctuating rainfall placing increasing pressure on the food security of local populations (Terwilliger at al. 2011). Existence in Tigray takes place against a distinctive and challenging landscape which dominates the region but also impacts the interconnectivity of the population and the routeways that extend across it.

1.7 Obsidian

The discussion of obsidian in first millennium BC Tigray has been a late arrival to the pre-Aksumite discourse when, as I propose in this thesis, it is in fact a central one. As a primary regional resource, it has been hiding in plain sight. Zarins (1996, 1990, 1989), and Tosi (1986, 1985) in their Yemen Tihamah surveys drew attention to the presence of obsidian and its place in Red Sea trade noting that research in Arabia had progressed more than in the Horn of Africa due to military conflict there. The study of obsidian involves theories concerning its movement within a network, whether this was down-the-line, or direct, exchange, as well as the importance of commercial exchange (Renfrew 1977, 1976). Initial research proposed that Anatolia (Gimenez et al. 2015) was the primary regional source of obsidian as it had a known distribution in Iran, Iraq, the Persian Gulf, and as far as southern Palestine (Zarins 1990). It is only within the last 15 years, an indicator of the protracted study of obsidian's place in the Red Sea region, that research finally enhanced this narrative. In Yemen, Khalidi's PhD (2006a) drew attention to the microlithic technologies and bead manufacture from her Tihamah fieldwork. New research in Africa (Ambrose 2012), Ethiopia specifically (Oppenheimer et al. 2019), Yemen (Khalidi et al. 2010; Khalidi 2009) and Egypt (Gimenez et al. 2015; Bavay et al. 2000) appears to confirm, I suggest, that the trade in obsidian might be one of the primary drivers of the Tigray social complexity ca. 800 BC, although occurring notably later than in the rest of Africa and the Middle East (Curtis 2008; Connah 2001; Munro-Hay 1993).

Whilst a number of these publications rely on laboratory analysis of obsidian and suggestions for the provenances of obsidian, archaeological sites demonstrate where obsidian has been transported to in both the Horn of Africa and Yemen (Khalidi 2009). The presence of Afar sourced obsidian in both Egypt (Aston et al. 2000), ca. 3100 BC, and Yemen, ca. 5000 BC (Khalidi 2006a) indicates that regional trade was taking place well before the Pre-Aksumite. Archaeological excavation in Yemen suggests that coastal Al-Midaman may have been the primary site for obsidian arriving from Africa (Khalidi et al. 2010; Keall 2004), or at least where it is best archaeologically attested to. D'Andrea et al. (2008) suggested it was most likely exported from Adulis on the Red Sea coast and whilst this is possible there may be other places along the Red

Sea coast, in modern Djibouti, that were also involved in the movement as will be discussed during chapter four.

Research provenancing Afar obsidian (Ambrose 2012) is still some way behind the rest of East Africa but the primary sources closest to Tigray have been identified in the northern Rift Valley on the Ethiopian-Eritrean border at the Nabro-Mallahle volcanic range (Oppenheimer et al. 2019; Khalidi et al. 2010; Negash and Shackley 2006). Finneran et al. (2003), Zarins (1996) and Tosi (1985) had previously speculated about Afar sources without being more specific. Neutron activation analysis indicates that obsidian from Nabro, Mallahle, and Abadir (Gimenez et al. 2015) was found in archaeological contexts on the southern Arabian Tihamah coast as early as the sixth millennium BC (Khalidi 2009, 2007; Tosi 1985). Significantly, it is chemically distinct from Yemen's obsidian source on the Dhafar plain (Khalidi et al. 2012), 150km north of Tihama, despite this source being much closer than the Ethiopian source. Identifying obsidian sources indicates, significantly for this research, that the regional late prehistoric economy was, partly, centred on Nabro (Oppenheimer et al. 2019). This is a significant factor for the economic and cultural development of the Pre-Aksumite first millennium. It is only since 2010 that Oppenheimer et al. (2019) and Khalidi (2009) specifically, have developed obsidian sourcing in Arabia and Africa to the point where specific sources can now be identified. The identification of Nabro volcano as an obsidian source (Oppenheimer et al. 2019) creates a fulcrum around which questions of the first millennium BC obsidian procurement now coalesce.

Although somewhat delayed by regional conflict a newly established database of geochemical obsidian analyses (Khalidi et al. 2010; Khalidi et al. 2013) began tracking obsidian dating and source exploitation in Ethiopia. Although this has barely begun to achieve its potential (Negash and Shackley 2006), the work of Khalidi et al. (2013) highlighted interconnectivity between Arabia and Tigray. The ETAP survey of Gulo-Makeda (D'Andrea et al. 2008) concluded that obsidian only became important in the pre-Aksumite period. One might anticipate earlier evidence considering regional trade dating to the fifth millennium BC in Egypt (Aston et al. 2000) and Yemen (Khalidi 2006).

Obsidian has been found in second millennium BC contexts at the Egyptian harbour of Mersa Gawasis on the Red Sea coast (Luccarini et al. 2020). The sources have been identified as Arafali, in Gulf of Zula, Eritrea, and Dhamar-Reda (Yafa'3 near the Isbil volcano) in Yemen (Luccarini et al 2020), sources that appear not to have been identified yet in the first millennium BC sites in Arabia or Eritrea. Second millennium BC activity, therefore, was using both different obsidian sources and different routes thereby bolstering evidence for earlier activity in the region than has been previously understood.

1.8 Phenomenology and natural landscapes

In a useful discussion of both what landscape is, and is not, Ingold (2000) presents a theory that is applied to the landscapes discussed here. Landscape is “quantitative and heterogeneous” (Ingold 2000, 190), it is what we see around us as well as being temporal, with each landscape having its own meaning that, as archaeologists, we have to decipher. Excavation and fieldwork is the practice of determining that meaning.

To understand the landscape of Tigray, Tihamah, and the Danakil depression (Fig. 8), Tilley’s (1994) phenomenological theory, and Bradley’s natural places (2000) are both approaches that I apply in this thesis. Two citations are useful here in defining how I apply phenomenology in this thesis:

> Phenomenology is “A space in which human activity is mapped” (Tilley 1994, 35).
>
> “Phenomenological approaches describe the embodied encounters of people in the present with landscapes, monuments and artefacts from the past” (Bruck 2005, 45).

Using phenomenological theory is a way to understanding a phenomena, a place, or an archaeological site, when the material culture does not provide the answer that I, as an archaeologist, ask of it. Phenomenology evokes Benders (1998, 7) suggestion of “going beyond the evidence” in cases where there is an absence of written texts and buildings, and a lack of sufficient archaeological evidence on which to base ones theories.

Since everyone in the world experiences phenomena and then places meaning on that phenomena, the only way we can really understand the lived experience of someone in the past is by attempting to put ourselves in their place and asking what phenomena would they have experienced and what meanings might they have attached to these phenomena.

Twenty-four hours after arriving in the Danakil depression, the intense heat was impacting the structural fabric of my expensive hiking boots and they were quite literally coming apart at the seams. I was prepared for the intense heat, having been in this situation previously in different places, in footwear that I anticipated would be wholly satisfactory for the undertaking. Someone else standing in the same place as me, experiencing the same phenomena would have arrived at the same conclusions, whether they were a 21st century archaeologist or a first millennium BC Sabaean without the expensive footwear. But this was my lived experience of a specific place, and a place that most people would probably avoid. A phenomenological approach thus allows the archaeologists to use their own lived experience to inform their interpretation of how an individual or community in the past might have used their own lived experience to attribute meaning.

To remotely walk through the Danakil landscape, as I do in chapters five and six, is a combination of two things:

Step 1: Using all the archaeological data available to me I ask whether the phenomena that I am sensing are the same (or broadly the same) phenomena that someone in the past would have experienced. If the landscape is now dry and hot and it was also dry and hot 3000 years ago, then I am able to move to step 2. But if there is archaeological evidence that it was wet and forested three thousand years ago (Gerlach 2021; Terwilliger 2011; Billi 2015) or that there used to be a bridge over the river gorge in front of me, then I am not able to do that. Step 1 therefore is based entirely on archaeological data.

Step 2: Adding the phenomenology: I can feel that it is extremely hot and that walking up the steep slope of the hill in front of me will be hard work in this heat, so instead I will take the lowland route, as it will be easier, and I think that someone 3000 years ago would do the same. Step 2 therefore is entirely phenomenological.

Sometimes however a further step is needed, which is one that combines both the archaeological and the phenomenological data. This is also however, as I discuss in this thesis (Bruck 2005; Johnson 2012), where the major source of phenomenological criticism is applied. Step 3 comprises two parts:

a) Different people place different meanings on the same lived experience. For example my experience of the Danakil volcanic field is that of an extremely difficult place to access and to function in, because of the high temperatures. The geology and topography has prevented the area from becoming vegetated, and the obsidian found there is produced by the volcanoes. Someone else from a different background and experience to mine might interpret this phenomena of a shiny, smooth, black, heavy object in a place that is extreme and challenging, and place the meaning on this phenomena as magical and special.

b) I know from my lived experience of all the landscapes discussed here that the meanings that people place on the phenomena that they experience can be influenced by the meanings that other people place on these phenomena. For example if everybody in Ethiopia thinks that the Queen of Sheba was born at the Tempe of Yeha, I might believe that statement. Those meanings might be accepted by others even if my interpretation of the available archaeological data lead me to reject this local interpretation.

If we have archaeological and/or historical, and perhaps ethnoarchaeological evidence of how people in the Danakil depression, or the Yemen Tihamah, think about the phenomena they experience we can use this to modify our phenomenological interpretation. My experience of the Danakil depression suggests that it is a difficult and potentially dangerous place to visit, and this is not something that I might do regularly. But the archaeological evidence of obsidian provenancing and the quantity of obsidian that is found elsewhere, for example the Yemen Tihamah (Oppenheimer et al. 2019) indicates that people, thousand years ago, were visiting this place regularly.

By combining the archaeological data with my phenomenological interpretation, I can adapt that interpretation, so that whilst I think the Danakil is dangerous and challenging, I can see why someone three thousand years ago might choose to visit regularly if this was the only way to get access to this obsidian that is evidently highly valued throughout the region. In doing so they place special value on both the phenomena, and the landscape, transforming the space to a place of significance.

Step three in this account is however where the major critiques of phenomenology are made. Archaeological, historical and ethnographic data demonstrate that the sheer number of ways in which people and cultures produce different meanings from the same basic lived experiences is immense and varied, and that the meanings that people and cultures place on these phenomena are subject to change. Therefore it is impossible to predict what meanings people will place on phenomena without detailed data. Whilst I propose that, as Bender suggests (1998, 7), “going beyond the evidence” is necessary, it does require some archaeological evidence on which interpretations can then be built. The proposals that I make in chapters five and six incorporate both archaeology and phenomenology because I am able to use my lived experience of this, and other similar landscapes, to inform my interpretation of likely routes.

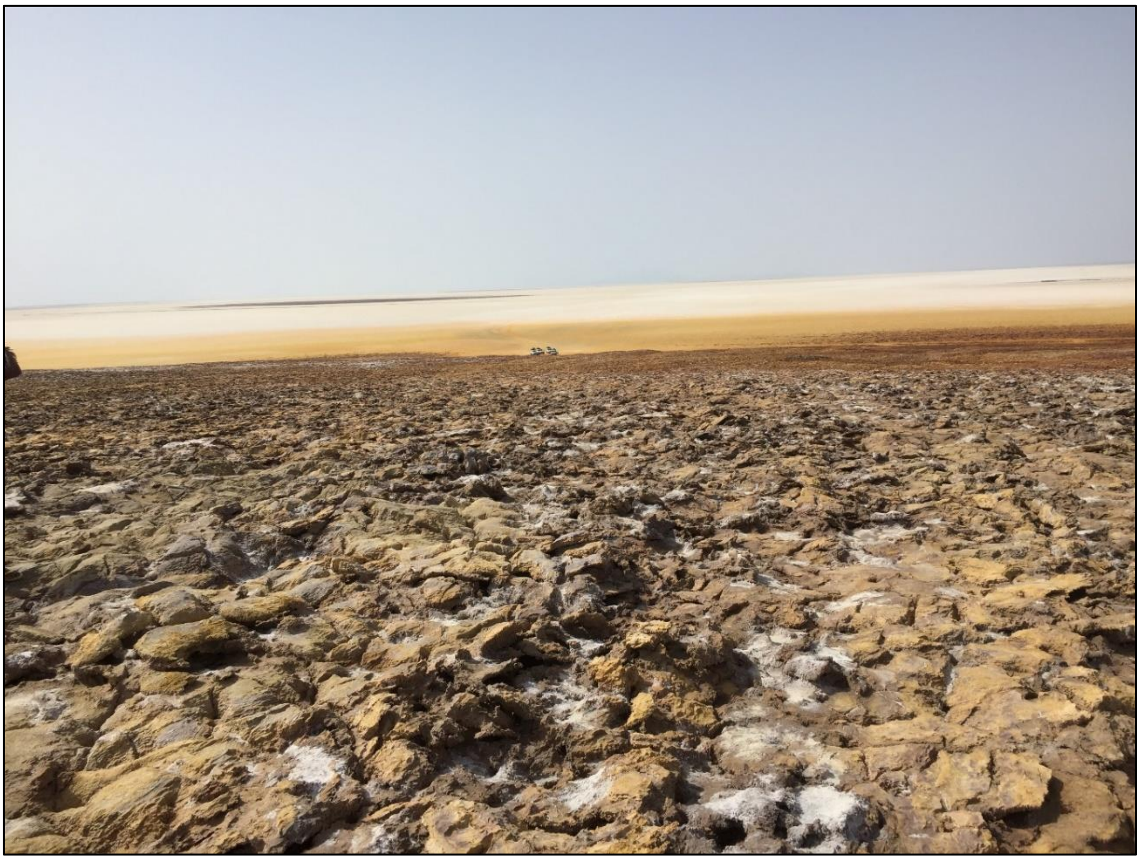

Figure 8. The Danakil depression, with two land cruisers in the centre for scale. Photo Richard Lee, 2018.

Both Bruck (2005) and Johnson (2012) critique the advantages and disadvantages of phenomenological archaeology analysing the methods that have been taken in the past and whether they have been appropriate. Whilst Bruck (2005) is critical of many aspects of phenomenology she concludes that when it is used well, into past understandings of the material world, it is a combination of factors, of material culture, and landscape. The totality of material culture and landscape has shaped and formed human beings into who we are as individuals and groups. This is the value of a phenomenological approach and its contribution to archaeology. Johnson's review (2012) is another significant document for landscape application, and he presents a critique of phenomenological perspectives and its relevance to archaeological landscapes. Johnston's (2012) response is that phenomenology needs to work hand in hand with traditional landscape archaeology, they are both complementary not mutually exclusive, and together create a more realistic assessment of the landscape being investigated. Both Bruck and Johnson's positive views were surprising, precisely because phenomenology has attracted so much criticism in recent decades. Its application for this thesis, therefore, is appropriate for landscapes where these approaches are largely untested.

Bradley (2000) defines what he means by the archaeology of "natural places" and what it constitutes by its application to the landscapes of the Nordic Saami culture who do not populate their landscape with monuments but instead have significant *places, or locations* that are of importance. For this PhD research, the term "natural places" (Bradley 2000) is entirely apposite, with the temple of Yeha, built on the highest point in the immediate landscape and surrounded by the round-topped hills of the valley, as an example of this. The builders of the temple made a clear decision to use the natural features of the landscape to enhance the appearance of their structure. The Tigray highlands, an upland landscape, has characteristic topographic features that lend themselves directly to study in the same way as the Saami's relationship to their topography, a landscape largely without monuments.

As archaeologists we begin with the physical archaeological evidence, but we also have to "go beyond the evidence" (Bender 1998, 7) which is how phenomenology reaches its conclusions. An evidence-only approach limits our understanding of what people were attempting, or indeed achieving, in their living environment. The facts-on-the-ground only tell us a limited amount, as essential as they are; hence it is imperative that we aim to develop our understanding beyond the purely physical archaeological remains. The disagreements between the landscape archaeologists and phenomenologists of the 1990s post-processual period are not necessary. The latter have to provide reliable archaeological theories, but the former have to realise that understanding goes beyond the physical remains. Hence, standard physical landscape survey (Bower 1986) has to incorporate phenomenological perspectives in order to gain the fullest understanding of what people at any given site, or place, were doing and in terms of going beyond everyday life, examining what we may refer to as ritual or ceremonial practices. Whilst Tilley was criticised for this approach, and sometimes the physical evidence he presented did not always support his views (Fleming 2006; Bruck 2005), as Johnson says, in developing a broad cognitive approach," What alternative do you have in mind?" (2012, 277).

Although citing British examples of landscape theory, I focus as far as possible on examples applied to African landscapes although these are few and far between. "Post processual archaeologies seem to have had relatively little impact" on sub-Saharan African studies (Wynne-Jones 2015, 56); theoretical landscape archaeology in Africa is still "in its infancy" (Grzymzski 2004, 25), "lags behind" and has "stood on the sidelines" (Fleisher 2013, 189), is "largely neglected" (McIntosh 2008, 85) and in the Horn of Africa particularly, it is "an omission of some consequence" (Insoll 2015, 232).

Lane's suggestion of "socializing landscapes" (Lane 2008, 241) may be applicable in this rugged topography as it necessitates local people marking the landscape with indicators, rock-art for example, used to "socialize" (Lane 2008, 241) the challenging environment rendering it a part of their social activity (Lane 2008, Bollig 2008). The contents of rock-art act as a group of signs that, together with their place, aim to establish the significance of that location, perhaps even with a gender distinction (Bradley 2000) despite the difficulty in always assessing that status. The core element here is the audience/viewer – for whom was the rock-art intended, and on what occasion would they witness it? Why was it located where it was? Who was able to view it? (Bradley 2000). As D'Andrea et al. (2008) say, the signs themselves are not what is intrinsically important, it is the place/landscape, and, as part of this research, rock-art could potentially play a part in alluding to a mythical indigenous landscape (Bradley 2000) of forests, hill, mountains, streams, rivers, and trackways of the Tigray landscape. A "socialized landscape" (Tilley 1994, 58) morphs into Lane's concept of **"**being-in-the-land" (Lane 2008, 242) where the landscape is "the world as it is known to those who dwell therein" (Ingold 1993, 156) and was, as already stated, not static, but a "constant temporal phenomena" (Lane 2008, 243) with personal engagement, an approach that is ripe for development (Lane 2008). The caveat here is that the personal engagement is the "ethnography of others" (Lane 2008, 242), and not that of the white western male researcher (Meskell 1996; Thomas 1993). The "ethnography others" (Lane 2008, 242) is presenting the voice of those being interviewed as accurately as possible, and not our version of their opinion. This can only be presented by having an accurate interpretation of what an individual has said, which more often than not, comes through a third-party interpreter, who might themselves not be translating exactly the interviewees exact response. Hence the ethnography of others can be elusive and dependent on one's interpreter, and the interpretation of the researcher.

Although writing about Europe, Thomas (2001) has cautioned against a one-size-fits-all model for attempts to understand the pre-modern past because of the very real difficulty in reconstructing sacred and secular ancient landscapes (Insoll 2004). His red flag is equally relevant to the Horn of Africa. The question here is how do we "bridge the gap with the third person past" (Insoll 2015, 244) a core tenet of the phenomenological approach?

The literature on archaeological landscape theory, even as applied here, is vast and impossible to fully document in this concise document, beyond obvious empirical factors such as the landscape being semi-arid with limited water sources (Nyssen et al. 2009), and how inhabitants may have lived with that (Harrower et al. 2010). Ingold suggests (2011) that valley-dwellers, for example in Tigray's Kerseber valley may have perceived a "weather-dome" (Ingold 2011, 132) arcing over their living space. At ground level they would have been familiar with the everyday "signature landscapes" (Wilkinson 2003, 7) of their surroundings as they lived and worked in them.

1.9 Movement and routeways

Figure 9. The sites of Tigray and Tihamah and the connecting routes during the first millennium BC.

When discussing trade and interconnectivity between Tigray, the Afar or the Tihamah (Fig. 9) when this is applied practically, it is clear that moving through or across these landscapes was not an easy undertaking. Having surveyed and excavated in Tigray, the Afar, the Danakil depression and the Yemen Tihamah, the landscape of this thesis, I can attest to the difficulties ancient populations faced in their movement. Research along the Silk Route (Franklin 2020; Harrower and Dumitri 2017) examines movement and the necessity of the embodied experience of humans in motion. Franklin (2020, 859) cites "memory paths" and "phenomenological approaches" to "human space", as do Bradley (2000) and Wilkinson (2003), with a significant movement of people along, in this case, the Silk route. Although Franklin is analysing the long-distance mobility of the Medieval Silk Route, the theory is applicable to the topographies of this thesis, discussed in further detail in chapters five and seven.

Woldekiros (2019) has taken movement and mobility a step further with ethnographic research of a modern camel caravan across the Danakil depression salt trade route. In this case the physical practicalities of movement across a challenging landscape are experienced and we see where the theory and the practical contrast with each other. Woldekiros research focuses on salt but it also records where obsidian has been found along the journey (Woldekiros 2019). Establishing trade routes from Tigray to the obsidian sources in the Afar, from there to the Red Sea coast and then to Yemen, and from Tigray north into the Ancient Ona sites (introduced in section 2.3.4) and then into the Nile valley will be mapped in chapter 6. By tracking the presence of archaeological obsidian in relation to its source at Nabro volcano the routes along which it is transported can be identified. The challenging topography of the region largely dictated which routes the travellers would take of the limited choices available to them. The Afar desert is one of the hottest and lowest environments on the planet (Fazzini et al. 2015), whilst Tigray is dominated by mountains and high altitude. A sea crossing was necessary for reciprocal Arabian trade, incense and technology (discussed in chapter three), and even longer distances were involved in reaching the Nile valley overland. Hence Woldekiros (2019) contemporary Afar research actually put feet on the ground obtaining results demonstrating movement and mobility and that the activity of the past was not, in fact, so distant.

1.10 Agriculture

The landscape of Tigray is a central factor in settlement, trade and the emergence of the Pre-Aksumite. That Tigray is semi-arid environment, and not arid (Nyssen et al. 2009) makes the difference between it being habitable and not. The capacity for agriculture to take place enables the Pre-Aksumite to flourish, and without which the discussion of this thesis would not be possible. As with the archaeological record, agriculture is attested to much later in Ethiopia, and Nubia (Grzymzski 2004), than in Arabia or Egypt (Harrower et al. 2010). With the valley bottoms primarily used for agriculture (D'Andrea et al. 2008) the use of the land in the Tigray highlands is a core factor in understanding the processes taking place in the Pre-Aksumite. In Arabia there is archaeological evidence in the fourth millennium BC for agricultural development (Harrower et al. 2010), yet this does not permeate across the Red Sea to Africa for another three thousand years. Various reasons for this have been proposed including the controversial Garden of Eden theory (Neumann 2003) i.e., a rich savanna environment in the Ethiopian Highlands inhibited the appearance of crops (Neumann 2003), although Harrower (2010) suggests periods of increased aridity may have had more impact as drivers of subsistence change. Paleoenvironmental studies in East Africa indicate the latter half of the Holocene moving towards the aridity that then accelerates with “human induced erosion” (Harrower et al. 2010, 460), by the mid second millennium BC (Harrower 2010; Bard et al. 2000; Darbyshire et al 2003), again notably later than North Africa and the Near East.

The Ethiopian highlands are a dynamic and agriculturally marginal landscape due to degradation, erosion, and crop failure (Munro et al. 2008), and what we see there today, assessed as semi-arid (Nyssen 2009), is not the topographic landscape of 3000 years ago. Indeed, recent research (French et al. 2014) appears to contradict what was previously understood (Darbyshire et al. 2003; Butzer 1981). In arriving at his conclusion Butzer (1981) assessed the hillslopes and floodplain of Aksum and the changes that had taken place. Butzer (1981) suggested that short term environmental erosion caused by the increasing population of Aksum was responsible for culturally induced environmental degradation visible around the city. What Butzer considered to be a swift change ca. 100 AD now appears to have been gradually occurring over a prolonged period (French et al. 2014), although De Muelenaere allows that because “landscapes are dynamic, significant change” (De Muelenaere 2014, 331) can still occur in as little as 8 years. French examined the same areas as Butzer but concluded that “a more complex record of human influence” (French et al. 2014, 1614) was responsible for the changes. The change was a result of climate, geology, soil development, hydrology, vegetation, erosion, settlement pattern and land management practices (French at al. 2014) each having a specific impact on the landscape. Extreme moist, or extreme arid, phases can cause swift change to occur. Whilst some of the evidence seems to present a contradictory picture, what is evidently occurring is concurrent change across the dynamic rugged topography, that has been “more complex, variable and nuanced” (French et al. 2014, 1621) than Butzer (1981) initially recognised, with the Intertropical Converge Zone (ITCZ) impacting those fluctuations (Billi 2005).

This contrast in evidence is apparent in Fattovich’s suggestion (2010a) that D’mt’s social and economic expansion happened in a period of increasing aridity with Terwilliger’s suggestion (2011) for a wet phase during the same time and place. The changes need to be understood as very localised events of the extreme contrasts possible in Tigray (Billi 2015; Terwilliger 2011). Indeed, individual parts of Tigray could simply be a good catchment area for localised rainfall (Harrower et al. 2020) which would be a key factor for agriculture and settlement. A similar conclusion was arrived at by the Canadian ETAP team who did not find major irrigation structures in the area, as anticipated in association with Sabaean influence, but did discover “spatial associations between major archaeological settlements and low-lying areas” (Harrower et al. 2020, 54). Many archaeological settlements are found on sediment slopes leaving valley bottoms accessible for their valuable arable land and grazing areas (D’Andrea et al. 2008), as I witnessed when surveying in the Kerseber valley in 2019. Whilst Michels Yeha survey (2005) considered land use around the region, more recently Harrower et al. (2020) indicate that the presence of water is not always a determining factor in settlement location, which sounds counter intuitive. The effect of springs, and the use of terraces, now dried-up or eroded, may have played a significant role for agriculture and settlement, as suggested by Lane (2010) and Stump (2010) in other African contexts. As Harrower et al. (2004) suggest the water source does not need to be located in close proximity to the settlement, it just needs to be accessible from nearby springs or there needs to be reliable rainfall (see page 189) that can be collected and stored for agricultural use. At Debre Damo monastery, for example, (Matthews and Mordini 1959; Crawford 1949) cisterns for catching seasonal rainfall were cut into the stone surface of the amba to supply the monk's needs.

1.11 Methodology for mapping and routeways

Throughout this thesis I use ArcGIS-PRO for creating maps illustrating the archaeological sites discussed here, and for creating the routeways that are depicted in chapters 5 and 6. I use Google-Earth Pro for creating the routeways that I suggest are in use during the first millennium BC as the high resolution available is essential for making informed and detailed maps of the journeys that were being undertaken for the transportation of obsidian, and the migration of people, across Ethiopia, the Red Sea and Yemen. Chapters 5 and 6 rely heavily on my lived experience of working and travelling through these landscapes, and the demands and challenges that they place on an individual. Without that direct experience of the Danakil depression, of the Tigray highlands, the phenomenological framework that I use throughout this thesis, would not have been possible.

1.12 Thesis structure

In order to understand developments in the Pre-Aksumite it has been necessary to synthesise what is known archaeologically in Tigray. This chapter, therefore, has highlighted the issues and themes that I will address in this PhD. In chapter two I will present a critical review of the Pre-Aksumite period during the first millennium BC. I will argue that the Pre-Aksumite is both temporally and spatially greater than previously recognised. Research since the 1960s (Anfray 1972, 1963; Fattovich 1971) established early definitions of the Pre-Aksumite that has focused on prominent sites such as Yeha, and the evidence for South Arabia in Tigray. That Pre-Aksumite definition is now questioned and in need of a reassessment (Gerlach 2012; Fattovich 2009; Phillipson 2000) . Chapter two outlines what we know about the Pre-Aksumite and the questions that arise from this in relation to establishing a link with South Arabia.

Secondly, and with similar outcomes, the Yemen Tihamah is an area into which only limited research has been possible. This has presented a first millennium BC framework creating an initial outline for a local chronology and culture, potentially Sabaean (Khalidi 2005; Phillips 1998, 1997), but about which we can pose many of the same questions arising in Tigray. Both Tigray and Tihamah had cultures neither of which we know the identity of, hence using the terminology Pre-Aksumite, and Sabaean, which I will discuss in chapters two and three respectively. The Pre-Aksumite and the Sabaean (Tihamah) chapters present the two cultures at the centre of this thesis, followed by chapter four which examines the impact of obsidian on both of them. In chapter five the recent identification of the sources of African obsidian has brought into focus one of the drivers of the relationship that thrived across the Red Sea. This has had the impact of creating an awareness of the trade economics between Tigray and Tihama and the reciprocal influences of each partner. Having established the impact of obsidian on Tigray and the Tihamah, chapter five then examines the physical realities of movement and how this relationship was manifest. In chapter six I will use remote sensing to explore the routes of long-distance trade between Ethiopia and Yemen despite the difficulty of traversing the challenging topographies of the 300 km journey. These routes, effectively, a first millennium BC superhighway I suggest, brought wealth, power and influence on both regions leading to the growth that we see reflected in the archaeology. I will discuss theoretical approaches to the landscapes of Ethiopia and Yemen in chapter seven. In chapter eight I will conclude with a summary of the issues, themes and suggested outcomes for future research stemming from this thesis. Archaeological survey and excavation in both Tigray and Tihamah has been hampered by the military and humanitarian crises that have occurred there and are even now preventing further research from taking place.

1.13 Note: Terminology

Whether in relation to Ethiopia or Yemen the spellings of names of archaeological sites can vary significantly, it is rare that any two authors discussing the same site will use the same spelling. I will use the name that the primary author of a specific site has used even if later authors use different spellings. Or, if otherwise I will indicate the difference. Therefore, I use Al-Kashawba (the Gas Station), in Yemen, as Carl Phillips undertook the first significant fieldwork there despite later authors using alternate spellings. I opt for Aksum rather than Axum as the former seems to be in more common use. I use Beilul rather than Beylul as this is how the modern village name is spelt. With the emerging archaeologies of Yemen and Ethiopia, particularly, sites can often have completely different names. This is certainly the case with some of the Yemen sites discussed in chapter three and has led to confusion in some instances. For example, an archaeological survey from the Tihamah in 1980s may use a different name to a more recent survey, which may not be apparent when the work is being undertaken, and it is often only much later that the discrepancy arises via discussions between different authors.

Chapter Two

2 The Pre-Aksumite in Tigray 800 – 400 BC: Introduction

In this chapter I will discuss the archaeological sites, the cultural characteristics, the ongoing development of the chronology, and the contentious issues that form what is termed the Pre-Aksumite period in the Ethiopian Tigray highlands (Fig 10). Note that some authors reviewed here prefer the alternative Axum and Axumite. It is essential to first provide this critical review of the available data because without it the discussion throughout the rest of this thesis will be without foundation. An awareness of what was occurring during the Pre-Aksumite period (800-400 BC) is essential to an overall understanding of the outcomes that I suggest in this thesis, and the suggestions that I make particularly in chapter four and five discussing the procurement of obsidian and the regional trade routes.

This chapter will discuss what is understood by the nomenclature Pre-Aksumite and its place in Ethiopian Tigray. Two factors contribute to defining the Pre-Aksumite. The first of these is characterised by six stone inscription found in different locations in Ethiopia and Eritrea, none in-situ, (Munro-Hay 1993) which infer the name D'mt (Phillipson 2009). D'mt (Daamat/ Diamat) is potentially the name of the regional polity (see page 69), geographic boundaries unknown, but within which the elite religious centre of the Temple of Yeha is located in Tigray (Fattovich 2009; Anfray 1971). Archaeological excavation and survey has found sites with similar cultural identifiers throughout the region which will also be introduced. The second feature that defines the period is the relationship with South Arabia (Yemen). Between the two is the presence at some of the Tigray, and the Tihamah sites, of obsidian. These two factors have a defining impact on the Pre-Aksumite culture, and its chronology that evolves during the first millennium BC.

Much of what we, as archaeologists, thought we knew about the Pre-Aksumite after the initial forays of pioneering researchers, is now questioned, often by the very same individuals (Gerlach 2012; Fattovich 2009; Phillipson 2000) and the very terminology and chronology that was initially proposed is now being revised. The Eastern Tigray Archaeological Project (ETAP) usefully define the term Pre-Aksumite as being used to denote chronological meaning only which refers to "sites and cultures that pre-date the Aksumite period which begins in the third century BC" (D'Andrea 2009, 5). Parallel to the Ethiopian Pre-Aksumite is the Ancient Ona culture (page 64) which although chronologically parallel to the Pre-Aksumite is a separate culture in northern Eritrea. The period prior to 800 BC in Tigray has been referred to as "prehistoric" (Harrower et al. 2020, 54), however D'Andrea et al's new chronology (2019) redefines this, but it still requires further definition as will be discussed. A revision to the Pre-Aksumite chronology, although using the same terminology (Table 1) has been proposed (D'Andrea et al. 2018) which now reframes the first millennium BC. After the Pre-Aksumite, from 400 BC onwards, the Tigray region gradually evolves into the Pre-Aksumite-Aksumite period (the PA-A transition) (Taddesse 2019) with the town of Aksum as the capital of the state and the gradual introduction of Christianity.

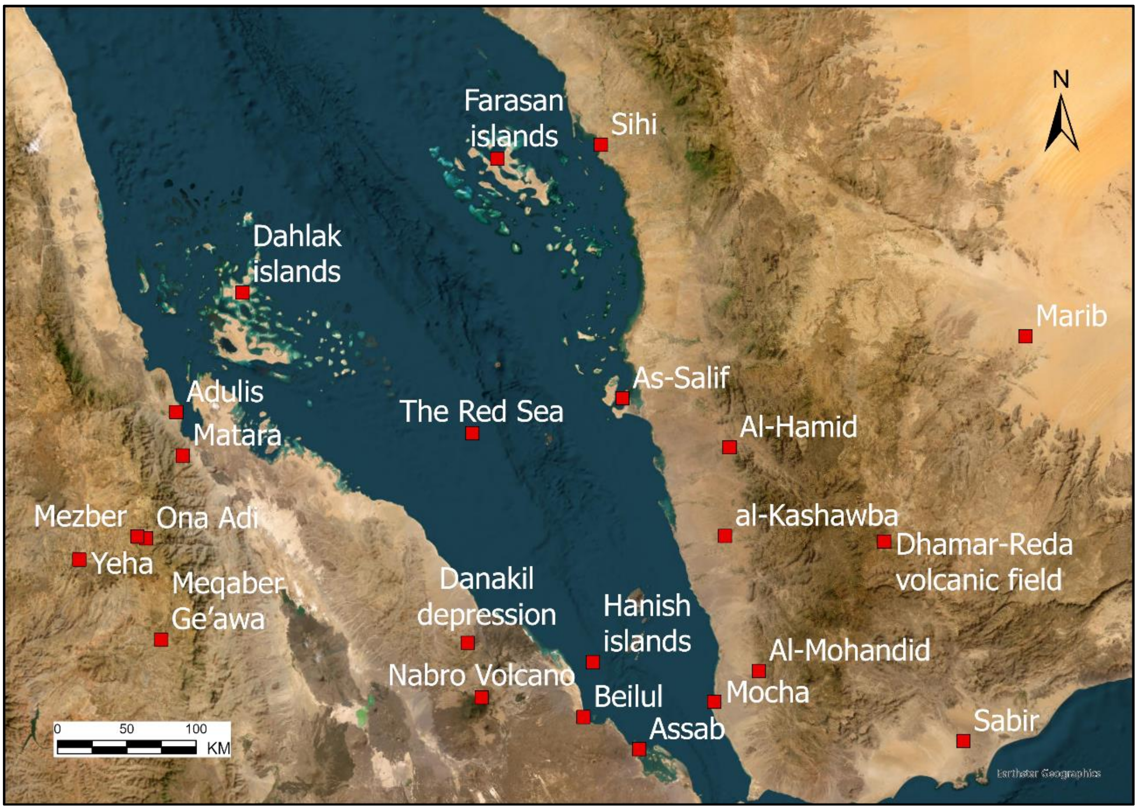

Figure 10. Map of Ethiopia Tigray and Yemen with sites discussed in this chapter.

The Tigray region of northeast Ethiopia (Fig. 10) has evidence of activity extending back 3000 years, at least, with regional interconnectivity to Egypt, Nubia, and Southern Arabia (Fattovich 2012, 2009; Phillipson 2010; D'Andrea et al. 2008; Anfray 1967). The earliest documentary record referencing Tigray is the Graeco-Egyptian trade manual, the Periplus of the Erythraean Sea, dating to the 1st century AD (Casson 1989; Huntingford 1980). Away from the ancient urban centres, documentary records are extremely limited until accounts by 19-20th century European explorers (Crawford 1958; Nesbitt 1930; Bent 1893; James 1867). What these travellers contribute (chapter five) is a significant series of maps illustrating the trade routes that were in use at the time.

Defining the Pre-Aksumite period (Fig. 12), or culture (each of these terms is now questioned), as will be discussed in some detail below, has been a protracted discussion during the last 60 years. Progress has finally been achieved, I suggest, with the newly proposed chronology at Mezber (D'Andrea et al. 2018) extending the Pre-Aksumite period. Whilst this has so far only been realised at one site there is potential, I suggest, for this new chronology to be discovered elsewhere in Tigray.

Researching this topic in 2023, I suggest that the specific focus on the sites of Yeha and Aksum has both expanded and restricted the development of the narrative. What is needed is new fieldwork in eastern and southern Tigray to address the cultural and chronological framework (Table 1).

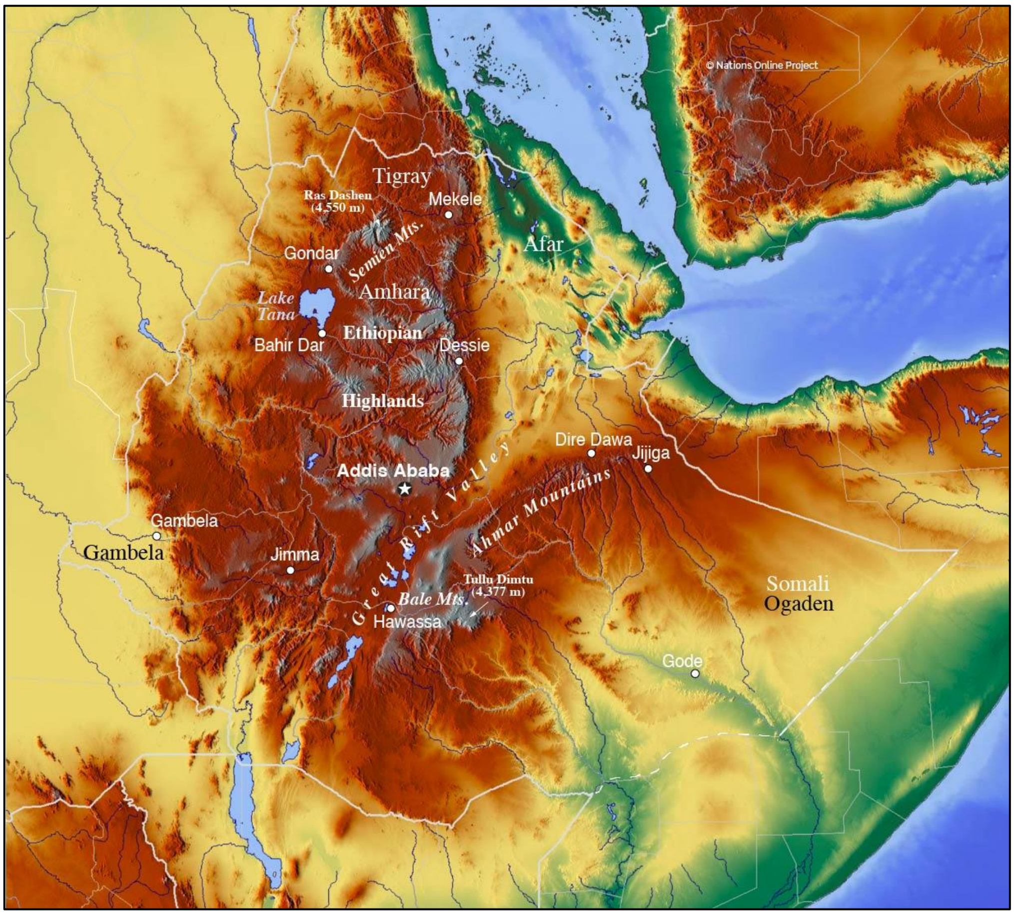

Figure 11. A topographic map of Ethiopia with Tigray shown at the top centre.
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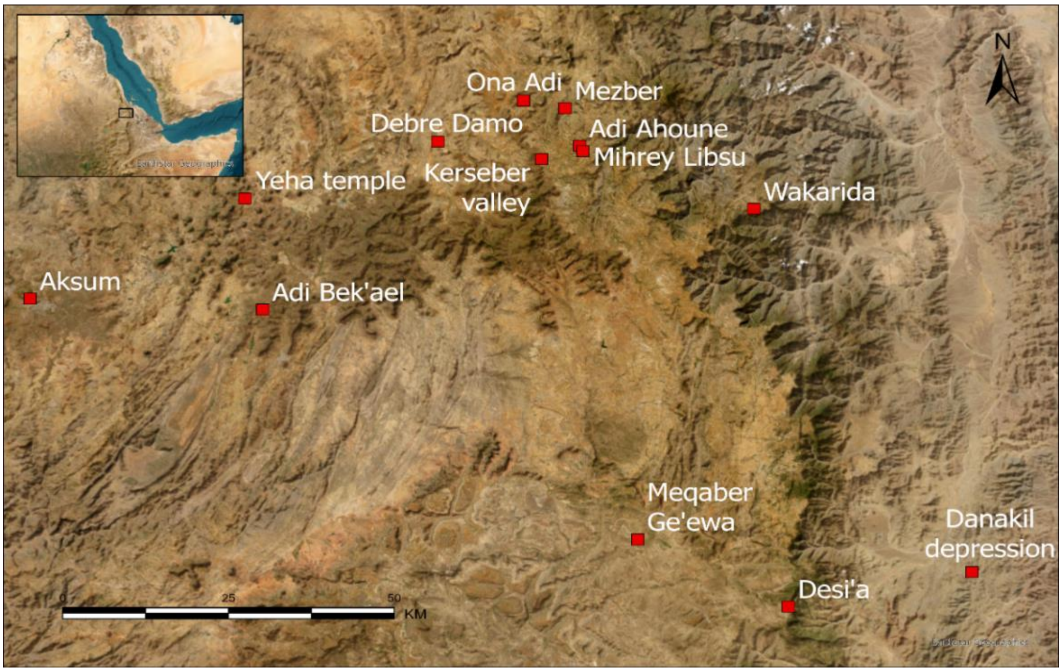


Figure 12. The primary Pre-Aksumite sites in Ethiopian Tigray ca. 800 BC.

2.1 Part One- Prehistory in the Tigray highlands: *Période préaxoumit*

Tigrayan archaeology began in earnest in 1963 when Anfray's French expedition investigated Matara, in southern Eritrea, an easily identifiable series of rock cut tombs. Anfray (1967) ascribed the term *Période préaxoumit* as a way of subdividing the characteristics apparent in the material assemblage within the Aksumite chronological development, a similar practice to Petrie's Sequence Dating in Egypt (Petrie 1920). The period prior to 800 BC in Tigray has been referred to as prehistory or as "an earlier ill-defined prehistoric era" (Harrower 2020, 54) but without any further definition and only limited study (Oppenheimer et al. 2019) .The newly extended Mezber Pre-Aksumite chronology (D'Andrea et al. 2018), however, shifts the boundary of the Prehistoric period back almost 800 years to 1600 BC. This represents a highly significant temporal shift in perception for the second millennium BC and the Pre-Aksumite. Harrower's (2020, 54) "ill-defined era" could now begin to have a clearer definition. I suggest that the newly proposed chronology at Mezber (D'Andrea et al. 2018) (Table 1) can address those concerns having extended the timeframe if not changed the terminology. We need to know how this 800-year period of time contributes to and defines our overall understanding of the Pre-Aksumite phase. Investigating this period specifically will illuminate what is meant by the Pre-Aksumite.

An indigenous population probably lived in the Tigray uplands of Ethiopia for hundreds of years prior to the first millennium BC (Phillipson 2013), meaning a time prior to written records, the definition is not time specific. Academically the term itself is currently being revised as "deep history" (Gamble 2021, 1) or "deep past" (Garrow and Wilkins 2022, 19), as is currently used in the British Museum Stonehenge exhibition, in an attempt to counter the hierarchical implication that literate cultures are in some way superior to those that do not use text.

By establishing the earliest phase of the Pre-Aksumite as 1600 BC (D'Andrea et al. 2018), this means there is 800 years before the building of the main phases of the temples at Yeha, and Meqaber Ge'awa. This doubles the chronological sequence (Table 1) indicating a significant absence in the current archaeological record. So, who and what was occupying Tigray during this time? Were they the Sabaeans, from South Arabia, as suggested by Phillipson (2013) and Gerlach (2005), at Yeha? On the evidence of the archaeological record a Sabaean influence is present in the earliest stratigraphy at Yeha, indicating an exogenous presence in Tigray that is linked with the trade and procurement of obsidian. Based on the evidence of fragments of Sabaean styled ceramic incense burners (page 95) found in Tigray (Wolf and Nowotnick 2010) it is assumed that incense was being imported to Tigray and the Horn of Africa from Arabia (Khalidi 2007; Inizan and Francaviglia 20002). So were South Arabian cultural imprints, language and writing, and possibly architectural and technical skills, in evidence at Yeha and Meqaber Ge'awa (Wolf and Nowotnick 2010; Fattovich 2009) ?

2.1.1 Excavations at Yeha: The Great Temple of Yeha

The Great Temple (Fig. 13), a Sabaean style temple, consists of a rectangular building 18m in length by 15m wide and currently stands 15m in height, with an entrance facing west. The interior of the building was divided into five aisles with four rows of pillars, with three chambers situated at the east end of the building. The floor of the building is covered by sandstone panels laid directly on to the bedrock although a drainage system is carved into the floor to prevent the interior from flooding. The building had a second story with the central area open to the sky. The shape of wooden interior walls are still visible as a dark shape marked on the stone walls. The façade was a six pillared covered entrance leading to a single doorway into the Temple. The stratigraphy at Yeha indicates an earlier pre-Temple structure existed at the site (Japp et al. 2011; Robin and De Maigret 1998), probably dated to 750 BC (Manzo 2009; De Maigret 1998) from which fragments of Sabaean architectural material may survive (Manzo 2009). The building is not on the highest point of the mound on which it stands, a modern church now stands here, and it is possible that an even earlier building stood here.

The Temple of Yeha (Fig 13) is the only remaining standing building of the Pre-Aksumite period. Here the Pre-Aksumite themes are most strongly represented and extend across the Tigray highlands. The Pre-Aksumite themes defining Yeha are the relationship with the Sabaeans, Yeha's relationship to the D'mt polity, the trade of obsidian, potentially the trade in incense, other exogeneous links with the Ancient Ona culture, and Nubia, the temple as a representation of a natural landscape, and the dominant first millennium chronology (800 – 400BC). The Sabaean influence is seen at its strongest here and helps define the chronology of the first millennium BC. The Temple of Yeha is largely seen as the heart of the Pre-Aksumite, and around which a significant part of this PhD discussion revolves. The Temple of Yeha has examples of South Arabian architecture comparable to Sirwah (Schnelle 2018; Gerlach 2005), the Nakrah Temple at Baraqish and the Temple of Ma'in (Schnelle 2018; Japp et al. 2011), these latter two of the primary temples at the Sabaean capital Marib, in Yemen (Fig 10). The Temple of Yeha, for which UNESCO World Heritage status has been applied (https://whc.unesco.org/en/tentativelists/6477/), is both a genuine Sabaean sacred building (Japp et al. 2011; Robin and de Maigret 1998), dedicated to the Sabaean god Almaqah, and a revered National Monument, being the oldest standing building in Ethiopia (Fig. 13).

Figure 13. The Great Temple of Yeha. Photo Richard Lee, 2018.

Anfray's excavation (1972, 1971, 1963) revealed seventeen shaft tombs at Daro Mikael cemetery (Fig. 14), south-west of the Temple, with between one and three burial chambers in each tomb. The results here included eight tombs of a mid-first millennium BC date, one of uncertain date, two dating to the early second millennium AD, and six that were empty (Anfray 1963). Dating was by ceramic identification in comparison with ceramics from the settlement site of Matara (Anfray 1967) revealing clear similarities between the two sites however only a limited number of styles could be found in the funerary contexts. In tomb 3 one S-profile vessel, typical of the

Ancient Ona Culture (Schmidt et al. 2008) was found. Fragments of a ceramic known as black polished coarse ware, associated with the late Pre-Aksumite rather than the earlier phase, occurred in all the shaft tombs however, suggesting that the archaeological contexts had already been disturbed when Anfray began excavations. Only a small number of ceramics were described as a South Arabian style (Anfray 1972).

Fattovich (1972a, 1971) excavated eight test pits , 4x4m square, 3.00m in depth to the north and to the south-east of the Temple. It is unclear what the location of test pits A-C (Fig.14) were aiming to achieve as they are not close to the temple, however excavating within the temple may not have been permitted. Sondage 1 at Gual-Edaga, west of the palace, however, does show what appears to be collapse from a former structure. Dating was primarily from comparison of ceramic styles. Significantly for this thesis, to be discussed in chapter four, the excavation found obsidian fragments, ca 1.00m depth, and obsidian blades in level II at 2.20m depth, dated to the 5th century BC. Fattovich' s excavation at the Temple confirmed that the existing monument had replaced an earlier small temple, or "shrine" (Fattovich 2004, 73) built in the same area. The ceramics from the foundations of the temple were South Arabian in style (Fattovich 2004).

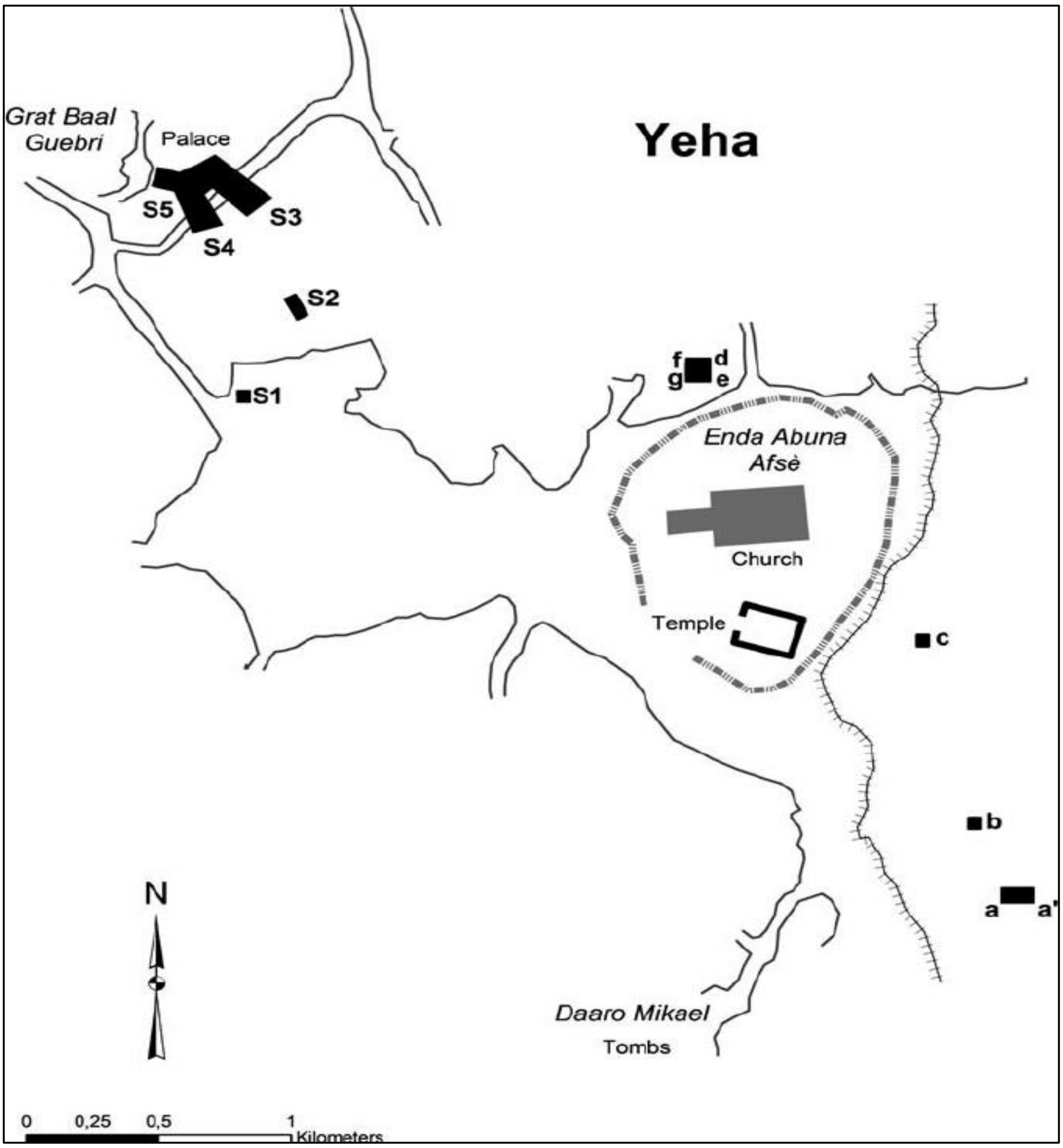


Figure 14. A map of the site of Yeha (Fattovich 2009, 279) indicating where the early excavations took place. Anfray’s test pits S1-5 were at Grat Ba’el Gebri; Anfray also excavated at the Daro Mikael tombs to the south of the Temple. Fattovich's test pits A-G.

The French project (Robin and De Maigret 1998) is the only one to excavate actually within the walls of the Great Temple and the first to use what might be referred to as modern recording methods (Spence 1990). This project focused on investigating and recording the construction and architectural aspects of the Temple rather than excavation of its remains. Robin and De Maigret were the first to completely record the architecture of the Temple both internally and externally. Robin and de Maigret (1998) confirmed that the ceramics from the foundation of the temple were South Arabian in style, and that the Temple may also be South Arabian (Robin and De Maigret 1998).

2.1.2 Grat Ba'el Gebri

Grat Ba'el Gebri is a monumental timber frame building (Fig. 15) (Schnelle 2018) with an eleven-stepped podium and a six-pillared portico, 10m in height, first discovered by Theodore Bent in his travels through Abyssinia. The rectangular building, 46x46m sq, is a complex with a multi-floor superstructure. A huge gate with large doorposts would have led into a corridor through the building. Inside, the walls of the rooms were reinforced with wooden beams (Schnelle 2018) although these were later destroyed by fire. The walls on top of the building were constructed of a timber framework (Schnelle 2018) consisting of wooden beams, stones and mud. A second story of the building can be identified but was also destroyed by fire. Anfray (1963) refers to the building as a Palace due to its elite appearance. The building is dated to the 8-6thcentury BC and of Sabaean style. The remains of the building are in a poor condition and have now been roofed for protection, although this is not an attractive feature. An earlier building appears to have stood here also.

Only the lower levels of the building now remain with much of the superstructure requiring clearing and excavation. Anfray (1963) excavated a series of test pits to the south and west of the building. Stratigraphic test-pits at the base of the podium demonstrated that the area had been occupied before the construction of the 'palace', but no walls were found just debris (Anfray 1973a). Anfray's test pits at Grat Bael Gebri indicates that what he finds is stratigraphically very disturbed. There is a considerable amount of destruction, which he describes as scorched earth, coal, collapsed walls, with evidence for significant burning and "fire of rare violence" (Anfray 1972, 51) which appears to have immolated wall structures, and the wooden interior (Anfray 1973).

Figure 15. The facade of the Grat Be'al Gebri, Yeha. Photo: Richard Lee, 2018.

Fattovich placed a test pit near to the podium of the Grat Ba'el Gebri although this is not indicated on his map (Fig.16), perhaps indicative of recording practices at the time. The base of the podium revealed that an earlier stratigraphic deposit predates the Grat Be'al Gebri (Fattovich 1971; 2009). The deposits, as with Anfray (1973), revealed a very mixed stratigraphy with considerable disturbance, sometimes "without any discernible difference" (Fattovich 1972a, 84).

The most recent excavations at Yeha are by the Sanaa Branch of the Orient Department of the German Archaeological Institute (Schnelle 2018; Gerlach 2012, 2013; Japp et al. 2011) who had switched their research to Ethiopia following the Yemen civil war. This was a conservation and renovation project, not excavation, which has focused on securing the long-term structural integrity of the Yeha Temple and Grat Ba'el Gebri. The only excavation undertaken by the project was the nearby cemetery of Abiy Addi (Japp et al. 2012), a series of shaft tombs, comparable to the tombs excavated by Anfray (1973, 1963). The cemetery excavation revealed shafts 2.5m in depth with multiple burials although these had been previously disturbed. Based on the grave goods a date of 7-8th century BC is proposed (Japp et al. 2011) with both local and South Arabian artefacts depicting the Sabaean styled Ibex ceramics (Fig. 18) known from the Yemen Tihamah. Whilst a number of short publications (Gerlach 2014) report on the teams work the project was interrupted by the Tigray military conflict in 2020, with a full summary still awaited. The aim of the project is to reconstruct Pre-Aksumite society (Gerlach 2012), to whatever degree that is possible.

Bibliographic reference	**Grat Be'al Gebri**	**Great Temple of Yeha**	**Abiy Addi cemetery**	**Fattovich phasing (2009)**
Fattovich 2009	8-7th c BC (Yeha I)	8th c BC (Yeha I)		Yeha I
Gerlach 2014	800 BC (^{14}C)	650 c BC	8th c BC	Yeha II
Japp et al. 2011	Late 8th - 6th BC (^{14}C)	6th c BC	7-6TH c BC	Yeha III

Table 3: A chronology of the Great Temple of Yeha and its associated sites. The Daro Mikael cemetery dates to the 7-8th century BC (Yeha II) (Fattovich 2004).

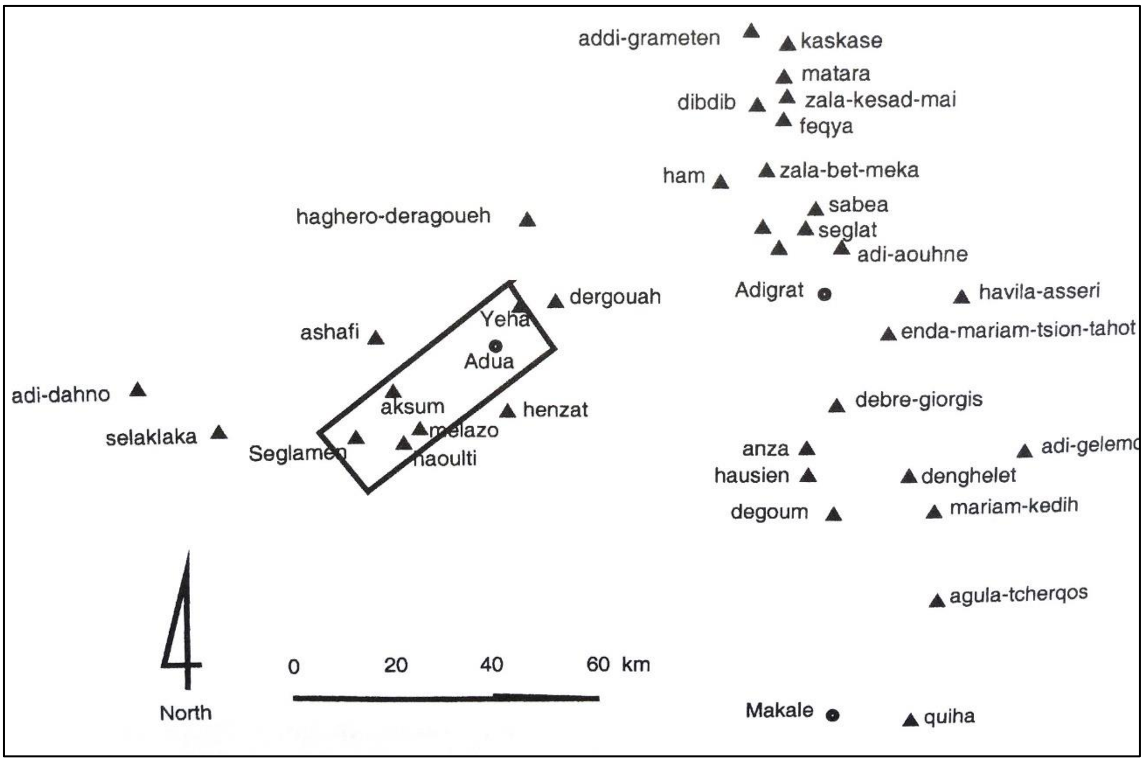


Figure 16. Michels survey area 1974. (Michels 2005, 51).

Joseph Michels, Pennsylvania State University, undertook a landscape survey of 714km^2 (Fig. 16) between Yeha and Aksum, in 1974, although unpublished until 2005. No excavation took place during this project but the survey identified 253 sites in the hinterland around Yeha and Aksum with many of the sites dated to both the first millennium BC and the first millennium AD (Michels 2005). The majority of the sites discovered during the survey have still not been excavated. One site, known as Enda Gully, (Michel 2005) was noted to be a large settlement with ceramics dating to the early and mid-first millennium BC, indicating the possibility of being a non-elite settlement for Yeha temple, a theory still awaiting archaeological testing. The survey collected 180,000-plus sherds from surface collections presenting a major challenge in assessing the collection, in part why Michels survey publication took nearly thirty years. The resulting publication (Michels 2005) is a dense series of results that are difficult to assess. Michel's (2005, 15) Yeha chronology was primarily based on obsidian hydration, the veracity of which has been questioned (Ambrose 2012; Finneran 2005b). Michel's Middle Pre-Aksumite sequence aligned with Fattovich's (2009) suggestion for the same chronology, the 7th-5th centuries BC, so although they both used different techniques the answer is broadly the same. This survey encompassed an unusually large area, significant parts of which still remain to be investigated further.

Making sense of the Yeha excavations

The test pits Fattovich excavated suggest three chronological phases at Yeha (I-III) (Fattovich 2004) (Table 2) but these are based on comparative ceramics from other sites in the region, particularly Matara in Eritrea, plus the dating of Sabaean inscriptions. The dating is only relative, therefore, and open to question, but useful for developing a narrative for the building. The newly excavated Yeha cemetery at Abiy Addi (Japp et al. 2010) provided ^{14}C dates (specifics not published) using contemporary excavation techniques and providing more accurate dating than Anfray 1970s excavations at Daro Mikael hence they are cited above (Table 2). Anfray's (1967) excavation at Daro Mikael (not Abiy Addi tombs) was located 300m to the southeast of the Great Temple and dated to the 5th-4th centuries BC based on the ceramic typology of finds retrieved during the excavation. Fattovich disagrees with this date preferring a mid-first millennium BC date (2009). The German excavations (Japp et al. 2010) suggest a date of 7-6th centuries BC based on their ^{14}C dating and their Sabaean, and indigenous, grave goods.

Fattovich excavated eight test pits around the Great Temple, and Palace, indicating that an earlier structure had existed there with Sabaean ceramics in the earliest stratigraphic deposits (Fattovich 1971) although there is uncertainty about which chronological phase these belong to (Fattovich 2009, 28). Fattovich (2004, 73) describes the earlier structure as a "South Arabian shrine" because Sabaeans had settled on the plateau - both of which are definitive statements that others, notably Phillipson (2009) question, but which Arabian epigraphers would affirm (Phillips and Beeston 2005). This is the only time the term shrine is used to describe the pre-Temple structure at Yeha, with Fattovich perhaps drawing on knowledge from the small shrines at Hawelti and Melazo (Japp et al. 2011; De Contenson 1963). Subsequently, Robin and De Maigret (1998) identified the foundations, where South Arabian ceramics were found, as representing an earlier small temple without calling it a shrine. The Great Temple of Yeha was not built on the highest level of the mound therefore it is possible that an earlier structure did once stand where the modern Christian church now stands, a not uncommon characteristic in Tigray (Henze 2005).

The Grat Be'al Gebri (Fig. 15) bears an architectural resemblance to structures at Sirwah near Marib, Yemen (Japp et al. 2011) c14 dated to the 9th century BC. The term palace (Fattovich 2009; Anfray 1963) is a questionable one to use, with echoes of antiquarian archaeology, but, in comparison to similar structures in Yemen and Egypt, an appropriate one. The architecture of Yeha temple, whilst impressive, bears more of a practical functional style. The Grat Be'al Gebri is clearly for a different use, with its stepped entrance façade suggesting an elite building in keeping with similar structures in Egypt i.e. the Ramesseum at Thebes (Shaw and Nicholson 2003), or indeed the Marib temple (Anfray 1972). Anfray's excavation of the Grat Be'al Gebri revealed that the monumental building was constructed with a stepped podium, with a porch and pillars in a South Arabian style, which was destroyed by fire of an unknown cause in the mid first millennium BC (Anfray 1972). A later rebuild placed a new wooden structure over the top of the destruction.

The pre-temple and pre-palace deposits are Fattovich's (2009) Yeha I phase (8th-7th century BC) (Table 3) with this date range based on similar Sabaean ceramic and inscription analysis. At the Daro Mikael tombs an alabaster vessel indicates a date of the 8th -7th centuries BC based on comparisons with Napatan examples from Nubia (Fattovich 1990). Yeha I ceramics have no parallel with similar assemblages at Ancient Ona sites (Schmidt et al. 2008) but do have similarities with ceramics of the early Jebel Mokram group near to Kassala, in the Gash delta (Fattovich 1989a). Characteristic Jebel Mokram ceramics were also found in the earliest deposits of the Yeha Abiy Addi shaft tombs (Gerlach 2021). Fattovich's Yeha I phase, based on ceramic typology, provides a stratigraphic benchmark for comparing other early Pre-Aksumite sites throughout Tigray. But a caveat should be applied because it is drawn from disparate sources which Fattovich (2000) acknowledges are not absolute-dates.

Fragments of Sabaean decorative masonry (Fig. 17) including pillar bases, and Ibex frieze's, have stylistic parallels with the Almaqah temple at Sirwah near Marib in Yemen (Gerlach 2005) discussed in chapter three. The ibex motif (Fig. 18) is one of the most iconographic images in South Arabia at this time (Manzo 2009). A re-used fragment of a Banat 'Ad - a stone pillar decorated with animal scenes – is the most ancient artefact that can confidently be dated to the Pre-Aksumite at Yeha (Manzo 2009; Robin and de Maigret 1998). The significance of the Banat 'Ad is that as a temple decoration it pre-dates the South Arabian Sabaean culture suggesting that another structure, that it came from, existed at Yeha prior to 850 BC (Manzo 2009) or that it was from another site but reused here as part of the building foundations. The stone inscriptions (Fig.

17) are displayed in the Yeha museum, located between the Temple and the church, but without any information or explanation provided.

Figure 17. Fragments of Sabaean architectural masonry decoration displayed in the Yeha Enda Abuna church, adjacent to the Temple. Photo Richard Lee, 2018.

Figure 18. An Ibex decorated sherd from Al-Hamid, Yemen. Photo Carl Phillips, 2000.

The excavations at Yeha, having taken place over nearly sixty years, have constantly developed and progressed but produced contradictory results and theories. Gerlach (2012) suggests that contacts with South Arabia existed for some time before the Temple was built, evidenced by the ceramics, and the Banat Ad, found in the pre-temple test pit deposits. Jacke Phillips (2004) suggests that interaction with Arabia must be seen as already existing by the Pre-Aksumite period, that “Direct Sabaean cultural influence is a separate discussion” (Phillips 2004, 82), but that, as Phillipson notes, Yeha “may safely be described as Sabaean in style” (2013, 3)**.** As already mentioned, and I will discuss further, this is at the core of understanding the Tigray region and Pre-Aksumite culture.

It is very probable, presented with the Sabaean evidence at Yeha (Japp et al. 2011; Gerlach 2012; Fattovich 2009), that the Temple was built by the Sabaean visitors assisted by the local Tigrayan communities. The Sabaeans would have been the architect, based on the style, the project manager effectively, supervising local crafts-people in how to construct a building which by then were plentiful in Yemen (Japp et al. 2011; Gerlach 2005), for example Al-Hamid on the Tihamah (Phillips 1997) discussed in the next chapter. The German renovation work of the Yeha Temple recorded typical Sabaean building techniques on the exterior stonework alongside inscriptions indicating that the craftsmen were from Marib, Yemen (Gerlach 2012).

Determining why the Temple is built where it is, I propose, is some guidance as to why the place, the location chosen for building, is significant. Yeha temple appears to be the western limit of the Pre-Aksumite, possibly a spatial limit. The temple appears to demarcate a boundary or a border – the end of the line, a line that starts further to the east - perhaps at the Nabro volcano obsidian source, or overseas on the Yemen Tihamah. This still doesn't explain why there is a strong Sabaean influence in its very earliest stratigraphy. Is this linked to the 'place', or might the temple have been located on a significant trade route? Building a structure in an area that had not previously had one is an action "recognising memory and mobility", as suggested for similar activity in the French Alps (Walsh & Mocci 2011), by the Sabaeans in relation to their movement from Yemen to Ethiopia. In constructing Yeha temple the incoming Sabaeans are both replicating their own culture and assimilating their position in the community. Yeha is a religious temple site, with an elite palace, but also with a distinctive exogenous Sabaean characteristic.

The non-elite settlement at Yeha may have been located at Enda Gully, described as the "earliest urban community" (Michels 2005, 71) in the Yeha valley, a potential 6ha town site discovered, but still unexcavated, by Michels 1974 survey. Michels survey identified the site from the densest concentration of pottery fragments in the Yeha region. Excavation here has the potential to be highly informative of not just the site itself, but the chronology and the culture at Yeha generally.

Evidence for fire and destruction is one reason why Yeha may have eventually ceased to exist as a major religious centre. But there may be more prosaic, if equally detrimental evidence, for its decline from environmental degradation. The significant population growth and its need for resources impacted the development of agriculture around Yeha causing severe soil erosion subsequently leading to a reduced carrying capacity due to intense cultivation and livestock grazing (Machado, Perez-Gonzalez, and Benito 1998). Whilst the Yeha region had a wetter climate during the first millennium BC (Gerlach 2021; Terwilliger at al. 2011) than currently this was intermittent and significant population growth may have proved too onerous for the marginal semi-arid environment to sustain.

A ninety-minute walk north of Yeha is the tell-like town site of Beta Semati excavated by the Southern Red Sea Archaeological Histories Project (Harrower et al. 2019; Harrower 2021) one of 84 sites within its 100-km^2 survey area. Sixteen of these sites were dated to the Pre-Aksumite. Beta Semati is primarily an Aksumite occupation but with a brief Pre-Aksumite archaeological context. The earliest layers of the site provided c14 dates of (D-AMS 020959 2477+/-27 cal BP 771 to 458 BC), and (D-AMS 022060 2455+/-39 cal BP 752 to 430 BC) (Harrower et al. 2019, 1543), dates coeval to the Pre-Aksumite. Amongst the lithics retrieved from the site were obsidian cores, debitage and tools. The site's location potentially places it on the northern route towards Adulis, but also close to the Rama valley which may have been a route connecting to the Nile valley, discussed further in chapters five and six. The early dates for the site place it centrally to his thesis discussion of Tigray interconnectivity.

2.1.3 Yeha: a summary

The words tentatively and probably appear frequently when interpreting the results from Yeha indicating the uncertainty with which Anfray, Fattovich, Michels, and commentators such as Phillipson (2009) apply to the excavation results. But this also presents the contemporary reader, new to the site, in this thesis for example, with the challenge of interpreting its history.

As a field archaeologist myself, the early Yeha excavations of the 1960-1970s were less forensic than one would wish for. Excavating in "spits" (Roskams 2001, 112) of 10-25cm intervals is not the optimum way to create a precise stratigraphic sequence which is how Fattovich (2009) describes his excavations as being undertaken. My long-term experience as an archaeologist working on excavations that are undertaken in spits, also known as the planum method (Darvill 1999) indicates that excavators do not necessarily apply as much attention to arbitrarily defined 'spits', as they do when excavating naturally stratified deposits. Indicative of this, Fattovich uses the term "approximate" (2009, 278) when discussing earlier excavations, as it was not possible to always link archaeological strata to artefact provenance with the result that materials from different strata became mixed (Fattovich 2009). This obviously has serious implications when considering that ceramic analysis was his primary method of dating the archaeological strata. Single Context Recording excavation (Spence 1990) gives the archaeologist greater control of the stratigraphic deposits than a method in which designated 10cm 'spits' are excavated. Most of the excavations at Yeha took place before the general use of expensive ^{14}C radiocarbon dating, hence the uncertainty of the dating as Fattovich confirms (2009). Although the pre-Temple test pits are very tantalising, they provide only a very limited window into a specific area of the site and, as discussed above, they had frustratingly mixed results.

Significantly however, the construction of this elite centre most likely assisted in coalescing a scattered indigenous population (Phillipson 2013), enhancing the region's socio-economic and political value. The stone for the Temple was sourced from a quarry near Wukro almost 90 km away (Gerlach 2013) necessitating massive human effort for the transportation. Phillipson (2009, 264) suggests that "it appears safe tentatively to conclude that the Great Temple or its vanished predecessor was the first major structure at Yeha", which is certainly possible but unless the greater area of the site can be excavated, uncertain.

The results of the test pits indicated that the archaeological deposits were very mixed with Fattovich (2009) acknowledging the difficulty he faced in providing accurate dates for these levels. Both Anfray (1972) and Fattovich (1972) describe finding debris rather than walls, although the black and white photograph of one sondage (Fattovich 1972a) appears to show what could be interpreted as structural elements rather than debris. Fattovich's stratification reports (1972, 1972b, 1971) however have no section drawings, plans or illustrations, so reinterpreting his work 50 years later is a challenging task. As a modern-day archaeologist, it is difficult to see this as anything other than a failure. It is difficult to match his description of the location of his test pits with what his map indicates (Fig. 14). His "reconsideration" of Yeha (2009) is also confusing relying as it does on comparative ceramic styles from Matara for dating purposes. By his own account the "factual evidence dating to the first millennium BC from Tigray and Eritrea is very scarce and any interpretation of this evidence must be regarded as speculative and largely intuitive" (Fattovich 2009, 278; Phillipson 2009).

The site of Yeha is an impressive archaeological site, but one which some of the recording and publication by modern standards. It is quite difficult, in 2023, to extrapolate from the publications a clear understanding of exactly what archaeological work has taken place at the site, and what the results were. Fattovich's (2009) reconsideration of Yeha doesn't assist with clarity but does underscore the uncertainty of some of the results. As discussed in this section, Anfray (1963, 1971) and Fattovich's work (1972a, 1972b) creates a chronology, a history, and probable evidence for the destruction that terminated Yeha; the work of Robin and De Maigret (1998) records the architecture and its potential South Arabian influences at the site. One longs for a single clear and precise record of the site, but we also have to allow for the recording techniques of their day which are not quite as accurate as modern excavation practice. Even when looking to Michels Yeha survey (2005) there is concern over his use of obsidian hydration dating (discussed in chapter four), hence further uncertainty.

Fattovich (2004) does not indicate why he uses the term 'shrine' to describe the building that existed before the temple. All of the Yeha excavations indicate that a structure of some type pre-dates the Temple, with the evidence of Sabaean ceramics found in the same stratigraphic deposits confirming the exogenous influence at the site. The currently interrupted work of the German Archaeological Institute has presented ^{14}C dates (Japp et al. 2011) that finally suggest absolute dating for the cemetery and the Temple, dates which corroborate the South Arabian influence. The present of Nubian Jebel Mokram ceramics in similar early deposits alludes to a potential further regional trade connection, yet not as overtly as one might anticipate, given Nubia's relative proximity.

2.2 Other Pre-Aksumite sites in Tigray

Yeha is the defining architectural feature of the Pre-Aksumite first millennium BC, but there are a number of other sites with direct relevance to this discussion. Fattovich (1990a) initially identified three sites that represented the Pre-Aksumite period: the Temple of Yeha, and two smaller temples at the twin sites Hawelti, and Melazo, 1.5km apart, to the south of Aksum (Japp et al. 2011; De Contenson 1963). The oldest South Arabian inscription in the northern Horn of Africa was found at the site of Seglamen (Sernicola 2017)**,** southwest of Aksum, and dated to the first half of the first millennium BC and similar to inscriptions known at Yeha, and Keskese in Eritrea. Excavation at Seglamen (Sernicola 2017) revealed extensive building foundations, a 7ha size site, perhaps of a provincial elite characterised by three major architectural phases, with a cemetery consisting of rectangular or circular shaft tombs, some of which were accompanied by sandstone stelae. The architectural remains alone indicate a site of significance but its location, close to the Shire region**,** south-west of Aksum, is of particular relevance as, there is little evidence for the Pre-Aksumite here (see chapter four).

Hence the excavation of Seglamen potentially expands the geographic parameters of D'mt, a summary of which I present later in this chapter. The excavation (Sernicola 2017) highlighted imported materials, including wood, pearl, and animal skins, from all neighbouring regions – the Nile Valley and the Red Sea - suggesting that the site was a part of an "interchange circuit" (Sernicola 2017, 178) incorporating the Nile Valley, the Tigrayan highlands and both the African and Arabian Red Sea coasts, indicating the scale of the interconnectivity. Sernicola's "interchange circuit" (2017, 178) and also what Fattovich calls the "Afro-Arabian interchange circuit" (2004, 71) become central tenets of my hypothesis for this thesis. Both are terms that I utilise for describing the regional trade or exchange taking place between Tigray, South Arabia and the Nile valley during the fifth to first millennium BC.

The Hawelti and Melazo temples (Japp et al. 2011; De Contenson 1963) are located 10km south-east of Aksum on a flat hill overlooking a large fertile plain. It appears this pair of sites were once a significant architectural complex with buildings identified as temples (De Contenson 1963). One building had stone sculptures and a "throne" in a 'South Arabian style' (Manzo 2009, 298). Manzo (2009) suggests that the throne is a naos or sacred niche of Egyptian or Nubian style, related to the movement of portable deities. At Hawelti three free standing pillars, or stela, were found, in a South Arabian style with incised Sabaean letters, but these were thought to be independent monuments, not burial markers (Japp et al. 2011). Ceramics were both local, and possible Sabaean imports dated to the eight and sixth centuries BC (Japp 2005). Ceramic torpedo jars, made both locally and as imports (Porter 2004)**,** emphasise a connection between South

Arabia and the Tigray highlands, but are known to be made in both regions. Parallels with the Awwam temple, at Marib in Yemen, are suggested (Japp et al. 2011), where the Sabaean God Almaqah is named, as at Yeha.

The site of Melazo, 1.5m south from Hawelti, is a small temple measuring 9m x 7m, divided into two rooms with a votive altar on a raised platform to the east, and more reminiscent of a South Arabian temple than its twin at Hawelti. Inscriptions here mention LMQ – interpreted as the Arabian god Almaqah (Finneran 2007) - with parallels to those found at Yeha, as are the ceramic types (Finneran 2007). The comparison with Yeha, particularly, places the inscription within the date and the region of the D'mt polity (Daamat/ Diamat) (Finneran 2007), making it one of the key sites with South Arabian influence. Yeha, Meqaber Ge'awa, and Melazo are the only three temples with a South Arabian Almaqah dedication in the Horn of Africa, marking them out as important links in the "interchange circuit" (Sernicola 2017, 178) between Yemen and Ethiopia.

2.2.1 The Peopling of Tigray: migration, acculturation, or assimilation

Japp et al. (2011) postulate that political and religious connections between South Arabia and the Tigray highlands are proven through the Ethio-Sabaean inscriptions created by "Sabaean stonemasons in Yeha" (Japp et al. 2011, 148). Therefore the migration of larger Sabaean groups across the Red Sea into the Tigray highlands can be "assumed" (Japp et al. 20111, 157). 'Proven' and 'assumed' are contentious words to use in this discussion where so much is uncertain, and the evidence is often inconclusive, so her certainty (Japp et al. 2011) is welcome. Japp suggests that a possible trade in raw materials, without stating which these materials might be, is responsible for the influx of Sabaean "settlers" (Japp et al. 2011, 145) not simply individuals or small groups (Fattovich 2004, Phillipson 2009b). Combined with D'Andrea's Mezber chronology (D'Andrea et al. 2018), and Fattovich's proposal for a pre-Yeha "shrine" (2004, 74), the early Sabaean presence at Yeha is a consequence, therefore, of the trade of obsidian, and potentially incense.

Whilst incense trees are known at Yeha temple (Gerlach 2021) it is unclear what quantity of incense was available or may have been traded. The incense exchange network is firmly established in Arabia during the second millennium BC (Groom 1981), at which time obsidian is being transported from the Horn of Africa to the Tihamah (Keall 2004; Inizan and Francaviglia 2002). Gerlach suggests that the arrival of Sabaeans is an attempt to control the extant 2nd millennium BC incense trade with the Nile valley and expand the Arabian Incense trail. At the very least therefore visitors from Tihamah are arriving in the Horn of Africa potentially bringing with them a Sabaean ideology represented in iconographic stone inscriptions at Yeha, Hawelti/Melazo. The influence must have been significant as by the early first millennium BC there are Sabaean temples at those locations. This level of change, or acculturation, doesn't occur rapidly, so either highly important figures from the Kingdom of Saba were having a significant local impact, or the constant influence of visitors was steadily leaving its imprint. If Yeha temple was a purely Tigrayan structure, we would expect to see other buildings in the region, but we don't see this, and Yeha appears to be a singular event in Tigray, although there are smaller structures at Hawelti and Melazo. The only other known Pre-Aksumite, potentially Sabaean, temple is 120km south-east at Meqaber Ge'awa (Wolf and Nowotnick 2010), discussed later in the chapter.

The exogenous peopling of Tigray in the late 2nd – early 1st millennium is one of acculturation (Gerlach 2012; Japp et al. 2011; 265 DiBlasi 2005) as opposed to a South Arabian migration or as initially suggested by Rossini (1928), colonisation although this is still a much-contested notion. Acculturation, meaning assimilation to a different culture, usually the dominant one, appears to be the most appropriate term for what was occurring at the time, I suggest, particularly if colonisation is disregarded. The German excavations of 2009 (Japp et al. 2011) proposed a theory of *both* migration and acculturation. Fattovich (2012, 4) questions both hypotheses, migration/colonisation, and acculturation. The former, he suggests, not unreasonably in my opinion, is not supported by the archaeological record which lacks the quantity of South Arabian material culture that one would expect if such a migration hypothesis were accurate. In the latter hypothesis, archaeological evidence does not support a "late Prehistoric chiefdom in the highlands" (Fattovich 2012, 4; 1997a; Harrower et al. 2022). Manzo (2009) and Phillipson (2013) suggest only a small number of immigrants from southern Arabia may have arrived in Tigray, that the invasion/colonisation hypothesis is not a valid one. Whilst the Sabaean influence is highly characteristic it is difficult to assess it in terms of quantities of people arriving in Tigray. Yeha has evidence of Sabaean stonemasons working there (Japp et al. 2011, 148), there are temples dedicated to Almaqah, inscriptions in the Sabaean language, so the influence of South Arabia is strongly expressed. Achieving this level of local recognition may need more than a small number of settlers, or perhaps a small number with significant influence, implying acculturation.

2.2.2 Culture transfer

"Culture transfer" (Gerlach 2009, 259) is used to describe the impact of South Arabian influence visible in the Tigrayan archaeological record. This suggests that the Sabaeans took architects from Yemen to Tigray in the eighth century BC to build the "hypostyle hall" at Yeha (Robin and De Maigret 1998, 745). Archaeological evidence for external ethnic groups influencing South Arabian culture is rare until the beginning of the first millennium BC despite its extensive incense trade. In Ethiopia the opposite is true and South Arabian art is present in inscriptions, cult objects, pottery, and seals (Phillipson 2009). Yemen's location, at the bottom of the Arabian landmass, bordered on two sides by sea, means that there is little passing overland trade, suggesting that Yemen is "isolated" in the way Connah (2001, 66) claims for Tigray. If Tigray was geographically isolated because of its mountainous highlands (Connah 2001), what we see in its regional interconnectivity suggests otherwise, I propose, and that the landscape was not a barrier to exogenous influence.

Whilst South Arabian inscriptions at Yeha (Fig. 19) can be identified they remain undated and unprovenanced. The South Arabian architectural style can be evidenced from the 8th century onwards in the Yeha Temple 1 phase (Fattovich 2009). The architecture is modern not archaic, with the building reflecting a South Arabian "declaration of power" (Gerlach 2009, 265), or as Fattovich suggests, an "architecture of power" (2014, 95). Gerlach suggests the Pre-Aksumite period as one of a very short colonial period, perhaps a "sounding out phase" (Gerlach 2009, 56) by a few South Arabian merchants although without much connection between local populations and the South Arabians. Given that the Arabian cultural transfer appears to be a significant one, it is probable that only selected classes were sent to Ethiopia (Gerlach 2009) – merchants, priests, architects - representing their own, rather than state economic interests. This is evidenced by the limited South Arabian pottery styles, or local Tigray imitations, suggesting that only specific sections of the population were represented. Therefore a "preliminary stage of colonisation" (Gerlach 2009, 265) with connections to South Arabia was intense, and visible in the architectural style with South Arabian gods worshipped at first before local gods were admitted to the pantheon. Considering that only small numbers of Sabaeans initially arrived in Tigray it would be difficult for them to colonise a part of Tigray; acculturation therefore may indeed be a more suitable term. An interaction with the Yeha elite for example, rather than a broad trade exchange with the non-elite population seems to be a better understanding of the interaction.

I agree that it is unlikely, in the Pre-Aksumite period, that South Arabian colonies existed, which Gerlach defines as "a group of persons of the same nationality living in a foreign country" (2009, 265). Gerlach suggests the South Arabian visitors were assimilated, gradually revoking their original purely indigenous traditions, with contact with the Kingdom of Saba becoming weaker. This activity parallels a loss of Sabaean power in South Arabia towards the end of the 7th century BC, by which time the term D'mt *can* legitimately be applied in Tigray (Gerlach 2009).

Figure 19. South Arabian stone inscriptions at the Yeha Enda Abuna church adjacent to the Temple. Photo Richard Lee, 2018.

Contradicting this Japp (2011) says there must have been significant migration into Tigray to have had such an impact. Some combination of the two may be an accurate assessment, with a select few individuals initially visiting Tigray, finding the situation to be amenable, and then being followed by larger numbers of people.

The Sabaean material culture excavated at Yeha however, or at other sites, does not give, I suggest, the impression of large numbers of people. It suggests instead an elite highly influential presence, an acculturation, therefore. I propose that this exogenous influence may be the catalyst for the germination of D’mt with the trade in obsidian and incense (discussed further in chapter four) assisting the development of its regional powerbase.

Since its early definition (Anfray 1967) the number of Pre-Aksumite sites has expanded to include Fiqya, Keskese, Matara, Ona Adi, Mezber Enzelal, Adi Gerameten, Wakarida, Meqaber Ge’awa amongst others (D'Andrea et al. 2008; Fattovich 1990a). I suggest that a research bias was unintentionally introduced to the Pre-Aksumite with Yeha as the only standing building of the period. This does not necessarily equate to it being the most important place, simply one that has survived; hence attention has focussed there. Other more significant sites may have long since been dismantled in an effort to remove an ideology, or powerbase, or have simply not survived.

Survey and excavations have revealed a wealth of important sites that indicated a significant presence had existed in Tigray: elite tombs were found at Matara, sculptures were found at the other sites, small votive altars were common, stone sphinxes were a recurring sculptural symbol alongside pottery, metal tools, and lithics. Specifically informative in defining the Pre-Aksumite was the monumental South Arabian inscriptions found at Yeha (Fig. 17-19) and elsewhere providing evidence of an overt external influence in Tigray and defining the first millennium BC chronology. The inscriptions at Yeha Temple record leaders with the title of mlk (king) and mkrb (mukarib), perhaps meaning priest-king (De Maigret 2002), commensurate with those used for the contemporary Sabaean kingship in Yemen (Fattovich 2014). The Sabaean influence, whatever the numbers involved, created a significant elite presence in Tigray, with a considerable impact on the first millennium BC culture and trade, and without which Tigray probably would have been an isolated region (Connah (2001). Although as I indicate elsewhere, I see Connah's 'isolation' as an erroneous declaration.

Part two

2.3 Archaeological Sites of Tigray

2.3.1 The Meqaber Ga’ewa temple

Whilst the Temple of Yeha represents the most visible aspect of the Pre-Aksumite, another significant temple site, Meqaber Ga’ewa**,** is located 120 km southeast of Yeha (Fig. 20). Once again Sabaean inscriptions closely parallel those at Yeha (Wolf and Nowotnick 2010) and considering its location, and style, the building could be as equally important as the Yeha temple, although it is not now a standing structure. Whilst the Sabaean influence is highly distinctive at Meqaber Ga’ewa temple, by Sabaean inscriptions and ceramics, Phillipson (2013) suggests that it has a closer parallel with the local indigenous style of northern Tigray as it lacked the finely crafted masonry of Yeha. As with much in Pre-Aksumite Tigray this apparent contradiction, one the one hand, a strong external influence, and on the other a local one, is typical of the discourse indicating the dual response to the same evidence.

Figure 20. The Meqaber Ge'awa temple excavation. Photo (c) DAI 2021, by P. Wolf.

The first known mention of Yeha is at Meqaber Ge’awa on an inscription found near to the temple, alongside an inscription referring to the Sabaean god Almaqah (Wolf and Nowotnick

2010). The Sabaean influence here makes it the most important site, I suggest, after Yeha, for the South Arabian presence in Tigray. Architecturally the temple has three stages of development. The earlier structure is on a northeast - southwest orientation dated to the 8th century and therefore coeval to the Yeha Temple. A preserved wall. 0.40m in height, is what remains of the earlier structure, ^{14}C dated (Lab used, and calibration data not published) to the 8th century BC (Wolf and Nowotnick 2010, 373). The main temple is built directly on top of the earlier one. Temporally the archaeological horizon between the two structures is quite short as both date to the 8th century. The later third structure is in an east-west orientation, dated to the 3rd-4th millennium BC and characterised by two new walls dividing the building internally.

Meqaber Ga'ewa is a smaller temple than Yeha but is more similar to the Sabaean temples at Marib and Sirwah (Schnelle 2018; Wolf and Nowotnick 2010). Whereas Yeha is a single room structure, Meqaber is a single-roomed structure but with a porticus and a surrounding temenos wall (35m E/W x 45m N/S) (Fig 22). The term temenos (Wolf and Nowotnick 2010), meaning a wall surrounding a sacred area, is not often used in the Horn of Africa and Arabia, being more common to the Levant and Mediterranean. Unlike Yeha, the internal floor level, and interior architectural detail are still in place including a preserved libation altar with a royal dedication to (Sabaean god) Almaqah, a seated female statue, architectural blocks, limestone incense burners (see page 91), and Sabaean inscriptions dated to the 8th-6th centuries BC (Wolf and Nowotnick 2010).

As with the Temple of Yeha, Meqaber Ga'ewa is an example of the elite building structures to implement their ideology, an "architecture of power" (Fattovich 2014, 95), albeit that the architectural style is marginally different. If not quite as impressive a structure as Yeha the recent archaeological excavation at Meqaber Ge'awa has been more precise and the internal architectural features and Sabaean evidence are better preserved here. This may be a consequence of better modern excavation techniques, and the site being a relatively recent discovery, in contrast to Yeha's 3000 years of existence and gradual decay. Whilst comparisons with Baraqish, Marib and Sirwah in Yemen are suggested (Wolf and Nowotnick 2010; Gerlach 2005) there are geographically closer sites to consider, the Al-Hamid temple for example (Phillips 1997) in the next chapter.

2.3.2 The Gulo Makeda region

The Eastern Highlands are eastern Tigray and the highland sites of Eritrea. Gulo Makeda (Fig. 21) is a strategic region located close to the modern Ethiopia-Eritrean border. As I propose in chapter five this seems to have been the primary route linking Tigray with Eritrean Akkele Guzay, and Ancient Ona culture sites further to the north (Fig. 21). The Eastern Tigray Archaeological Project

(ETAP) has been the most intensively researched area for first millennium BC Tigray, other than Yeha, finding 137 sites within its 196-km^2 research area, of which 32 were Pre-Aksumite (Harrower et al. 2022). Excavation found a number of significant Pre-Aksumite sites including Ona Adi, Mezber, Mihrey Libsu, Fekada, and Adi Ahoune (Harrower and D'Andrea 2014; D'Andrea et al. 2008), this latter site being the largest. Adi Ahoune and Mezber, site of the revised chronology, have what at the time was described as a prehistoric presence (D'Andrea et al. 2008) although this is now within the new Mezber Pre-Aksumite chronology 1600-400 BC. The Gulo Makeda sites lack the "monumental or sacral media" (Benoist et al. 2020) that characterises the D'mt polity, for example the Yeha Temple, but of which it may not be a part of (Benoist et al. 2020).

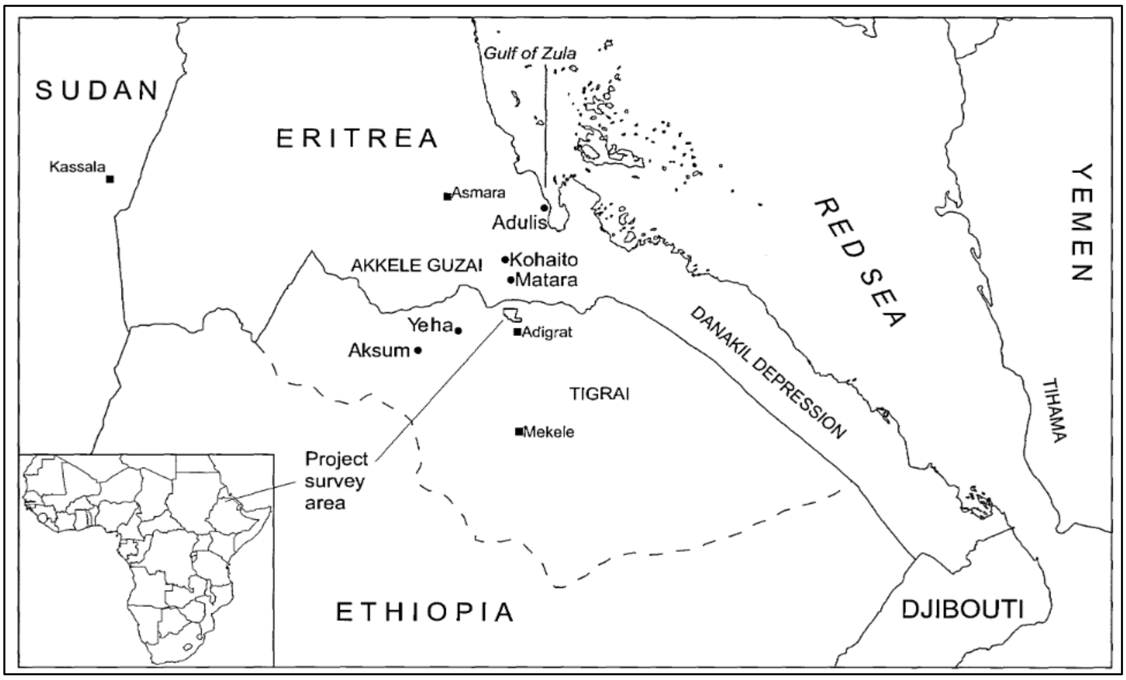


Figure 21. The Gulo-Makeda ETAP Survey area in Tigray (D'Andrea et al. 2018, 152).

2.3.3 Mezber

ETAP excavated at the site of Mezber in northern Tigray, with the evidence indicating an earlier date for the Pre-Aksumite than previously recognised (D'Andrea et al. 2018). Mezber (Fig 23) is built on a slightly raised hillside situated in a valley bottom covering 0.83 ha and is by far the oldest Pre-Aksumite site in the Horn of Africa to date (Taddesse 2019; D'Andrea and Welton in Prep). Both the second millennium BC date and the presence of obsidian at Mezber is of great significance in developing a new definition for the Pre-Aksumite. The large quantity of obsidian, 7015 pieces (Johnson and Brandt 2011) being worked here in greater quantities than elsewhere

(Table 9, chapter four), suggest Mezber may have been a central place for down-the-line regional trade.

The scraping-wiping treatment on the external surfaces of some ceramics found here (Fig 22) is known regionally, throughout the Horn of Africa, since at least the 6th millennium BC and is well represented in Eastern Tigray (D'Andrea et al. 2008). At Mezber it is dated, via other ceramics and stratigraphy, to the early first millennium BC. Mezber had similar ceramic types to those also found at Yeha, Matara and the Ancient Ona culture, in Eritrea (Anfray 1967), which may relate to a “period of unification under the D’mt state” (D’Andrea 2009, 39; Fattovich 1990).

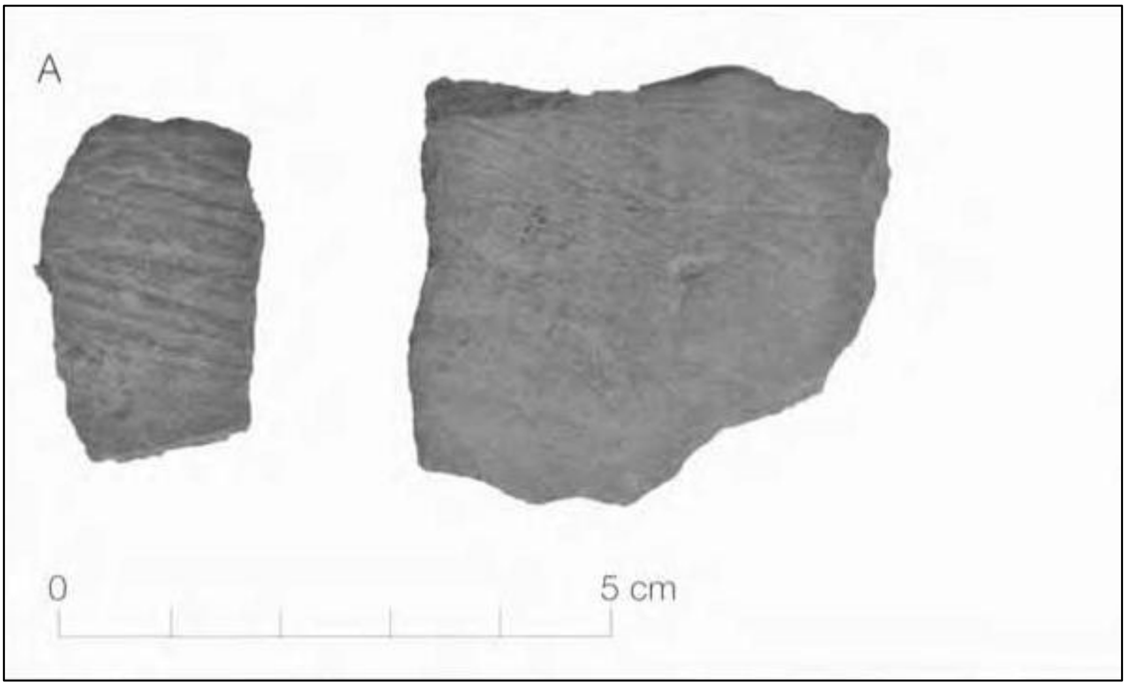


Figure 22. The scraping-wiping treatment on the external surface of ceramics at Ona Adi (D'Andrea et al. 2008, 165).

Figure 23. Excavation at the site of Mezber (D'Andrea 2009, 15).

The Early Mezber Ceramic phases dated to the late 2nd and early 1st millennium BC (Manzo and Gaudiello in Prep) also have similarities with the ceramic tradition at Meqaber Ga'ewa (Wolf and Nowotnick 2010). This data suggests Mezber's involvement in exchange networks with the Horn of Africa (Fig. 24) and beyond since at least the end of the 2nd millennium BC (D'Andrea and Welton in Prep), and probably before. This is highly significant as it anticipates further second millennium BC data which, I propose, is where the answers to many Pre-Aksumite questions may be resolved.

The population at Mezber were sedentary agro pastoralists (Woldekiros and D'Andrea 2016) practising diverse livestock and crop husbandry. The presence of unshaped fieldstone used for domestic stone walled architecture, an unusual practice in the region, suggests wealthy or elite individuals inhabiting the site (Taddesse 2019). Excavation revealed periods of abandonment and reuse, with five phases of architecture being recorded (Taddesse 2019). A short valley corridor (2.5km) links Mezber with the site of Ona Adi (discussed next) and is still in frequent use by villagers.

The new chronology pushes the beginning of Pre-Aksumite back to 1600 BC, 800 years earlier than previously known (D'Andrea et al. 2018). The chronology was based on ceramics, stratigraphy and a ^{14}C date (material dated, lab determination, and details of calibration not provided). In the initial survey Mezber appeared to be purely Pre-Aksumite but was notably larger than the other sites.

Mezber is one of the most important sites of early Pre-Aksumite Tigray, spanning both the first and second millennium BC. D'Andrea suggests that Mezber has similarities with Yeha, Matara, Aksum Site D, and the ceramics of the Ancient Ona culture (D'Andrea 2009). The parallel of ceramic types between Yeha and particularly Matara are potentially related to the period of unification of the Ethio-Eritrean highlands under the D'mt state (Fattovich 1990). D'mt however, perhaps had no political significance for Mezber and in turn reflecting its lack of political significance for D'mt in the Gulo Makeda area (Benoist et al. 2020). Based on its chronology, I propose Mezber existing parallel to the earlier pre-temple structures at both Yeha and Meqaber Ga'ewa hence indicating second millennium BC activity.

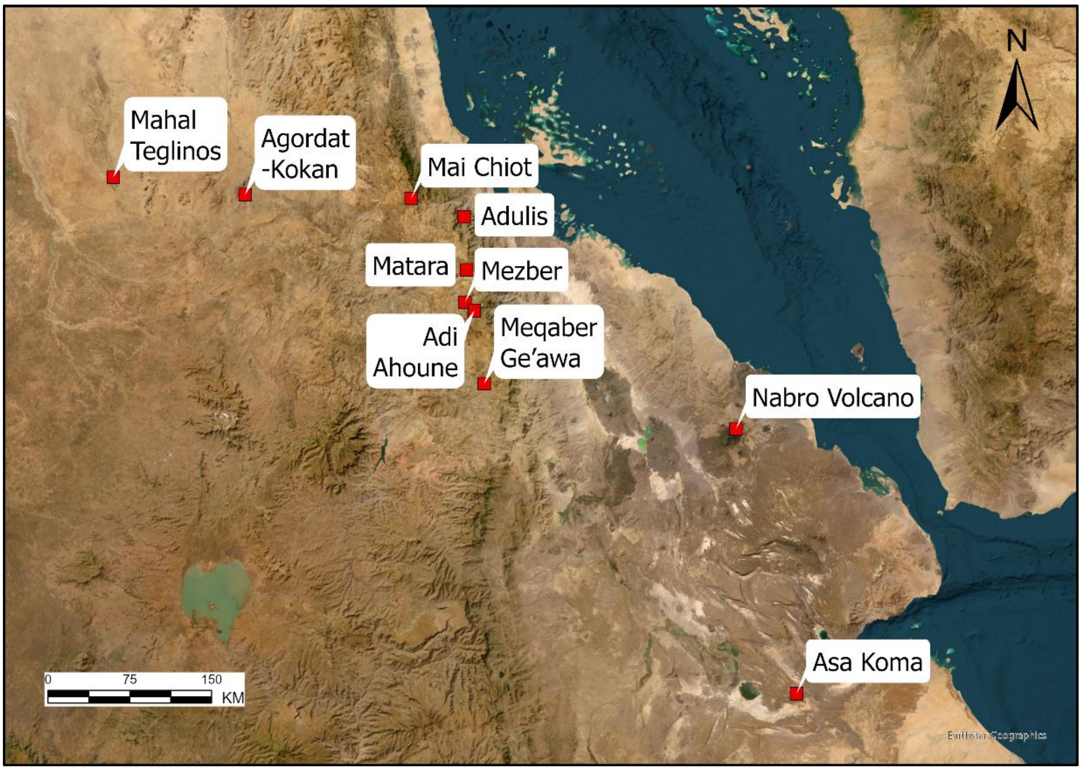


Figure 24. Map of second millennium BC sites in Tigray and Eritrea, with Matara and Meqaber Ge'awa shown for context.

2.3.4 Ona Adi

The Pre-Aksumite state flourished along a trajectory from the Takaze River in the Tigrayan south to the Eritrean Qohaito plateau in the north. Ona Adi is 2.5km west of the Mezber- Segelat-Kilat valley system and was first reported in the 1920s (Rossini 1928) but contradictory information since then presented an unclear picture of the site due to its myriad of names: - Menabeyti, Etchmare, Gulo Makeda, Enda Tekle Haymanot, and Enda Maryam de Makeda (Taddesse 2019). The site was continually occupied from the Pre-Aksumite through to the Aksumite period, encompassing the Pre-Aksumite-Aksum (PA-A) transition (Taddesse 2019; Harrower and D'Andrea 2014; D'Andrea et al 2008).

Ona Adi is a large town site (9.74ha) set in a flat agricultural landscape, with good water sources (Taddesse 2019). The Pre-Aksumite levels at the site are deeply stratified (Fig 25), 2.5m deep, with overlaying Aksumite architecture. Large stone burial mounds appear as landmarks in the fields around the site. Considerable damage has been done to the site by the construction of a modern church (Fig. 26), a not uncommon feature of Pre-Aksumite Tigray sites (Henze 2005), which impacted the archaeological deposits. The first occupation of Ona Adi occurred during the Early Pre-Aksumite period (800 BC) with the settlement being the result of a significant increase in site occupation and settlement expansion of communities from nearby village sites, possibly including Mezber during its Middle Pre-Aksumite Phase (8th to beginning of the 4th centuries BC). Initially farmers and artisans (potters, hide workers and ground stone makers) were the two social groups identified at Ona Adi, identified through their material culture remains (Taddesse 2019).

Geographically, the location of Ona Adi suggests that it was a hub for the regional trade that was taking place during the first millennium BC. The site is located at the foot of Amba Fekada which a major landmark in northern Tigray, almost on the Ethiopia-Eritrea border. An Amba is a steep-sided flat-topped mountain characteristic of northern Tigray, and where rock art panels display an ox-drawn plough and several human figures (D'Andrea et al. 2008) quite likely pre-dating the first millennium BC (Fattovich 1988), and coeval to the later phases of both Mezber and the Yeha Temple.

Figure 25. An excavation trench at Ona Adi. The lower-level wall is dated to the Pre-Aksumite and the upper wall to the Aksumite period. Photo Richard Lee, 2019.

Ona Adi's cultural contact with Southern Arabia, which is evidently only minimal, is suggested indirectly (Taddesse 2019, 360), through the appearance of ring-based vessels and a new jar form considered by Japp (et al 2011, 156) to be a local imitation of the "torpedo vessels" or "jar type 4100" (Porter 2004) known from the Pre-Aksumite and PA-A transition period. This evidence contradicts much of what is suggested for Sabaean power or influence over the socio-economic forces in Eastern Tigray. That stronger Arabian ceramic evidence isn't present at Ona Adi *is* surprising I suggest, given the dating for this site, but also because of its location on what would have been a busy north-south routeway connecting with the Danakil depression (I discuss in chapter six).

Figure 26. The cemetery of the church at the site of Ona Adi. Photo Richard Lee, 2019.

2.3.5 Eastern Tigray: Wakarida and Alakile Daga, Atsibi Wemberta

In the process of defining a Pre-Aksumite boundary or region, eastern Tigray is clearly an area of high significance. The sites around what I interpret as the crossroads of Wakarida - Armengela, Mangagebit, Alakile Daga – cluster on the escarpment between the Tigray plateau and the Danakil depression. The site Alakile Daga (Fig. 27) radio-carbon dated to 774-482 BC (Int-Cal 13.14c 2480+30 cal BP 774–482 BC) (Benoist et al. 2020) is the earliest and only Pre-Aksumite site currently known in this area. Its location, along the May Weini, and Ka'bile, valley, accessible from the Tigrayan plateau, places it on a route to the source of obsidian in the Danakil and, potentially therefore, connecting with South Arabian merchants arriving from the Red Sea coast (I use remote sensing to discuss this suggestion further in chapter five). The study of South Arabian influences in the highlands has largely concerned stylistic and architectural traits associated with the polity of D’mt but this area may not be part of D’mt. It was suggested (Gerlach 2012) that the hill terracing in this region was derived from those used in antiquity in South Arabia however this has been shown not to be the case (Benoist et al. 2020). The Wakarida terracing is modern, despite being in a prime location to be influenced by incoming South Arabians moving across the Afar region.

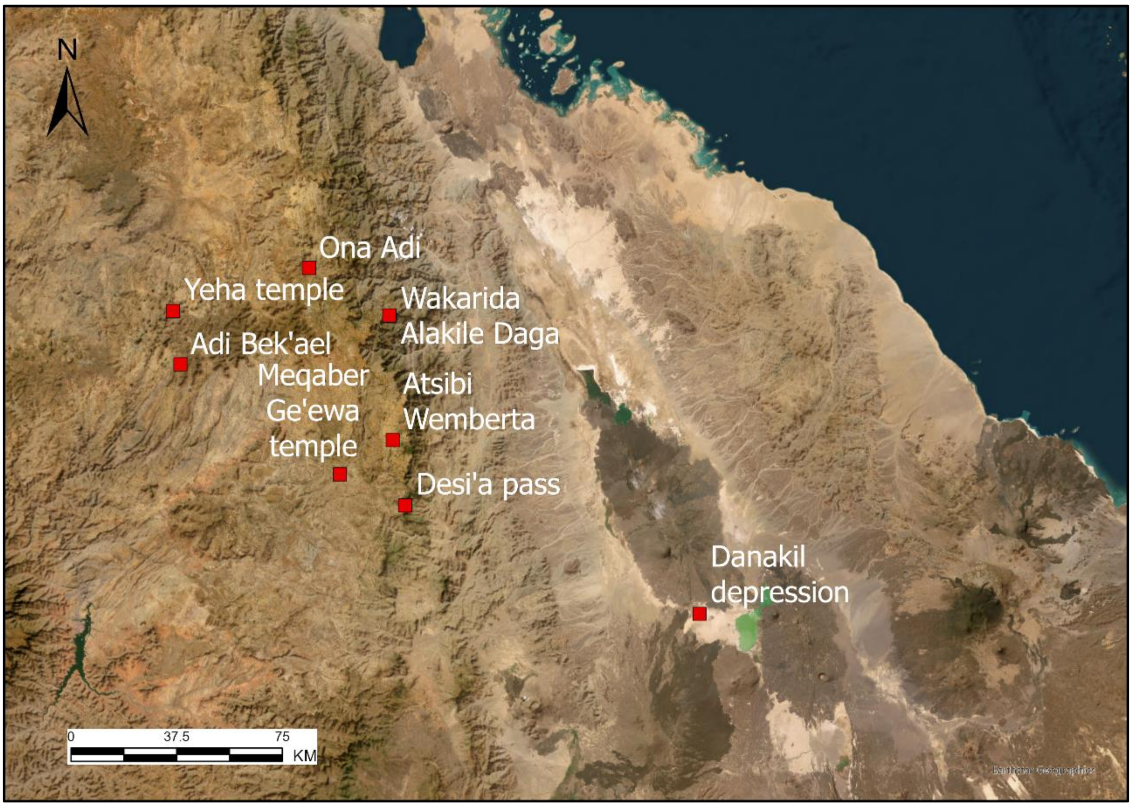


Figure 27. Archaeological sites in east and south Tigray along the escarpment bordering the Danakil depression which can be accessed through the Desi'a pass.

There is a notable absence of influence from either D’mt or South Arabia in eastern Tigray, where Wakarida is located (Benoist et al. 2020). As with Ona Adi this is surprising as the area could be part of a routeway connecting Tigray and the Danakil. At the site of Alakile Daga (774–482 cal BC) there is similarity in the pottery with Armengela and Mangagebit and other eastern Pre-Aksumite sites, including Mezber and Ziban Adi, a site close to Meqaber Ge’awa, but also with the Ancient Ona culture suggesting a regional continuity throughout the Pre-Aksumite period (Benoist et al. 2020). If, as suggested, the regional polity, D’mt, collapsed in the mid-first millennium BC (Benoist et al. 2020), indications at Wakarida are that settlement continues to prevail here unaffected by the collapse. This then raises the question of what the relationship was between the two and whether Wakarida, was, or had, an independent authority of its own. Based on the ceramic assemblage, Wakarida had little in common with D’mt but greater parallels with the Ancient Ona culture (Benoist et al. 2020). Benoist suggests that the Wakarida region was not part of the main D'mt trade routes (Benoist et al. 2020, 25) although its location, and potentially their map (Benoist et al. 2020, 39) might suggest otherwise. There are few options to travel from Tigray into the Danakil desert but this route, viewed from the perspective of remote sensing (discussed chapter 5-6) represents one of the few.

The ceramic assemblage at Wakarida is mostly different to that at Yeha with exception of red-black topped ware found in the earliest Yeha Phase I, 8-7th century BC (Fattovich 2009) which does have associations with South Arabia (Benoist et al. 2020). Notably, obsidian from the Wakarida site-cluster has so far only been found at Mangagebit and radiocarbon dated to 2230+30 BP (384–204 cal BC) so later into the PA-A transition than is directly relevant for this Pre-Aksumite research but still, importantly, present at the site, suggesting a potentially continuous trade.

Whilst plotting the sites in ArcGIS-Pro, it became apparent that the coordinates given for the site of Wakarida - 14°16’59"N; 39°43’32"E - locate it to the south-west of the modern city of Adigrat, whilst the maps from the fieldwork (Dugast and Gajda 2012b) place the site 30km east of Adigrat in the Afar region. Having been a field archaeologist for many years I know that some authors endeavour to give erroneous map coordinates in an effort to deter others from finding sites. This can be because they fear looting, unfortunately an all too real possibility, or sometimes because of the fragility of the site and hence for protection. Sometimes they may be genuine errors that only become apparent in a situation like this when mapping data in ArcGIS-Pro and the authors error becomes apparent.

2.3.6 Atsibi Wemberta

Twenty kilometres north-east of Meqaber Ge’awa, and south-east of Wakarida, is a single stela at a site called Atsibi-Wemberta (Fig. 27), located along the route to the Danakil and in use since Pre-Aksumite times (Hagos 2014). Atsibi is part of the Sacred Landscape of Tigray for which UNESCO World Heritage Status has been applied: (https://whc.unesco.org/en/tentativelists/6477/). The Atsibi hinterland has a number of sites of which many are Aksumite period, or Pre-Christian Aksumite, with a small number, Hagos (2014) being Pre-Aksumite. Some sites have multiple stela and tumuli but none have been excavated so a definitive characterisation is not assigned. A small quantity of obsidian flakes can be attested to (Hagos 2014). The site is in a location where I would indeed expect links to routes into the Afar and onto the Red Sea coast (Fig. 27) and hence important for this discussion. At the time of the archaeological survey many of the sites around Atsibi were under threat of development hence it is quite probable that some of them have already been lost and what little data we have is all we may ever have. Atsibi however is sited in a prominent location at the top of the eastern escarpment and presents one of only three passes through the mountains and into the Danakil depression on the modern salt trading route (Woldekiros 2019) (page 191).

2.3.7 Southern Tigray

The site of Adi Ba'ekel is located 11km to the south of Yeha temple in an archaeologically unknown area. It was investigated (Dugast and Gajda 2012a; Berhe 2011) for what is known as the Feresmay Cultural mound which dominates the village. Adi Ba'ekel is notable for a Sabaean stone inscription excavated by a local farmer, although there are numerous other historic sites in the area. Nearby is a stela field although most of the stones are damaged having been removed by farmers for other uses. No excavation has yet taken place here at any of these locations, but the Sabaean inscription is significant not just for what it is but particularly for *where* it is. There are no other sites in this area with finds that suggest a Pre-Aksumite presence. For the purpose of this discussion, I suggest that the site is highly significant as it indicates the movement of people, perhaps trade, in an area not otherwise attested to in the Pre-Aksumite archaeological record. The site's location 11km south of the Yeha Temple suggests that the site may be on a routeway between Yeha and the Danakil depression. There is no obvious route near the site (discussed in chapter 6) however this is the first indication of a Pre-Aksumite, and Sabaean Presence in the area. Its location is intriguing precisely because of its apparent isolation from other archaeological sites, but also away from routes that appear to connect to regional sites. Once again location may be the important factor here, as with Yeha, and I will discuss this further in chapter 6.

2.3.8 Shire: western Tigray

Shire is the region to the immediate west of Tigray, west of Aksum, and exhibits some Pre-Aksumite characteristics. I include it here because of its relevance to the overall discussion of this thesis and to the greater regional interconnectivity. Sporadic archaeological research over many decades had revealed a small number of archaeological sites (Table 3):

Site name	Date	Bibliographic reference
Mai Mesanu, artefact scatter	Middle Stone Age	Phillips 1997
Mai Adrasha site and cemetery	Pre-Aksumite	Finneran 2005
Hiritay	Early Middle Aksumite	Finneran 2005b
Seleklekha	Proto-Aksumite	Godet 1977; Fattovich 1988
Adi Adhano standing stela	Aksumite	Godet 1977
Webla Maryam church foundations	Aksumite	Hagos 1997

Table 4. Archaeological sites in the Shire region of northern Ethiopia.

The first systematic survey of the area was undertaken by the Ethiopian Authority for Research and Conservation (Tekle and Asamerew 2001) which revealed 36 new sites (Prehistoric – Medieval). Finneran's survey and excavation (Finneran 2005c; Finneran et al. 2003) provides a useful summary of the archaeological research of this region, formulated as a local Sites and Monuments Register (SMR), and of its relationship to the Pre-Aksumite.

The Shire survey (Tekle and Asamerew 2001) recorded a number of early Prehistoric sites interestingly, more than is currently known for the Tigray region. Some similarities with rock shelters in the Aksum region were noted, with 14 sites discovered spanning the Early (ESA) – Middle (MSA) and Late Stone Age (LSA) (Finneran at al. 2003) some with a significant number of lithic scatters and some with Acheulian features (Phillipson 2000). The lithic scatters represent the furthest west that obsidian is attested to, albeit in very small quantities, and claimed to deriving from a source some distance away (Zarins 1990), this source most likely being the Danakil depression, although this is unconfirmed.

The Pre-Aksumite/Aksumite site of Mai Adrasha (Fig 28) located on the Takaze river is one of the most important sites in the Shire region (Henze 2005; Finneran 2003; 2005c). Described as a townsite, built on a *tell*, an unusual term for Africa and more often used in the Levant, the presence of fallen stela and associated pottery indicates a significant settlement location of multi-period date. The site has been badly damaged by local people panning for gold, but walls and masonry of what appears to be at least three separate building phases (Finneran 2005) can be attested to. Considering the significant archaeological remains I anticipate Mai Adrasha to be the main Shire site connecting the region with Yeha and eastern Tigray between 800-400 BC. Of particular interest at Mai Adrasha is the presence of three distinctive clay anthropomorphic female “mother” figurines (Finneran 2005b, 21). The figures are 0.20m in height (page 122) and unlike anything else found in Tigray although their exact provenance is unknown as the artefacts had been looted from the site but then later returned by a local villager. Stylistically they are a singular anomaly for the Pre-Aksumite and attest to an external cultural influence in Shire that is probably not Sabaean but could be from the Nile valley. Similar figurines are also known in Sabir, and Al-Kashawba, in Yemen (page 125), which are also considered (Buffa and Vogt 2001) to have Nile valley antecedents.

This western region leads towards the Sudan steppe and the Nile valley hence it is potentially a strategically important area for the Pre-Aksumite. Topographically the region is described as being similar to that of Aksum (Finneran 2005), rather than the more rugged Tigray highlands: surface water is easily available from streams or runoff from *ambas,* with villages located around natural springs, and churches or monasteries “sacred sources of holy water” (Finneran 2005a, 10). It was the dependable agriculture of the region that made an “early manifestation of social complexity possible” here (Finneran 2005a, 14), although it could be said that the highlands of Tigray had not precluded that from occurring.

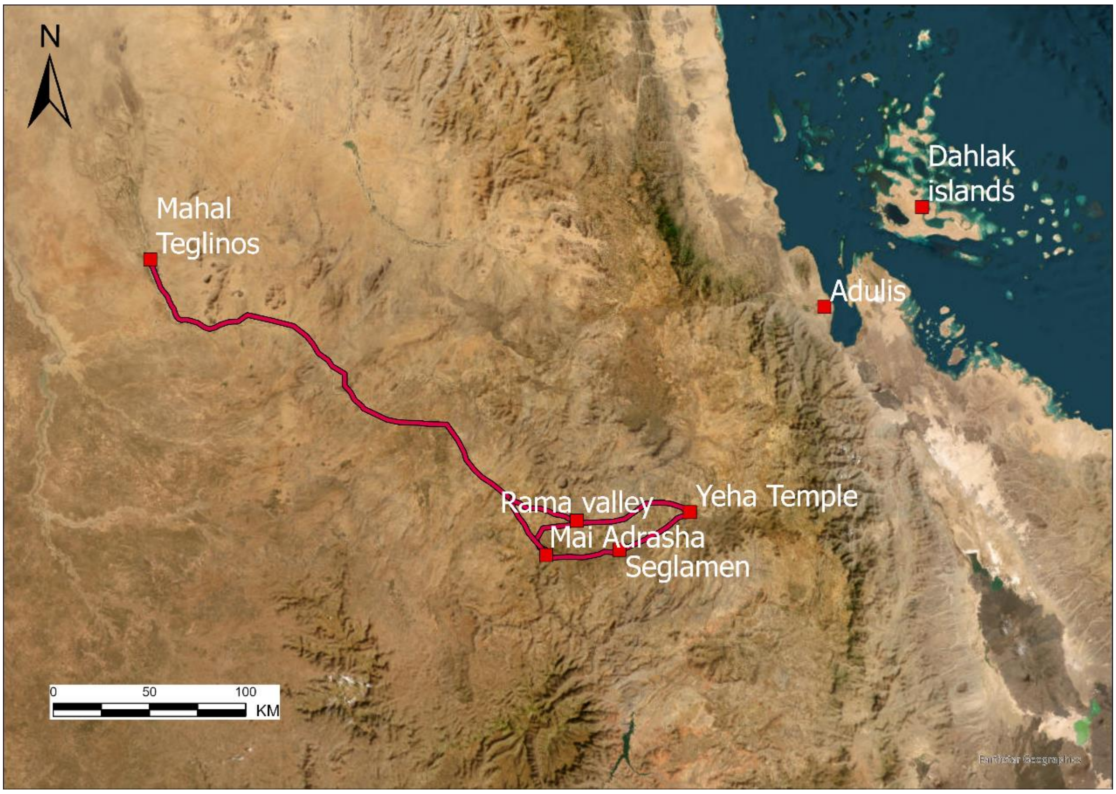


Figure 28. The location of Mai Adrasha on the route from Yeha to Mahal Teglinos and the Nile valley.

The limited archaeological research in Shire elucidates this cluster of sites that initially appear peripheral to the Tigrayan Pre-Aksumite. As will be discussed in chapter six Mai Adrasha may be located on a routeway connecting Yeha, perhaps via the Rama valley (Pfeiffer and Gerlach 2019), to Mahal Teglinos and the Nile valley (Manzo 2020). The destruction of antiquities in Shire has been addressed by Phillips and Hagos (2004) with Asamerew et al. (2002) drawing attention to and successfully scheduling or listing sites for protection.

2.3.9 Sites beyond Tigray

2.3.10 Eritrea: Akkele Guzay, southern Eritrea – Keskese, Matara.

Akkele Guzay in Eritrea, 30 km north of Ona Adi, is both a highly significant component of the Pre-Aksumite, and a link with the Ancient Ona culture, 100km further to the north. It is important to be aware that the sites in Akkele Guzay region including Keskese, Qohaito, Addi Gerameten, and Matara, are not part of the Ancient Ona culture (Fig 29). In the early first millennium BC, the Akkele Guzay area was linked with both Pre-Aksumite Tigray and the Ona culture sites.

Matara, in southern Eritrea (Schmidt et al. 2008), is the most important site here, and has already been mentioned repeatedly in this chapter. It was one of the first sites to be excavated in this area (Anfray 1967) and its ceramic sequence is frequently used for comparative dating purposes, notably Fattovich (2009) at Yeha. A cluster of building complexes, monumental architecture, and stela attest to a town, 20ha in size, of significance for both the Pre-Aksumite and Aksumite periods. The style of the buildings suggests regional governors or nobility rather than elite royal structures, unlike Yeha or Meqaber for example. The largest structure measures 60m sq. with a central pavilion of nine rooms. Inscriptions with reference to the Sabaean deity Almaqah are present here, alongside libation altars and sacrificial altars also with Sabaean connotations (Curtis and Habtemichael 2008).

To the north of Matara, at the peak of the Qohaito plateau, 2600m asl, is a series of sites, a spread of mounds, complexes, pillars, buildings, cistern-like features, stone tumuli, and a reservoir (Wenig-Curtis 2008; Wenig 1997). The sites are strategically placed along the axis of the north-central route linking Yeha in the highlands of Tigray to the port of Adulis on the Red Sea (Fig. 29). The cluster of sites are located at the highland terminus of the Komaile valley corridor from the Red Sea coast, with Qohaito being the first stopping point on the ca. 175 km journey (Harrower and D'Andrea 2014). Wenig (1997) identified ancient Koloe/modern Qohaito (Phillipson 1998; Munro-Hay 1991; Bent 1893) as a multi-period site with occupancy from the Neolithic (5000 BC)-Early Islamic (600 AD) periods, a "garden city" (Bent 1893; Wenig 1997) for the elite classes of Adulis with hundreds of houses, gardens, areas of cultivation and religious buildings. Although referring to the first millennium CE, Anfray's (1973) mapping suggests there may have been an Aksumite nuclear area, (Connah 2001) meaning an urban conurbation**,** at Qohaito. This is possible, considering the size of Matara and Qohaito, plus the potential for movement between Tigray and the coast at that time. A Pre-Aksumite urbanisation of Matara and Qohaito may have been the precursor to the Aksumite "nuclear area" (Connah 2001, 129).

One of the most significant sites in southern Eritrea is Keskese (Fig. 29) dated to the early first millennium BC (Fattovich 2009), with an alignment of six monoliths. This was an important ceremonial centre, suggesting the emergence of a hierarchical society in the Akkele Guzay region. It is neither Ancient Ona, South Arabian nor Pre-Aksumite in style, most likely belonging to the local tradition (Curtis and Habtemichael 2008, 321). This site, along with Qohaito, may represent a major urban centre along the route between Tigray and Adulis, a significant part of Fattovich (1990a, 22) "cultural complex".

The absence of South Arabian culture at the Ancient Ona sites to the north, and at Ona Adi to the south, but present at Qohaito and Yeha, raises important questions for the Sabaean influence in this area and its relationship with the Tigray highlands. The South Arabian influence may be stronger in eastern Tigray, connected to the Danakil depression, but less so in western Tigray.

The Sabaean presence is stronger in Ethiopia than in Eritrea (D'Andrea and Harrower 2008) suggesting the external presence was stronger in southern Tigray perhaps indicative of the migratory routes being used. A Nubian influence as seen at Addi Gerameten is unusual (Regional interconnectivity will be discussed in chapter five).

2.3.11 The Ancient Ona culture of northern Eritrea (800-350 BC)

In northern Eritrea, the Ancient Ona culture (Tringali 1965; Schmidt & Curtis 2001; Schmidt, Curtis and Teka. 2008b)**,** in the Hamasien province around Asmara (Fig. 29), exists parallel to the Pre-Aksumite, but is not a component of it (Table 4). It is also understood to be one of the "indigenous societies" of Punt (DiBlasi 2005., X1 ; Kitchen 1993)**,** along with northern Tigray and the Arabian Tihama (Curtis 2009). The only systematic survey of the Ancient Ona region (Schmidt, Curtis & Teka 2008b) encountered many large sites, often 5ha or larger, that included remains of formidable structural elements only visible as dense scatters of stone. The sites of Mai Hutsa, Mai Chiot, Sembel, Hara Hot, Weki Duba are chronologically parallel to the Pre-Aksumite but culturally distinct from it. Mai Hutsa, a large 15ha mound site (Fig. 29), could be said to be the Ona type site as it embodies most of its cultural characteristics.

Site name	**Date**
Sembel, Mai Hutsa	820-370 BC
Hara Hot	800-400 BC
Weki Duba	420-180 BC
Mai Chiot	300 BC

Table 5: Sites and approximate dates for the Ancient Ona culture in Eritrea.

Schmidt, Curtis, and Teka's (2008b) rescue and survey project managed to obtain thumbnail sketches of the Ona sites which have since been lost below Asmara's rapid urban growth. Abundant stone tools were in evidence, including many grinding stones, with considerable evidence for lithic working of quartz and obsidian. Large amounts of quartz were found on the sites, perhaps transported here for processing, or for use in gold extraction at the site of Hara Hot (Schmidt, Habtemichael & Curtis 2008). The most prominent material evidence that was found however are stone carved bulls-heads suggestive of a ritual centre at Sembel (Schmidt et al. 2008) west of Asmara, and evidently one of the principal Ona sites. Curtis (2009) notes that the Ancient Ona Culture may be seen as a localised expression of a wider first millennium BC cultural identity in the northern Horn of Africa. Hence it is an indigenous analogous culture interacting within those around it, effectively an element of Fattovich's proposed "Afro-Arabian interchange circuit" (2004, 71). Analysis indicates Eritrean gold was used for a sceptre of Egypt's King Khasekhemui (Dynasty II, 2890 BC) suggesting third millennium BC long-distance trade networks (Zarins 1996). This trade network supports the presence of obsidian in burials at Naqada, Abydos and Hierakonpolis 3100 BC (Dynasty 0-1) (Aston et al. 2000). In terms of regional trade networks the presence of both gold and obsidian is highly significant and indicates, I suggest, that trade was indeed more developed than we currently have evidence for (discussed further in chapter five and six).

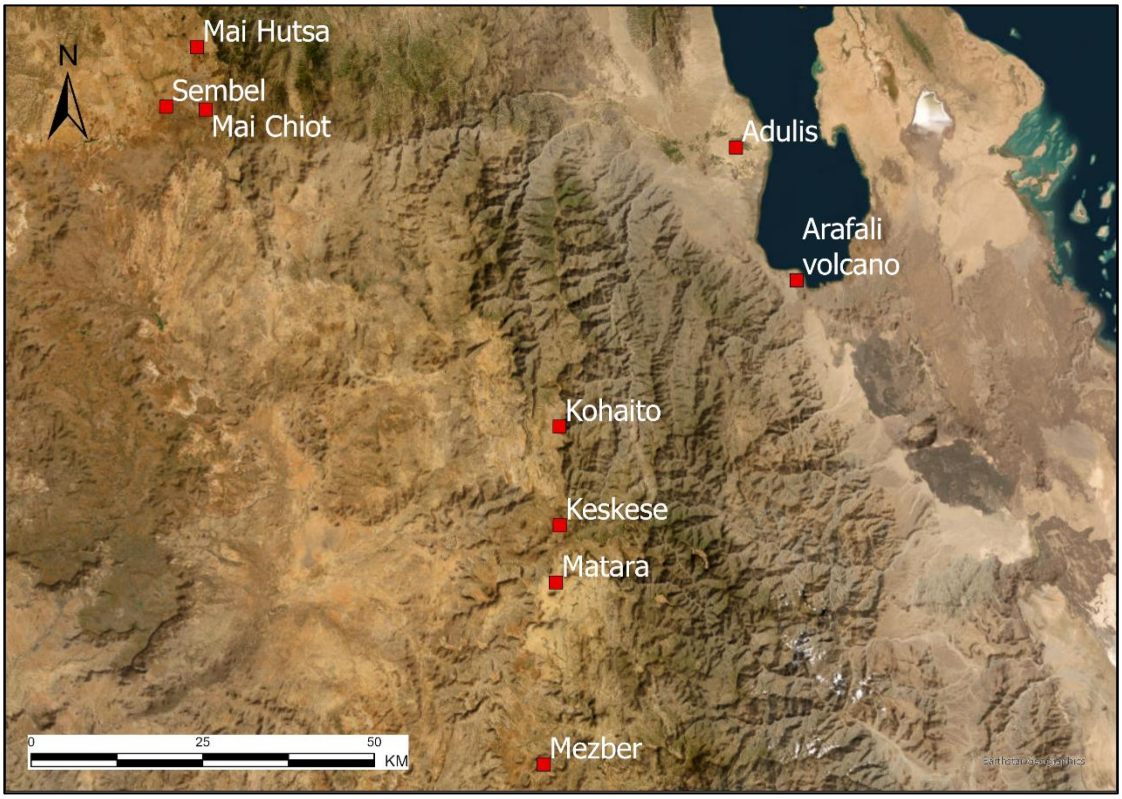


Figure 29. A map showing the main sites of the Ancient Ona culture in Eritrea - Mai Hutsa, Sembel, Mai Chiot - along with other significant sites in southern Eritrea and Tigray.

With particular relevance to this thesis, Mai Chiot has also provided an earlier c14 (cal) date of 1400 BC (Beta 161536 3030+/-40 BP CAL 1380 BC to 1250 BC/1400 BC -1140 BC) (Schmidt, Curtis and Teka 2008, 143). This then becomes an important site for potential second millennium BC activity, as I theorize in this thesis, and borne out by the Mezber Pre-Aksumite chronology (D'Andrea et al. 2018). The site, a small cluster of walls measuring approximately 2m x 6m is located in a rocky upland area surrounded by ambas and low mountains. The site is something of an enigma as some of the rooms appear to be without doorways, possibly a safe area in times of conflict (Schmidt et al. 2008). The date of the site, 1400-300 BC, suggests potential links with

Mezber as part of the greater regional interconnectivity. The presence of obsidian (Schmidt et al. 2008) is a further indicator of its involvement in the regional trade connected to the Danakil obsidian sources, although no geochemical analysis has been undertaken of the Mai Chiot examples. The modern town of the same name on the site however has probably removed significant parts of what may once have been an important site for this region.

The complete absence of South Arabian material culture at Ona sites (Schmidt et al. 2008b; Curtis 2004) indicates a regional distinction separating it from Pre-Aksumite sites in Tigray. But it also parallels the Sabaean absence at Ona Adi and Wakarida. Being closer to the harbour site of Adulis one might expect the Sabaean culture to be better evidenced here rather than further south in Tigray however the opposite appears to be true. A challenge for future research is to connect the Ancient Ona culture to even earlier chronological periods and create comparative regional perspectives (Curtis 2009). The early c14 date from Mai Chiot (1400-1140 BC) may be a chronological indicator of this direction. DiBlasi (2005) notes that there is pottery at Yeha with similar forms to the Ancient Ona ceramics so a link to the Pre-Aksumite south can be made.

The Hamasien region, the Asmara plateau, is a regional hub, "a major crossroads……. of cultural interaction" but lacks "substantive evidence" (Schmidt et al. 2008, 113) to archaeologically sustain the idea that it was influenced by cultures from the Nile valley and the Arabian Peninsula. Whilst further archaeological evidence will be difficult to retrieve here, considering its location it would be surprising, I propose, if the Hamasien region was not a regional hub connecting with the Nile valley. The Ona communities indicate a growth in urbanism during the 1st millennium BC due to its presence at a crossroads of regional trade on a route that led from Tigray, to Adulis on the coast, to the Gash delta in the west, and then onwards to the Nile valley.

120km west of the Ona sites, the Agordat sites, notably the Kokan rock shelter (Brandt et al. 2008) are ideally located to be a gateway to the Ancient Ona sites, and the Tigray highlands, from the Gash Delta, and to Adulis in the east. Limited excavation (Brandt et al. 2008) has revealed this to be a significant site for connections with the Nile valley Nubian C-Group and Kerma. The Agordat chronology spans over 2000 years with the earliest date retrieved so far being 2300 BC (Brandt et al. 2008) meaning that it is temporally and spatially central to the area's interconnectivity. Obsidian represents a high percentage of the lithics at the site, sourced in the Danakil (Brandt et al. 2008) and indicative of the extent of the obsidian trade network (Negash, Brown and Nash 2011).

Adulis is often assumed to be the main crossing point from the Horn of Africa to the South Arabian Tihamah coast, although it, and a Sabaean presence at Adulis, has yet to be archaeologically demonstrated. At Adulis, much of which is unexcavated (Peacock and Blue

2007), the lower levels of stratigraphy could still retain Sabaean material. As with many sites in the region, Adulis and the Gulf of Zula probably still retains much that, with archaeological excavation, could significantly expand second and first millennium BC knowledge. The absence of evidence therefore necessitates us questioning where a possible alternative Red Sea crossing point might be. A limited reconnaissance of the coastline at Djibouti (Khalidi 2009) has found evidence for prehistoric architecture, built structures and obsidian, at the sites of Assab and Beilul, discussed further in chapter four.

2.4 Themes of the Pre-Aksumite

2.4.1 The Nile valley: Egypt and Nubia

Ancient Egypt is peripheral to the first millennium BC Tigray (Fig. 30) but it is difficult to entirely exclude such a significant regional influence. By 800 BC Egypt's powerful pharaonic period was waning and the Nile valley powerbase had shifted south to Nubia. There are however the examples of Afar obsidian found in Egypt as early as the 4th millennium BC (Aston et al. 2000; Bavay et al. 2000) indicative of long-distance trade either overland or by sea. Beyond the obsidian however, evidence for Egypt's direct connection to Tigray however is limited, and the same can be said for the Nubian cultures of the early first millennium BC. Pottery of a Jebel Mokram style has been found in one of the earliest strata at Yeha indicating contact with the Nile valley in Yeha's pre-temple phase (Gerlach 2021). The newly revised Pre-Aksumite chronology (D'Andrea et al. 2018) pushes the start of the period back to 1600 BC therefore I would anticipate greater interconnectivity with Egypt and Nubia. So far this has not been manifest in the archaeology but future second millennium BC research might well unearth a closer relationship.

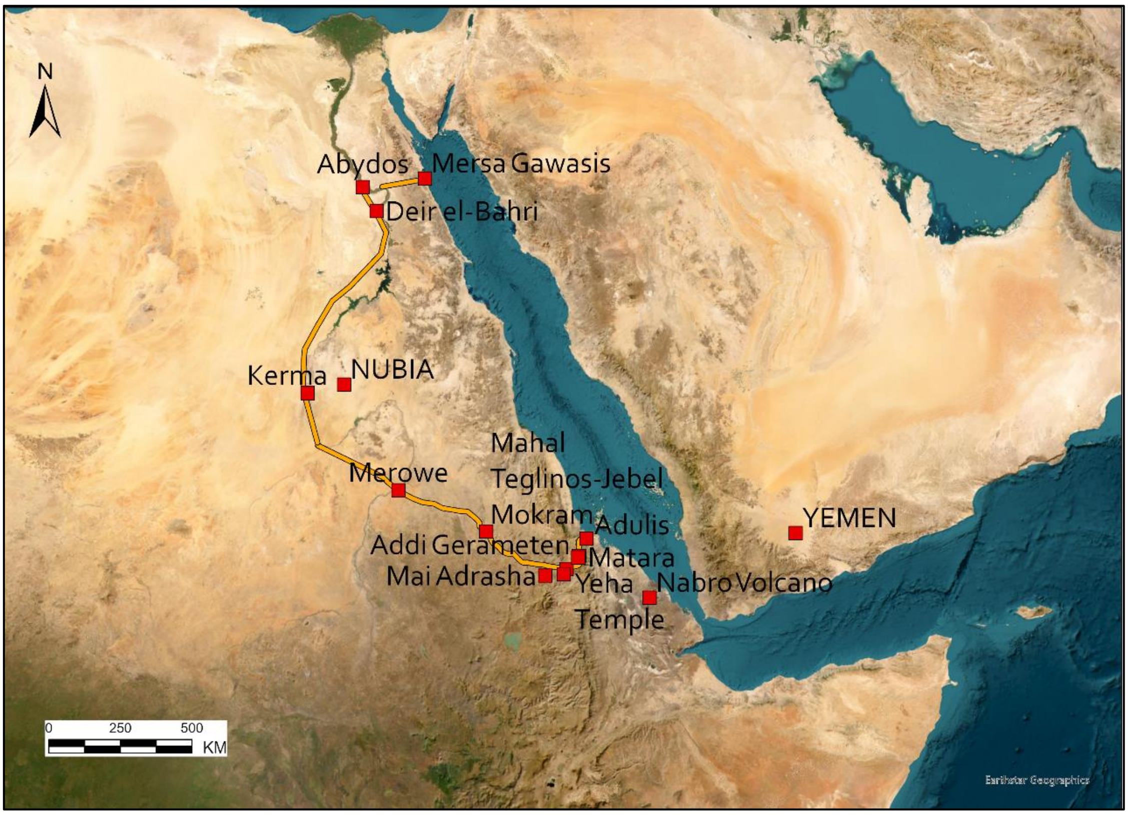


Figure 30. The sites discussed in this section along the proposed two-thousand-mile overland route between Tigray and Egypt.

That a non-South Arabian influence may also be present in Tigray is indicated by the sphinx found at Addi Gerameten (Anfray 1990) (Fig 30). The sphinx bears stylistic features unknown in early South Arabian art but well known in Egypt and Nubia (Manzo 2009). Manzo suggests that Pre-Aksumite Tigray is connected to the Gash Delta via these cultural indicators but also through the presence of the scraped treatment of ceramics (page 53) found at Mezber (D'Andrea et al. 2008). From the Gash delta a connection with the Nile valley is feasible. Nubian objects are attested to elsewhere: alabaster vessels in the Yeha cemetery (Fattovich 1990a), and Nubian amulets at Hawelti and Matara (J Phillips 1995) but this is a slight representation of a major local neighbour. Female statuettes found at Hawelti, Matara and Adulis are thought to have parallels with Meroitic queens but also have similarities to the image of the Wife of Punt (see page 126) as shown in Hatshepsut's Theban Deir el-Bahri mortuary temple (Manzo 2009). The statuette found at Mai Adrasha, see page 126, (Finneran 2005b) may also be a further Nile valley example of this. The Hawelti examples appear to be wearing typical Egyptian/Nubian pectoral necklaces (Fattovich 1990a). Manzo (2009) suggests that what we see in Pre-Aksumite Tigray is in fact an exogenous influence creating an original endogenous outcome influenced by both South Arabian and Nile valley characteristics. It is surprising that there isn't further evidence of Nile valley contacts, particularly Nubian influences of the 25th dynasty Kushite period (747-332 BC) (Shaw and Nicholson 2004) reflecting both its growth during the first millennium BC, but also the evident parallel decline of D'mt (Benoist et al. 2020).

Manzo (2009) alludes to more of a Nile valley influence than is generally acknowledged, and which I believe to be correct, but for which the archaeological evidence is still largely absent in the Pre-Aksumite first millennium BC. But, as I suggest at the beginning of this section, the evidence may be more apparent in second millennium BC sites.

2.4.2 The polity of D'mt (Daamat/ Diamat) and the Pre-Aksumite

Geographically, D'mt (Daamat/Di'amat), is an area within the Tigray highlands with Yeha as its proposed capital (Fattovich 1990a), or political centre point (Harrower et al. 2022) and Sabaean as its official language (Fattovich 2004). The name D'mt has been interpreted as the regional polity of Tigray (Fattovich 2004) whilst others suggest it was a localised and short-lived entity (Phillipson 2009; DiBlasi 2005), with a lifespan of 150 years (Fattovich 2014). Gerlach (2012, 218) refers to as "a union of different localities". Over 100 sites, scattered hamlets and villages, can be identified with the ceramics of the Yeha-Matara tradition ascribed to the D'mt polity (Fattovich 2012, 28) but most of them have not yet been archaeologically investigated so our understanding is still only a snapshot.

Phillipson (2009, 269) suggests that references to a single Pre-Aksumite state (e.g. Fattovich 2004) are "totally unjustified" and that the term is "illogical", "untenable" even (Phillipson 2013, 803). Likewise, Fattovich suggests later that the Pre-Aksumite culture "did not exist" but there were "different archaeological cultures in the first millennium BC" (2009, 275) that created what we recognise as the Pre-Aksumite. Finneran (2007) on the other hand, suggests using the term D'mt culture instead of Pre-Aksumite but Phillipson (2012, 2009B) and Wolf (2010) suggest the term is unjustified as a synonym for the Pre-Aksumite. Phillipson (2009) suggests, correctly in my view, that Fattovich's (2009) re-evaluation is hampered by inconsistent and misleading terminology. Hence, the protracted state of research in Tigray means that the development of even an appropriate terminology is still sought. As I suggested earlier in this chapter, the new Mezber chronology (D'Andrea et al. 2018) may well have a future role in resolving this.

Archaeological and epigraphic evidence suggests (Fattovich 1990a, 2004) that the D'mt polity developed in the early to mid-1st millennium BC and occupied a territory stretching from present-day central Tigray to central Eritrea. The name of D'mt is known from a series of six textual inscriptions which includes lists of names of probable deities which are recognised through Arabian terminology (MKRB, MLK) (Phillipson 2009b; 2012). The inscriptions are from Aksum, Melazo, Addi Gelamo and Wukro, although their precise provenance is unknown (Phillipson 2009b). Three of these inscriptions are from incised stone slabs found at Aksum whilst the other three are Sabaean altar-like incense burners (see page 91) from near to Meqaber Ga'ewa temple. None of the inscriptions, translated by De Contenson (1961) and Anfray (1967), referring to D'mt have been found at the site of Yeha (Munro Hay 1993), and none are known in Eritrea or Arabia either (Phillipson 2009). Of the known inscriptions in South Arabia there is no mention at all of colonies or vassal-states in the Horn of Africa (Curtis 2004). The inscriptions exist in a Pre-Aksumite no-man's land effectively; informative but unprovenanced.

DiBlasi (2005) suggests that the nature of the immigration, or gradual assimilation, consolidated the links between Arabia and the Horn of Africa leading to the creation of the kingdom of D'mt as a "multi-ethnic cultural state" (DiBlasi 2005, X1) whose rulers had hegemony over a variety of smaller polities in both Tigray and Eritrea. The creation of D'mt therefore represents a new cultural pattern of interaction and assimilation which transformed Pre-Aksumite society (Michels 2005), with a state mode of political organisation (DiBlasi 2005). Jacke Phillips agrees but advocates that "limitations need to be imposed upon our understanding of its permutations" (2004, 800). As with the Pre-Aksumite, D'mt is an elusive presence.

Meqaber Ga'ewa temple is beyond the conventionally recognised south-eastern borders of D'mt (Finneran 2007, 118). As Wolf and Nowotnick (2010) suggest, the inscriptions at Meqaber Ga'ewa clarify the contacts between South Arabia and the northern Horn of Africa suggesting that Sabaean craftsmen were indeed active beyond major centres such as Yeha. Meqaber Ga'ewa and the adjacent site of Ziban Adi (Matthews and Buchner 2016) however, both have structural and epigraphic links to what is generally defined as Tigrayan D'mt (Benoist et al. 2020, 18). Meqaber Ga'ewa temple appears to parallel the Temple of Yeha as an elite religious centre. Hence, a second elite centre is perhaps further evidence, I suggest, for D'mt being a larger geographical entity than has previously been acknowledged.

Inevitably, Pre-Aksumite non-elite residential and production areas in the Tigray highlands have been overlooked in favour of religious monumental sites (Curtis 2004), partly because the latter have survived better in the archaeological record. The only Pre-Aksumite village site to have been archaeologically excavated, Kidane Mehret (D-site) (Phillipson 2000) indicates people living in large and complex settlements of permanent multi-room buildings, constructed of stone. The D-site is of particular interest as the only Pre-Aksumite site at Aksum, dated to 800-470 BC (Phillipson 2012), precisely fitting the Pre-Aksumite chronology. The site is however without any Sabaean influence and the key characteristics of the "Ethio-Sabaean kingdom" (J Phillips 2004, 81), although use of this term is questionable as it is far from certain that such a kingdom existed at all. Phillips (2004, 81) suggests that we can also "assume", without presenting any evidence, that the salt-flats of Danakil, near to the obsidian sources, were exploited too (discussed in chapter five).

I propose that the intense period of activity in Tigray in the early first, and late second, millennium BC, is driven by the regional trade in obsidian. This led, almost inevitably, towards the formation, and growth, of D’mt as the local power and economy which was impacted by the interconnectivity of the trade. Those benefiting from the impact of this trade probably formed “urban” centres (Michels 2005) from which the trade was managed. D’mt urban centres may have included Yeha, Mekaber Ge’awa, and Ona Adi, perhaps the most important sites of the Pre-Aksumite. A site such as Enda Gully, at Yeha (Michels 2005), were it to be excavated, may join Kidrane Mehret (D-Site) as a significant non-elite Pre-Aksumite settlement site.

Whether D’mt is a region within Punt (DiBlasi 2005; Kitchen 1993) is unknown, but certainly possible. Any discussion of Punt, understood to be where the Egyptians traded during the second millennium BC (Fattovich 2018; Meek 2003; Phillips 2002; Kitchen 1993), is speculative at best. Whilst Kitchen (1993) supports that statement, Fattovich (2018) might not agree, but the evidence, whilst suppositional at best, is not something that can be ignored. Punt is defined as being the Sudanese coastal plain from the Atbay mountains on the Egypt-Sudanese border, from Suakin to Adulis, the highlands of eastern Sudan and Eritrea, the Barka and Gash lowlands to the Atbara river, and the coastal plains of south-western Arabia (Yemen) (Fattovich 2018). This is a very specific and convenient definition of Punt, perhaps even a little too convenient and proposed to adhere to Fattovich’s (2018) argument. By this definition therefore, Mahal Teglinos, Agordat, the Ancient Ona culture sites, Adulis, and the Yemen Tihamah, are a part of Punt. It can be questioned therefore whether this also includes the Danakil depression, Nabro volcano, and coastal locations including Assab and Beilul. Punt, whilst peripheral to this discussion does however hover in the background and like D’mt, or Pre-Aksumite, is just out of reach, as the discussion in this thesis demonstrates.

By selecting different components of South Arabian and Nile valley artistic traditions, Pre-Aksumite cultures, represented by the political growth of D’mt, created an endogenous culture Manzo refers to as the “decorum”’ (Manzo 2009, 29) of the newly emerging state. Manzo (2009) argues further however that the complex merging of foreign and elite state culture eventually undermined D’mt with the effect that it was unable to sustain any longevity, leading to its collapse. This explanation adds to the conflict (Fattovich 2004; Anfray 1971) and environmental collapse (Machado, Perez-Gonzalez and Benito 1998) theories for D’mt.

2.4.3 An Afro-Arabian interchange circuit

It appears that D'mt fragmented into a number of smaller polities, perhaps *chiefdoms* (DiBlasi 2005), a dated term even then. The collapse of the Pre-Aksumite period at Yeha, possibly due to environmental issues (Machado et al. 1998) sees a significant shift in population from there to the Aksum region (Phillipson 2009). By the 5th century BC, D'mt had fragmented after a brief flourishing of power, and the collapse of trade links and economy, and the polity, whatever its designation, had shrunk back to its original form (DiBlasi 2005). The Sabaean influence appears to have declined (Phillipson 2013), but evidence for contact with the Nubian Meroitic region is still not overt.

As D'mt disintegrates, fragments of the Afro-Arabian "society" (Fattovich 2004, 73) probably survived in Akkele Guzay, in southern Eritrea. Evidence at Yeha of fire damage at the Grat Ba'el Gebri (Fattovich 2004; Anfray 1971) is an indicator of how its end, and potentially that of D'mt, came about. Charred wooden remains from the excavations at Yeha provided a ^{14}C date between the early eighth century BC and the late sixth century BC which supports both the proposed dates of the Yeha temple (Japp et al. 2011) and D'mt's existence.

Using South Arabian royal titles was probably the result of a calculated attempt by the D'mt elites for legitimization through appropriation of symbols and material manifestations of wider socio-religious, political, and economic networks (Curtis 2004; Phillips 2004). For a period of time this method appears to have been successful, considering the rise to prominence of D'mt, however the environmental decline at Yeha (Machado et al. 1998) must also have impacted the D'mt polity. Hence the population and the economy were both affected. The Sabaean cultural influence was a "veneer over the indigenous elite culture" (J Phillips 2004, 84), with the influence being virtually invisible to the non-elite elements of society. In another regional example of this veneer Nubia, Kerma and Napata were long thought to have been recipients of "Egyptianising" (Shaw and Nicholson 2004) in their use of materiality and iconography. Recent studies suggest (Phillips 2004) this was in fact a result of limited borrowing by Nubian elites to emphasise their own power and authority in Nubian society. This is also what was happening in Tigray it seems.

Fattovich's "Afro-Arabian interchange circuit" (2004, 71), which he previously called a "Tihamah Cultural Complex" (Fattovich 1996, 398), is in place by the late second millennium BC. It is a continuous development, rather than one directed by D'mt and Sabaeans in the early first millennium BC. If we assume a prehistoric obsidian trade before 800 BC, perhaps with Mezber as a second millennium BC recipient (D'Andrea et al 2018), then Fattovich's suggestion is entirely plausible, and indeed probable I suggest, considering the increasing archaeological evidence for second millennium BC activity. Hence, acculturation is partly a result of the regional trade complexes that arise in the first millennium BC, if not earlier.

The Pre-Aksumite is recognised as a first millennium BC presence, yet throughout this thesis we see the second millennium BC becoming increasingly ubiquitous (D'Andrea et al. 2019) and, effectively, recalibrating what is known of the first BC Pre-Aksumite culture. I propose this as one of the main outcomes of this thesis.

2.5 Conclusion and summary

In summarising this chapter and the inherent uncertainty of what we think we know about the Pre-Aksumite, the Mezber chronological revision creates a new framework for it (D'Andrea et al. 2018). As Phillipson (2000), Fattovich (2009), Gerlach (2012) and others have commented, the definitions of the last fifty years are not an accurate representation of the first millennium BC Pre-Aksumite. Hence the new chronology is a welcome addition that not only extends the Pre-Aksumite by 800 years but, in doing so, addresses the elusive period referred to as "Prehistory" (Harrower et al. 2020, 54) which had seemed like an anomaly in first millennium BC context. In this PhD synthesis many of the questions that arise in the first millennium BC potentially have answers in this aforementioned prehistoric phase which has been, effectively, an erroneous 'dark age' for Tigray. Prehistory in Tigray now means a time before 1600 BC (D'Andrea et al. 2018) which is also *dark* but, with the increasing presence of second millennium BC sites, perhaps lighter than it was.

I propose D'Andrea et al.s (2018) Mezber chronology as the biggest step forward for the Pre-Aksumite, perhaps since the term was first derived, but it is a chronology from a single site only. As yet this hasn't been reflected in other Tigray sites, which may simply be due to the relevant sites not being found, or perhaps even a misinterpretation of former data. Replicating the same chronology elsewhere is necessary for the Mezber evidence to be applicable to the whole Pre-Aksumite sequence, although I anticipate that this will eventually occur. The Mezber chronology is however a highly significant and tantalising step forward which may appear to be an anomaly, but which future research may well define as the temporal model of the Pre-Aksumite.

Despite the colonisation/acculturation debate (Japp et al. 2011; Fattovich 1996; Anfray 1967), Gerlach (2021) still suggests that Yeha temple is form of colonisation by the Sabaeans to interfere with the extant second millennium BC incense trade between Yeha and the Nile valley. Gerlach (2021) claims the Sabaeans were aiming to create a strong presence at Yeha, which was in the control of the local communities involved with Nile valley trade. Evidence for this (Fattovich 1989; Gerlach 2021) is the Jebel Mokram ceramics in late second millennium BC deposits at

Yeha. Gerlach (2021) suggests that Yeha is significant to the Sabaeans therefore because of its economic value, perhaps without any ancestor or religious value. I would argue that this is indeed probable considering the strong Sabaean influence at the site and goes some way in responding to the question of why the Temple is where it is. The Sabaeans however had been involved in the obsidian trade network since at least the third millennium BC (Oppenheimer et al. 2019) as I will discuss in chapter four. Therefore an early presence, potentially ancestor-related, at the earlier pre-Temple structures at Yeha, cannot be entirely ruled out.

The interaction with Arabia, the Sabaeans, must be seen as already existing by the Pre-Aksumite (800 BC) (Phillips 2004) which therefore indicates that more second millennium BC activity was taking place than previously thought. Yeha "may safely be described as Sabaean in style" (Phillipson 2013, 3), is a highly significant statement, with a Sabaean 'shrine' (Fattovich 2004), or other structure (Robin and De Maigret 1998) being evidence for the earlier inhabitation at the site. Highlighting where a Sabaean presence is known – Yeha, Hawelti, Melazo, Qohaito etc- and where it is absent – the Ona culture, Ona Adi, Wakarida - shapes the narrative for this topic. Indeed, the Sabaean absence is as informative as its presence. That many of these sites are located near to one another, and on similar trade routes, suggests that not all the settlements here were involved in the network exchange with Sabaean visitors. Geographically there is no pattern to the Sabaean presence in Tigray, they must have been quite literally passing one site to visit another. Perhaps therefore there were tribal or regional loyalties where the visitors were not welcome. Perhaps some settlements were part of D'mt whilst others were not (Benoist et al. 2020) and therefore impacting trade affiliations. This is a question we may never have a definitive answer to but by asking it, helps define what may have been taking place.

Fattovich (1990a) suggests that the political range of D'mt extended northwards to the lowlands of the Atbara River and into the Gash Delta and controlled the caravan routes from there into the Nile valley. It is interesting that Fattovich sees D'mt's political strength, but not its geographic boundaries, being extended. Considering the vague definition of it that now exit (Phillipson 2009; Fattovich 2004) it seems unlikely I suggest, that D'mt would have been powerful enough to exert significant authority across such a great distance, but some political influence, or trade alliance, may have played a part. This was a premier trade route and potentially had been since the third millennium BC (Manzo 2009). As I will discuss in chapter 5, that route may extend south to Asa Koma in Djibouti, dated to the second millennium BC (Manzo 2010), and potentially a key in the greater Pre-Aksumite chronology.

The rise in social complexity in the first millennium BC is enhanced by the trade in raw materials, specifically obsidian (Oppenheimer at al. 2018) in this case but possibly incense also. The ongoing discussion between acculturation and migration is almost certainly more nuanced than Gerlach perceived it to be, I suggest, and the growth of D'mt as a regional economic centre singularly impacted this. Oppenheimer et al. (2019) suggests that some aspects of the regional late Prehistoric economy were anchored on the trade in obsidian, and as proposed in chapter four, this is crucial for an accurate understanding of the Pre-Aksumite.

The terms "Afro-Arabian interchange circuit" (Fattovich 2004, 71), the "Tihamah cultural complex" (Fattovich 1996, 398), and "Interchange circuit" (Sernicola 2017, 178), all describe essentially the same activity. These are broad inclusive terms that I cite here to explain the interconnectivity occurring between Tigray, the Tihamah, the Ancient Ona culture, and the Nile valley. The origins of this cultural complex begin quite early in the fifth and fourth millennium BC, as evidenced by the presence of African obsidian in Egypt (Bavay et al. 2000) and Arabia (Khalidi 2009). The interchange circuit then spreads through the region, obsidian procurement and exchange increases, and first millennium BC incense trade in Arabia expands. The presence of obsidian in Yemen suggests that it is the single agent bringing South Arabian acculturation into Tigray as part of the trade network. Simultaneously this exogenous influence acts as a catalyst for the inception of D'mt. This paragraph broadly defines the outcome of this chapter.

I propose Meqaber Ge'awa is one of the pivotal links in the relationship between Pre-Aksumite Tigray and Southern Arabia. The location of the site (Wolf and Nowotnick 2010) is midway between Yeha temple and the route into the Danakil depression. Apart from Yeha, Meqaber Ge'awa is probably the most important site for the Pre-Aksumite first millennium BC in southern Tigray and a leading catalyst in the relationship with Sabaeans arriving in Tigray after crossing the Danakil depression (discussed in chapter five).

The Pre-Aksumite characteristics at Mai Adrasha, in Shire, is significant due to being beyond D'mt's recognised geographic boundary. Shire is probably located on a trade route linking Tigray to the north-west at Mahal Teglinos and the Nile valley, in the second millennium BC. As another anomaly in the definition of D'mt, Mai Adrasha, along with Seglamen, Adi Ba'ekel and Meqaber Ge'awa, can be seen as extending D'mt's boundaries, but also being as important nodes on the trade routes connecting Yeha with the Danakil depression and exogenous routes used by the Sabaeans.

The Ancient Ona culture takes places concomitantly to the Pre-Aksumite with the new Mezber chronology (D'Andrea et al. 2018) strengthening the relationship particularly with the site of Mai Chiot (1400 BC). The presence of obsidian at both sites is a highly important signifier of that relationship. Geographically located midway between Tigray and the Ancient Ona, the southern

Eritrean sites of Qohaito and Matara are also significant players in the relationship between the two areas.

It is unknown who the people of the Pre-Aksumite Tigray highlands were during the first millennium BC. We recognise a material culture, and we recognise an exogenous influence in the form of South Arabian inscriptions. We recognise cultural elements that constitute what we have called the Pre-Aksumite because, quite simply, it precedes the Aksumite period which is a recognisable culture based around the site of Aksum. But for the people who preceded this, we lack a name or identity, hence applying the generic Pre-Aksumite nomenclature. Similarly with D'mt, although in this instance there are at least carved inscriptions, although unprovenanced, that mention the name. But beyond that we don't know exactly what D'mt constituted, other than that Yeha is suggested as its capital.

In this chapter I have discussed the essential elements of the Pre-Aksumite and its relationship, particularly, with South Arabia, but also other zones within the region, and why they are connected. As I have demonstrated there are many nuanced grey areas of this discussion without distinctive black and white answers being readily available. The chapter has discussed the sites and the relationship which, I interpret the evidence as indicating, the trade in obsidian with South Arabia took place. In the following chapter I will discuss the archaeological sites of the Yemen Tihamah and their relationship, an "Afro-Arabian cultural complex" (Fattovich 2004, 71), with the Pre-Aksumite during the first millennium BC, and earlier.

2.6 Outcomes from this chapter.

2.6.1 Tigray

- I suggest that D'mt was larger than originally thought - Meqaber Ge'awa, Seglamen, Mai Adrasha, and Adi Ba'ekel could also have been part of it.
- Yeha "may safely be described as Sabaean in style" (Phillipson 2013).
- The 1400 BC date at Mai Chiot (Schmidt, Curtis and Teka 2008, 143)is significant second millennium BC link between the Ancient Ona culture and Pre-Aksumite Tigray.
- I propose that Enda Gully may have been a non-elite second millennium BC pre-temple settlement at Yeha. The Sabaean visitors may have traded with this settlement before the temple was built.
- I suggest in this chapter that Mezber existed parallel to the earlier pre-temple structures at both Yeha and Meqaber Ga'ewa hence indicating second millennium BC activity.

2.6.2 Arabia

- Phillips (2004) suggest that the interaction with Arabia must be seen as already existing by the Pre-Aksumite period, which I agree.

- I propose Meqaber Ga’ewa temple as a site of high significance for the Pre-Aksumite with its stylistic parallel with South Arabia (Tihamah).
- The Melazo temple is one of the key sites for citing the South Arabian influence in the early Pre-Aksumite period (De Contenson 1963).
- There is a South Arabian influence at: Yeha, Addi Galamo and Hawelti Melazo, Meqaber Ga’ewa, Adi Ba’ekel, Qohaito, Keskese, Seglamen, Addi Akaweh.

2.6.3 Trade

- Wakarida may have closer links to the Ancient Ona culture rather than the D’mt Tigray sites (Benoist et al. 2020)
- Fattovich’s Afro-Arabian Interchange Circuit is a highly relevant term for this thesis hypothesis (Fattovich 1996)
- Mezber may have been a central place for down-the-line regional trade prior to Ona Adi.
- Keskese and Qohaito are a major urban centre on route north between Tigray and the Ancient Ona sites.
- The Ancient Ona culture is a regional hub and crossroads of the region.
- Nubian influence in Tigray is elusive, although Jebel Mokram pottery is present at Yeha(Fattovich 1989; Gerlach 2021).
- There is a possible second millennium BC interconnectivity between Adulis and Asa Koma in Djibouti (Manzo 2010).
- Although further evidence is required, Adulis probably was a second millennium BC coastal hub for Red Sea trade.
- As a core outcome of this thesis I propose that Obsidian plays a significant role in the relationship between Africa and Arabia.

Chapter 3

3 The Yemen Tihamah

3.1 Introduction

Whilst research in Yemen presents a counterpart to that in Ethiopian Tigray, since 2016 Yemen's civil war has prevented archaeological fieldwork in any part of the country. The unsettled recent history of both countries means that neither country has been amenable to sustained archaeological research. This chapter examines the other half of the equation in which the Yemen Tihamah (Fig. 31) is connected to Ethiopian Tigray in the first millennium BC via trade and cultural exchange. Having investigated specific sites in Tigray this chapter will do likewise for the Tihamah. One of the characteristic features of the Tihamah archaeological sites is the presence of obsidian, some of which has been traded and sourced from the Danakil depression in Eritrea.

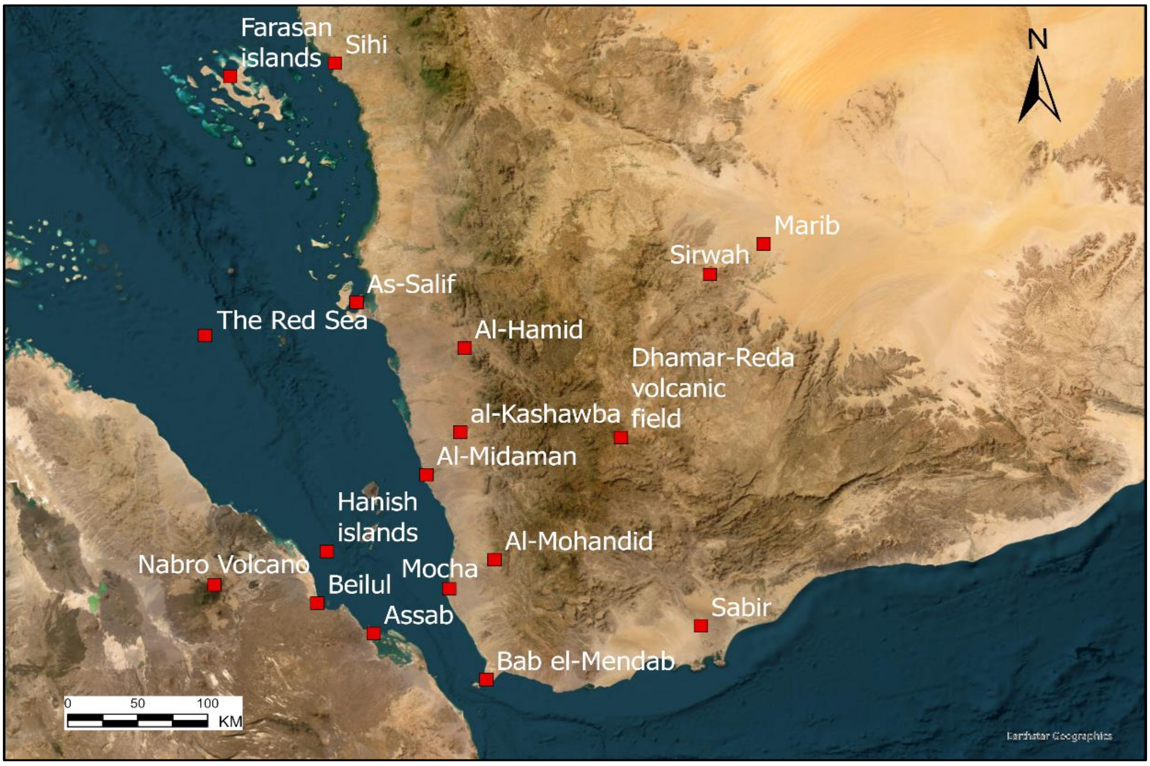


Figure 31. The Yemen Tihamah along the Red Sea, with the sites discussed throughout this, and the previous, chapter highlighted. Marib is the capital of the Kingdom of Saba in the second millennium BC.

In this chapter I will discuss the archaeological sites on the Yemen Tihamah coastal plain that extends 900km along the Red Sea coast north from the Yemen Bab el-Mendab (The Gate of Tears) to northern Saudi Arabia. The Yemen Tihamah (Fig. 32) which occupies the southerly most 450km of this region, is a semi-arid/arid environment, 50km at its widest point, although summer monsoonal rains can have a significant impact in May-June. The landscape is low-lying sand dunes, with acacia shrub and occasional clusters of doum palm (de Moulins et al. 2003). Sabkha formations extend inland from the shore for up to 1.5km caused by coastal uplifting and alluvial sedimentation, with wind deflation heavily impacting the sandy-silt terraces (Burrows 2010). A number of wadis cut through the plain as they migrate down from the mountainous escarpment which effectively separates the Tihamah from the Yemen highlands.

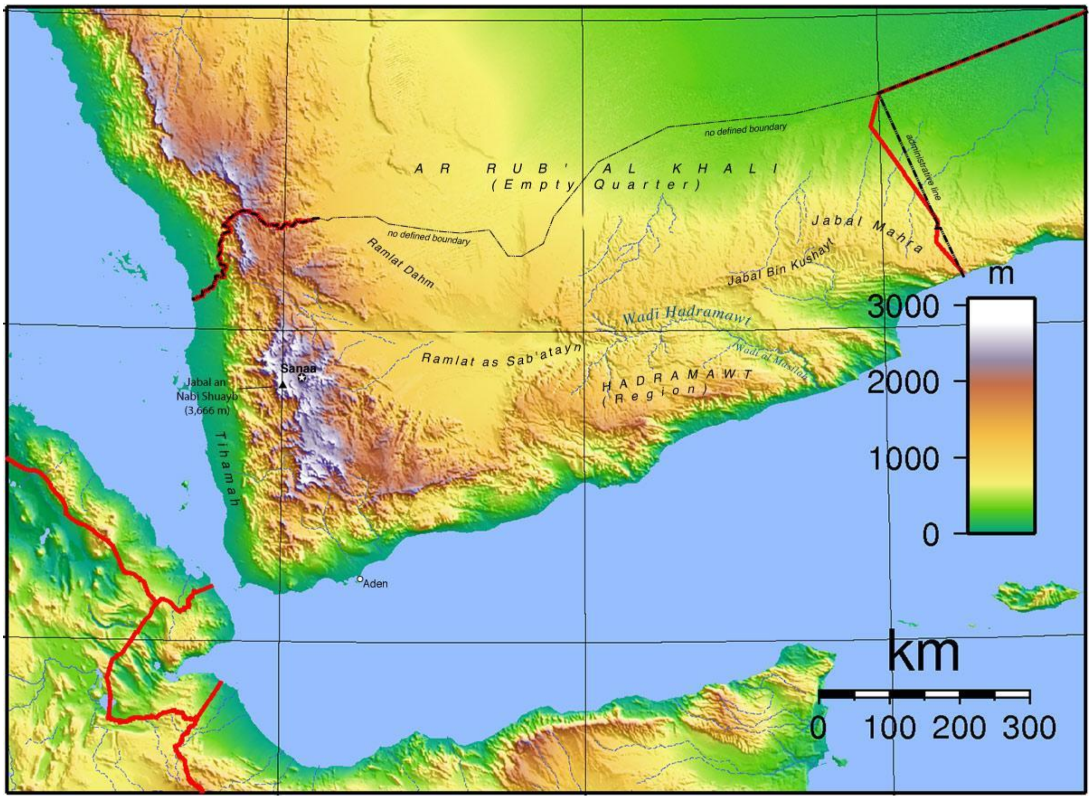


Figure 32. A topographic map of Yemen
(https://www.nationsonline.org/oneworld/map/yemen-topographic-map.htm

The Yemen coastal Tihamah was initially considered (Philips 1998) a difficult area to address archaeologically because of a paucity of evidence and difficulty in dating what was present (Phillips 1998). Its eastern escarpment dominates the Tihamah, effectively a physical barrier to the rest of the country (Fig 32, above). Yemen's ancient past, notably the Kingdom of Saba with its capital at Marib, was situated on the plain in the north of the country but south of the Ramlat Al-Sab'atayn desert (Fig 32) which effectively provides a northern barrier. Between the Ramlat Al-Sab'atayn and the western escarpment is where most of the modern country, and its ancient history, is located. The Tihamah then is effectively a peripheral, marginal region away from the ancient central development of Yemen. For the purpose of this thesis however the activity taking place there in the early first millennium BC places it centrally, connecting with Pre-Aksumite Tigray.

I was part of a British team undertaking excavation fieldwork in the Yemen Tihamah, during 1999, 2000, 2001 and 2006, at the sites of Al-Hamid, Al-Kashawba, Al-Mohandid, and Waqir, sites which will be discussed throughout this chapter. Yemen's location at the extreme southern tip of Arabian peninsula, a marginal geographic zone effectively, extends to its history, hence the archaeological record on the Tihamah is not as well-known as that of the Sabaean north.

3.1.1 Kingdom of Saba

When discussing ancient Yemen, two names are often used: South Arabia, or Sabaean. The former is a geographic description of the region whilst the latter is the culture that dominates in the late first and early second millennium BC. In this section I will discuss the Kingdom of Saba, where the Sabaean people and culture originate, and its capital Marib, northern Yemen (Fig. 33-34). The first known mention of the name Sabaeans is in the Bible (I Kings 10:1-13) with the Queen of Sheba visiting Solomon in Palestine. The Queen is named as Bilqis, again referred to in both the Bible, and the Qur'an, and mentioned as hailing from Marib (De Maigret 2002). The bible (I Kings 10:1-13) mentions Saba's intense commercial activity trading in gold, incense, perfumes, spices, jewels, and precious stones. Marib became the centre of the spice route trading frankincense and myrrh from the Hadramawt with the rest of Arabia, East Africa, Egypt and the Mediterranean coast (De Maigret 2002).

3.1.2 Marib

The Sabeaen capital Marib (De Maigret 2022; Phillips 1955) is located 260km north east of the Tihamah (Fig. 33). The site of Marib was excavated in 1951 by Wendell Phillips (1955), and the American Foundation for the Study of Man. Phillips excavated at the ancient cities of Timna, the capital of the once-prosperous Qataban kingdom, and Marib, the reputed home of the mythical Queen of Sheba (Kitchen 1997), known for their location on the ancient Trans Arabian Incense route. Phillips (1955) excavation began the archaeological history of South Arabia and much of what subsequently follows stems from his work. The city is dominated by two oases, north and south, and Jabal Balaq, with the Wadi Dahanaq flowing into the north oasis which is blocked by the Marib dam. The dam itself, heavily damaged by Saudi Arabian bombing in 2018 (Khalidi 2018) is a monumental construction 700m in length constructed from faced stone slabs bonded with a type of mortar, bookended by two monumental sluice gates through which water release was controlled to irrigate the two oases and depositing silt across the fields (De Maigret 2002) for agricultural benefit. The city relied on the dam for its agricultural prosperity. It was also far enough east so that it could benefit from the Spice trade as it passed through Marib from the Hadhramaut valley on its way to the Levant and Mesopotamia ca. 800 BC (Potts 1988) .

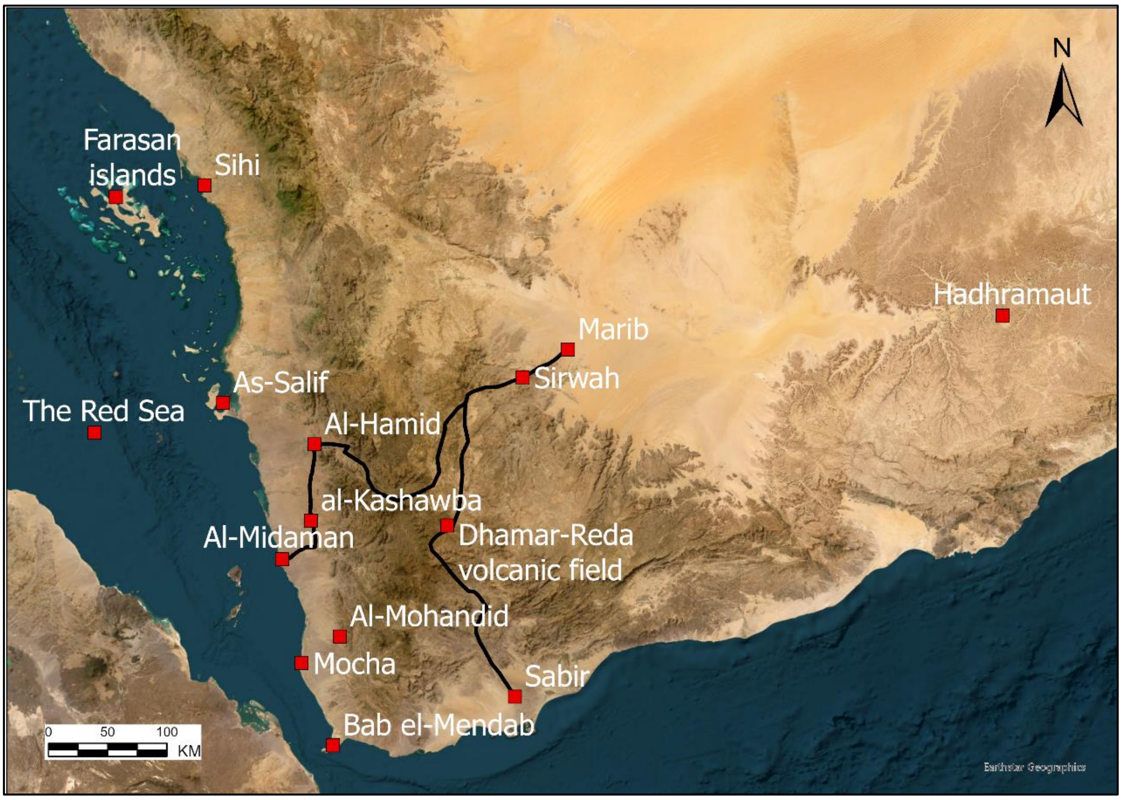


Figure 33. Yemen showing the location of Marib and Sirwah, in the Kingdom of Saba, in relation to Tihamah coastline (Bab el-Mendab-As-Salif).

Close to the city are the famous temples for which Marib is best known, the Mahram Bilqis also known as the Awwam temple (Fig. 34), on which Austrian explorer Glaser (De Maigret 2001) found an inscription saying that the temple was built in honour of the god Almaqah by the Mukarrib of Saba. Mukarrib translates as 'ruler' or 'sovereign' but it's exact meaning is still undetermined (De Maigret 2002). The temple is, unusually, oval in shape and measures 100m x 75m with walls 10m in height, with an elaborate entrance hall or *propylaeum* on its north side. The Mahram Bilqis also serves to substantiate the myth of The Queen of Sheba, ruler of Saba (Simpson 2001), its name translating as *Maḥram Bilqis* ("the Sanctuary of Bilqis"), although no physical evidence of the Queen of Sheba has ever been found. The archaeology uncovered does suggest however that it was the seat of an individual of significant, perhaps royal, power, whether or not they were called Bilqis. The fullest and most important version of the Sheba legend appears in the Kebra Nagast (Glory of the Kings), the 14th century Ethiopian national saga connecting Ethiopia and Yemen (Simpson 2001) .

The inscription at Marib naming the deity Almaqah, highly significant for this research, is the name that also appears on the Sabaean inscription at both Yeha and Meqaber Ga'ewa temples

(Wolf and Nowotnick 2010). To understand the spatial and temporal African-Arabian relationship this name is a singular part of that equation connecting both countries.

Figure 34. The Awwam Temple at Marib. Photo Amr Alsori, copyright: Nomination Team of the Landmarks of the Ancient Kingdom of Saba in Marib governorate.

3.1.3 Sirwah

The Sabaean oasis city of Sirwah (Fig. 35), located forty kilometres west of Marib, is the most important centre of the Sabaean kingdom, with its spiritual centre being the Almaqah temple. Gerlach (2005) cites Sirwah, along with Marib, as a major South Arabian influence on the temple of Yeha where reference to Almaqah was found. Architectural elements at Sirwah, specifically the Five Pillar building, a timber framed structure dated to 900 BC (Schnelle 2018), were restyled at Yeha, and potentially also at Meqaber Ge'awa (Wolf and Nowotnick 2010), such was its evident importance to Sabaean culture (Gerlach 2012). The work of the German team (Gerlach 2005) in ascribing a date to Sirwah was assisted by the discovery of a Bronze casting workshop containing artefacts dating to several Sabaean cultural phases from the 7th century BC to 3rd century CE (Gerlach 2005). Sirwah provides significant data on the Sabaean trading system notably in a bilingual Sabaean-Nabatean (Palestine) inscription from the temple dated to the 7-6th century BC indicating long distance trade networks and the earliest known Sabaean contact with Nabataea (Gerlach 2005). Trade routes pass to the north of Sirwah (Fig. 35) along the edge of the desert to Najran (Saudi Arabia) (Gerlach 2005) and east to Gaza, Palestine or north to Mesopotamia (Potts 1988).

Figure 35. The Almaqah Temple at Sirwah, Yemen. Photo https://commons.wikipedia.org/wiki/user:Kmatura

3.1.4 Chronology

The chronology in Tihamah (Table 6 is, as in Tigray, a central component of this discussion.

Date	Yemen Tihamah	Ethiopian Tigray
8000 BC	Neolithic	
4000 BC	Chalcolithic	
3000 BC	Bronze Age	
1800 BC	Middle Bronze Age	Tigray prehistory
1700 BC		Initial Pre-Aksumite
1600 BC		Early Pre-Aksumite
1200 BC	Late Bronze Age (South Arabian Protohistory)	
900 BC	Iron Age (Kingdom of Saba)	Middle Pre-Aksumite

Date	Yemen Tihamah	Ethiopian Tigray
800 BC		Yeha phase I
700 BC		Yeha phase II
750 BC	Kingdom of Hadramawt & Ma'in	
600 BC		Late Pre-Aksumite
400 BC	Kingdom of Qatabān	Yeha phase III
250 BC	Himyarite	
150 BC	End of Sabaean period	

Table 6. Comparative Yemen and Ethiopian chronology synthesised from Khalidi (2006), De Maigret (2002), the revised Pre-Aksumite dates (D'Andrea et al. 2018), and Yeha (Fattovich 2009).

The Tihamah chronology was established between those who favoured a long chronology suggested by Von Wissman (De Maigret 2002), the medium/mixed chronology (Van Beek 1969) or the short chronology (Pirenne 1956). The debate focuses on questions of dating that, for these purposes, does not involve African connections, but hinges on the cultural distinctions, primarily via inscriptions, of south Yemen Kingdoms, the emerging archaeological record of Yemen, combined with Biblical dating relating to the Queen of Sheba. The accepted outcome is that the long chronology (Table 5) is the most credible because of the coevolution of the language and the architecture, one does not happen in isolation to the other (De Maigret 2002).

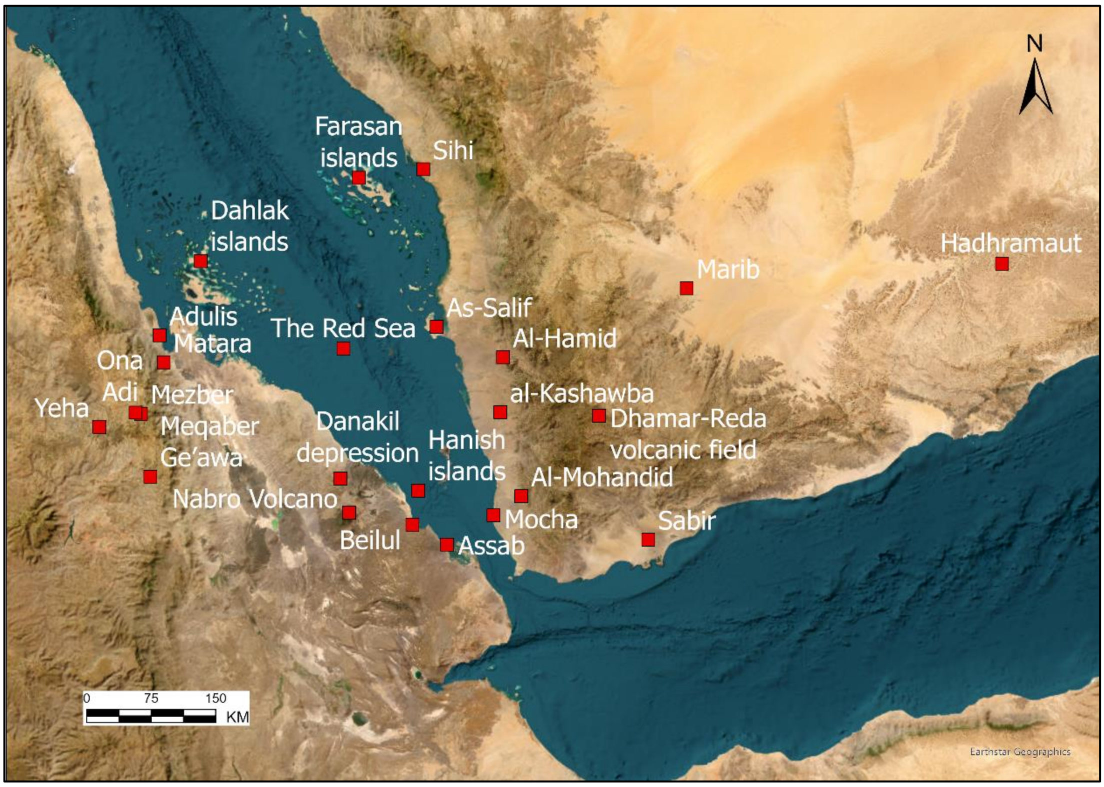


Figure 36. The Ethiopian Tigray and Yemen Tihamah archaeological sites discussed in this chapter.

3.2 The Yemen Tihamah: other relevant late first and early second millennium BC sites.

Tihamah was one of the later areas of Yemen (Fig. 36) to be archaeologically investigated, the Kingdom of Saba drawing initial attention from the early explorers and archaeologists. With the explosion of interest in ancient Egypt in the late 19th and early 20th centuries, notably the discovery of the tomb of King Tutankhamun, archaeological excavation in Yemen really begins with Carl Rathjens and Hermann von Wissman in 1927 and their work at Huqqah temple, near Sana'a (De Maigret 2002). This was followed (De Maigret 2001) by the English archaeologist Gertrude Caton-Thompson at Huraydah in the Hadramawt in 1938, Harry St John Philby rediscovering Shabwa in 1936, Freya Stark visiting the Hadramawt n 1938, the Egyptian geologist Ahmed Fakhry in 1947, and the arrival of Wendell Phillips in 1947.

In the decades following, a number of Italian missions, notably that of De Maigret (1981), began visiting Yemen. Tosi (1986, 1986a, 1985) identified two prehistoric sites along the Wadi Rima, and the As-Salif peninsula to the north of the Wadi Surdud. The latter connected the plain to the Tihamah but was also understood to be an ancient routeway owing to evidence of historic period use in the form of salt transportation (Breton 2021; Tosi 1986).

The earliest known presence of obsidian on the Tihamah is recorded at a site known as ABD located inland on the lower reaches of Wadi Rima (Tosi 1986, 1985). Obsidian flakes were recorded at the 4.5ha site although no radiocarbon dates were obtained. A second prehistoric site, JRBii, was found along the northern bank of Wadi Girb, c.8 km from the seashore with significant quantities of ceramics and lithics including flint, jasper, basalts, rhyolites, chalcedony, and obsidian. At the Gahabah shell midden site, obsidian represents 75 percent of the lithic tools. If the African Afar region was to be identified as the obsidian source it would indicate an early date for the trade of obsidian but one that is echoed by obsidian in Egyptian burials of the 4th millennium BC at Naqada and Abydos (Aston et al. 2000).

3.2.1 Al-Midaman

One of the keys to unlocking the archaeology of the Tihamah was the excavation of the site of Al-Midaman. The Royal Ontario Museum survey (Ciuk and Keall 1996) identified many of what are now recognised as major archaeological sites across the Tihamah, including Zabid, Al-Midaman, and Al-Kashawba. The survey prompted an extensive Tihamah research programme that continued until the current military conflict began in 2016. The survey provided the first chronology for the Tihamah ranging from 1500 BC to the present (Ciuk and Keall 1996). This provided further definition for the pre-Islamic period, and the prehistoric period, which had been suggested earlier in fieldwork by Caton-Thompson (1944). As discussed in the previous chapter use of the term prehistory is suggested as prior to 1200 BC and the advent of the Sabaean culture (De Maigret 2002).

As is often the case with sites on the Tihamah, the site of Al-Midaman is a series of severely deflated remains located amongst sand dunes. Local people took Keall to “see the stones” (Keall 1998, 139) a series of basalt megaliths located amongst dense scatters of ceramic sherds and covering the ground intermittently over eight sq. kilometres. Three large standing stones were visible, 2.5m in height and weighing approximately 6 tonnes each, with a further stone lying at an angle on the ground measuring 7m in length. There was evidence of a large, monumental structure known as Building A (13m length) partially visible in the sand dunes of the deflated site. From the stratigraphic record, Keall (2004; 1998) identified at least two separate phases at Al-Midaman and that the stone pillars dated from the third or early second millennium BC based on the date of the copper tools found with them. The monumental building was tentatively dated to the early first millennium BC based on the ceramics associated with it.

Keal’s (1998) excavation of the shallow stratigraphy revealed a domestic area of dwellings built of organic materials suggested to be palm branches although no traces of these were actually found. In a particularly significant discovery, the cache of copper tools, found below one of the standing stones, appeared to be specifically placed around a large fragment of obsidian, possibly as a ceremonial deposition (Giumlia-Mair et al. 2000). The cache consisted of two flat copper adzes of different size, two daggers, four points, two razors and a thin leaf-shaped object referred to as a spatula, primarily made from unalloyed copper. Giumlia-Mair et al. (2000) draws attention to the distinctive character of the copper tools which are diagnostic to the late 3rd and the mid-2nd millennium BC. The metallurgical tradition of the tools indicated an African source although this is unconfirmed (Giumlia-Mair et al. 2000). Obsidian was found throughout the site as geometric microliths and *pièces esquillées* (splintered pieces) were mixed with the pottery scatter, due to the deflation across the site. Assigning a definite date to the obsidian proved difficult considering the prolonged use of the resource throughout prehistoric Tihamah, discussed further in chapter four.

Keal (2004, 1998) suggests a number of possible sources for the standing stones: local sources at the Surat Mountain chain, fifty miles from Al-Midaman, or from one of the Red Sea Islands, such as Zuqar. Khalidi (2006) suggests that they could originate from the volcanic bay of Ras Rahamet which is situated near the Eritrean coastal towns of Iddi and Beilul. The logistics of transporting large blocks of stone across the Red Sea are considerable, however Keall suggests an overseas origin most likely (Edward Keall personal communication 29th January 2023) although this is unconfirmed. If so, however, it does indicate that if large basalt stones weighing six tons could be shipped overseas then moving considerably smaller quantities of obsidian should have been relatively easy.

Al-Midaman handmade pottery is dated to 1300-900 BC based on comparative ceramic stylistic parallels and ^{14}C dating (calibrated data not published) at Sabir (Keall 1998). Importantly, it also compares with that documented at the so-called Gas station site, Al-Kashawba (Ciuk and Keall 1996) some 25km from coastal Al-Midaman (see below). The same pottery also finds a comparison further north on the Tihamah at the site of Al-Hamid (C Phillips 1997) (see page 92 below). Here, however, the pottery was dated closer to the eighth century BC, again based on a comparison of palaeographic inscriptions between Al-Hamid and Waqir (below) (Phillips 1997).

The inhabitants of Al-Midaman are described as an enigma by Keall and that it is ”a tempting alternative to seek possible connections with the Horn of Africa” (Keall 2004, 52). Keall (2004) suggests a parallel with Mahal Teglinos (Gash delta, Sudan) as both site’s had similar monolithic stelae, not as single grave markers, but as pillars placed in a cemetery area in the early third-mid second millennium BC (Fattovich 1993). Establishing a direct link between Al-Midaman, 2km inland from the Tihamah coastline, and the Gas Station site (Al-Kashawba) 35km inland, and their relationship with Ethiopian Tigray 1500-800 BC, is one of the central questions of this part of the research. The archaeological evidence at both sites highlights the activity in this region in the late second and early first millennium BC.

3.2.2 Al-Hamid

Al-Hamid came to attention due to the discovery of a series of boustrophedon inscriptions (Beeston 1995; Stone 1985; Jamme 1981) suggesting, at the time, that it was the only known pre-Islamic archaeological site on the Tihamah. The Stone expedition (Stone 1985), the first such exploration to the Tihamah, was primarily anthropological but included an archaeologist, Al-Radi, who described the Al-Hamid site and published the inscriptions found there. Carl Phillips then began a programme of survey and excavation between 1995 and 2001 (Phillips 1998, 1997; Durrani 2005), at which I was a team member from 1998 onwards

Carl Philips, University College London, began work in the Tihamah in 1995, at Al-Hamid to the east of Bajjil town at the foothills of the Western Escarpment. Al-Hamid is located near to the Wadi Siham on the lower slopes of Jabal Al-Dhamir with a view across the Tihamah plain. The semi-arid location, dotted with acacia and littered with stone, was an attractive place for settlement due to the availability of seasonal run-off creating a very fertile environment. Initial findings at Al-Hamid (Phillips 1997) indicated pre-Islamic pottery similar to the Gas Station site, Al-Kashawba (Ciuk and Keall 1996) approximately 70km to the south.

Figure 37. The Temple (building 1) at Al-Hamid, Yemen. Photo Richard Lee, 1999.

Although the site includes houses and a cist burial dating to the Islamic period, the features of interest here are those of the first millennium BC. Seven seasons of excavations (Phillips 1997, 2005; Durrani 2005) revealed a nucleated settlement with distinct spatial patterning. A surrounding wall enclosed a series of buildings with the most obvious, Area A (Fig. 37, 38, 40), being a temple, identified on the basis of dedicatory Sabaic inscriptions (script of the culture) associated with it (Phillips 1997, 1998; Jamme 1981). The structure measured 11.5m x 9m on an east-west axis but with the remaining walls only standing to a height of 0.75m. The walls consist of two layers of dressed closely fitted ashlar blocks to a width of 1m with an inner core of smaller irregularly shaped stones and built on a foundation of large irregular stones (Durrani 2005). Whilst there was only minimal evidence for a floor within the north-east area of temple, a series of buildings or rooms were present along the west face of the temple. Some had better preservation than others due to evidence suggesting robbing or demolition (Durrani 2005).

Circular tombs with badly disturbed human remains were found (Area E) alongside many ceramic fragments. One notable burial of mixed human remains and pottery also included ten distinctive ceramic 'offering tables' ca. 0.50m in height, and a number of unique incense burners (Fig. 39), now known to be typical of Al-Hamid (Phillips 1998) and also found at Al-Midaman (Keall 2004) and Al-Kashawba (Khalidi 2006).

Figure 38. The Al-Hamid temple (building 1) Photo Carl Phillips, 1998.

Figure 39. Incense burners, 0.20cm height, excavated at Al-Kashawba, Tihamah, very similar to examples found at Al-Hamid, and at Meqaber Ge'awa, Tigray. Photo Carl Phillips, 2006.

A third area, the northern courtyard complex, was identified 50m east of Area F (Fig. 41) with similarly matching material culture and a further monumental inscription. It is probable that the site extends even further than excavation revealed as outlines of walls could be traced on the ground surface away from the main building cluster.

Al-Hamid is dated by its inscription palaeography and the ceramic comparisons, suggesting an early first millennium BC date (Phillips 1997, 293). One of the monumental inscriptions was found in-situ in the temple whilst the others were found in an "ashlar tumble" directly associated with it but which Durrani (2005, 80) considers to be reliable artefacts for dating the site since their presence in a deposit of wall collapse indicates that they were found adjacent to their original in-situ location. Architecturally the Al-Hamid temple matches the classic Sabaean temple architecture where the simpler archaic styles used are also the earliest (Jung 1988). Within the ceramic corpus are examples of local styles, although still of the same date based on Al-Midaman comparisons (Ciuk and Keall 1996),which reflects what is known as a distinctive Tihamah tradition. Whether the whole 10ha site was in use at the same time is unclear, but a date within 800-500 BC now appears credible particularly so as ceramics from Sabir, and Al-Kashawba, have reaffirmed the proposed Al-Hamid dates (C Phillips 2009). Only small quantities of obsidian were retrieved from the excavation, none of which has been sourced. An obsidian blade was retrieved from the surface of Area A, the temple area, alongside three small obsidian flake (Durrani 2005,79).

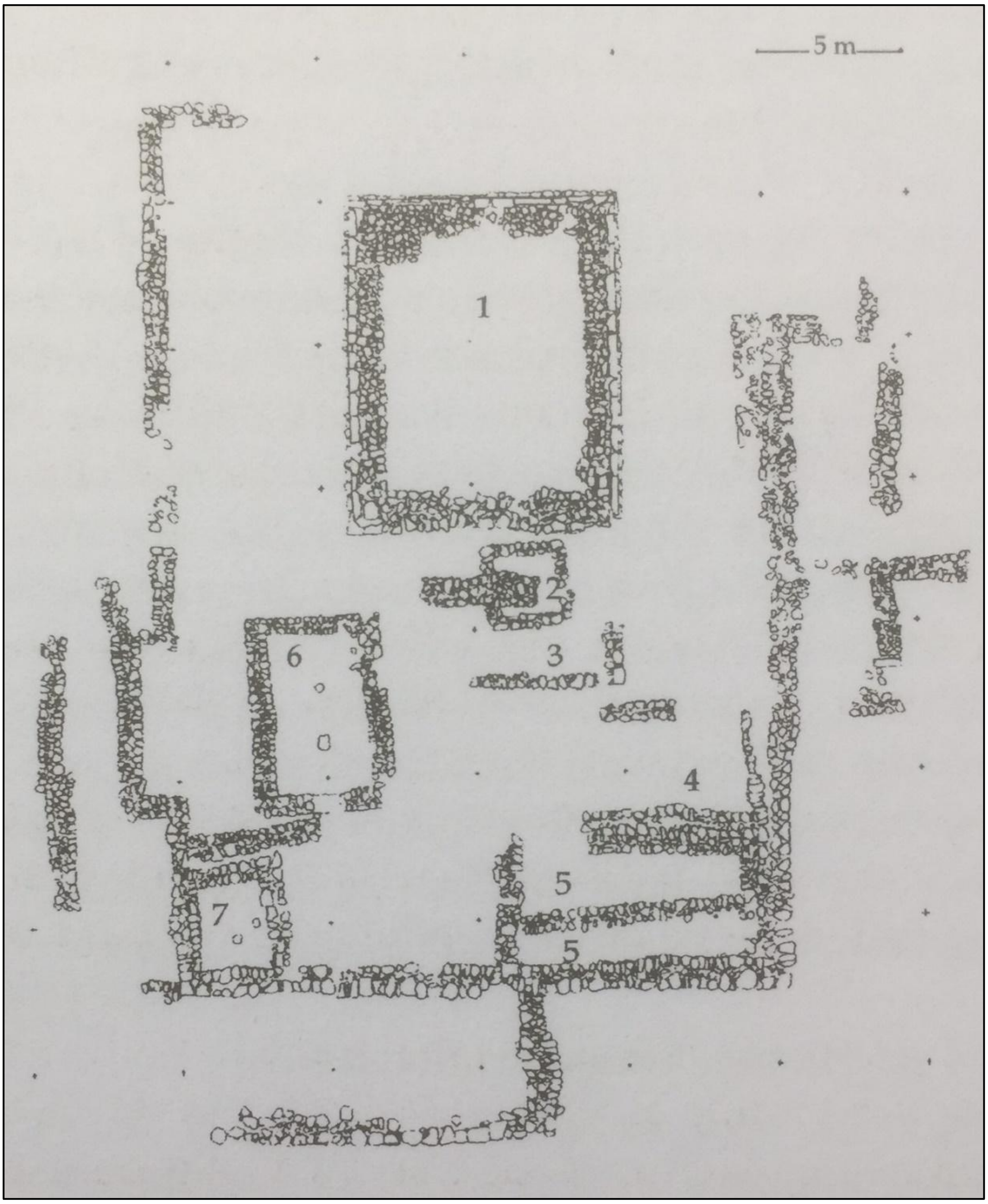


Figure 40. Area A, including the temple (building 1) at Al-Hamid (Durrani 2005, 76).

Al-Hamid was not a difficult site to identify and record as the upper levels of walls were partially visible on the ground surface. Whilst there may well be other structures at the site than have been identified so far, clearly the main central cluster of buildings have been recorded (Durrani 2005). A sounding, or test pit, measuring 1x1m was placed in the courtyard of Area B and a small wadi had cut into Area A (see Fig. 41), revealing the underlying stratigraphy, both of which indicate that the buildings at Al-Hamid were established directly on top of the natural terrace.

None of the pottery from the excavation, or surface finds, indicate that there might be an earlier occupation at the site unlike Yeha or Meqaber Ge'awa for example (see chapter 2).

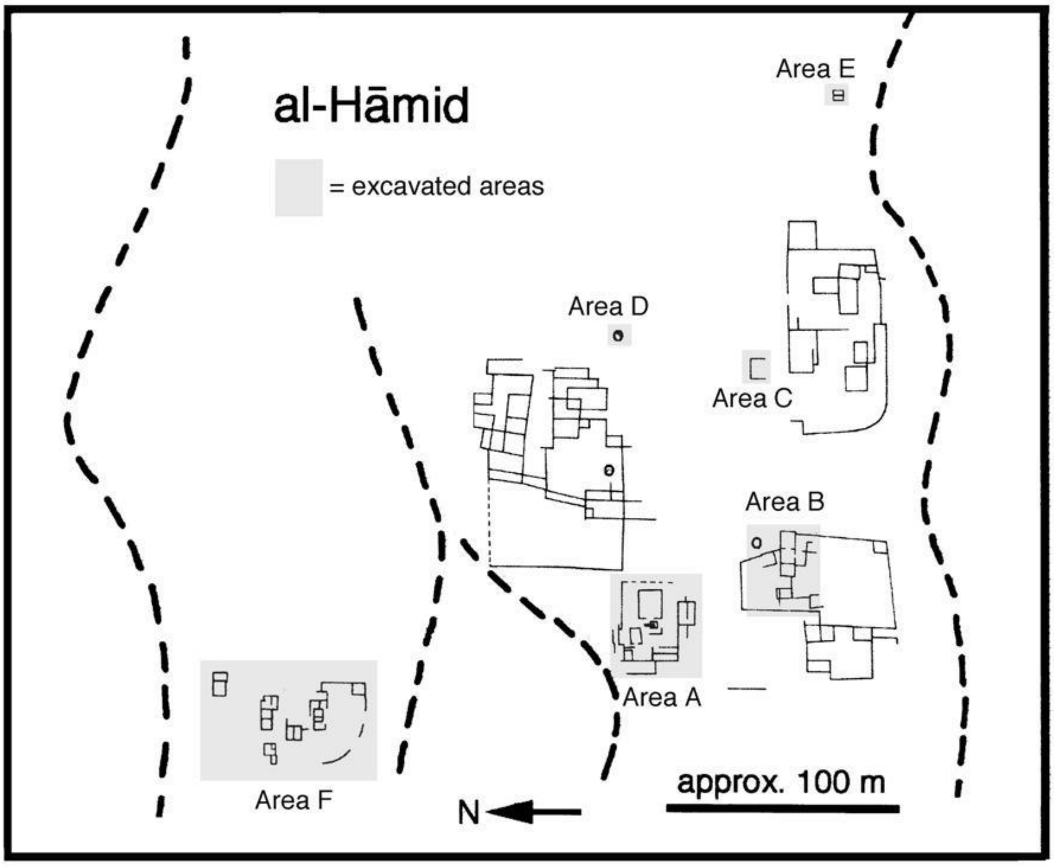


Figure 41. The site plan of Al-Hamid, with the temple area labelled Area A (Phillips 2005, 178).

As I discussed in this chapter's introductory section, the archaeology of the Tihamah lies outside the Kingdom of Saba which is further emphasised by the distinctive local Tihamah ceramics, and inscriptions (Phillips 1998, 2004). Interpreting how we recognise Al-Hamid is, not unlike the Yeha temple, a matter involving some conjecture alongside the harder facts. The initial interpretation of Al-Hamid's location, on the Wadi Siham between the Tihamah and the plain, suggested that it was a first millennium AD Aksumite incursion onto the Tihamah (Durrani 2005, 81). This interpretation was based on a reading of the inscriptions being of a later historical date (Durrani 2005). Once it became apparent that the inscription was in fact much older the interpretation changed to being a Sabaean "staging post" (Al-Radi 1985, 54) *en route* to the Red Sea during the late first millennium BC. A third interpretation is that Al-Hamid was indeed a staging post *en route* to the Red Sea but in the *early* first millennium BC (C Phillips 1997; Beeston 1995; Robin 1995). Based on architectural temple styles and pottery dating, this later hypothesis appears to be a more likely assessment. With what is known of the Sabaean relationship with Tigray (chapter two) this also supports this date.

This interpretation then raises the question, apposite for our understanding of the South Arabian influence in Tigray, of the political or cultural relationship between Al-Hamid and the Kingdom of Saba. Beeston (1995) and Robin (1995) perceive the site in terms of a militaristic one safeguarding the Sabaeans route to the Red Sea. This interpretation is developed from an understanding of the Sabaean national deity Almaqah, known via inscriptions at Al-Hamid, and at sites in Tigray (Yeha, Hawelti, Meqaber Ge'awa, in chapter two) and how the ethnic relationship between Saba and Tihamah functioned. Had a campaign of unification by the Sabaeans incorporated Al-Hamid into the Sabaean kingdom (Robin 1998) or was Tihamah an independent region? Phillips suggests that Tihamah was autonomous, and that Al-Hamid was a "continuation of local developments" (Phillips 1998, 237) with the prime location of the site making it an important local agricultural centre or local administrative centre (Phillips 1997). Its size is certainly suggestive of a large population, and bigger than would be necessary, for a military outpost.

The affinity with Sabaean temple architecture and inscriptions indicates that there was some relationship with the Kingdom of Saba (Phillips and Beeston 2005) and that these styles suggest an early date for the Al-Hamid temple, hence parallel to the primary Sabaean chronology (1200-400 BC). So, whether ethnically or politically, but notably via the presence of the name Almaqah and other South Arabian deities, a merging of local Tihama tribal tradition with Sabaean culture is apparent at Al-Hamid (Phillips 2009). This raises almost the same questions that are asked of the South Arabian influence in Tigray, how does Sabaean culture transmit and establish itself on the Tihama? As I suggest and will discuss in chapter five, the link between Tihamah and Tigray is established by the sites of Al-Midaman, Al-Hamid, and Marib (Yemen), with Meqaber Ge'awa and Yeha temple (Ethiopia) as the western most point in the chain.

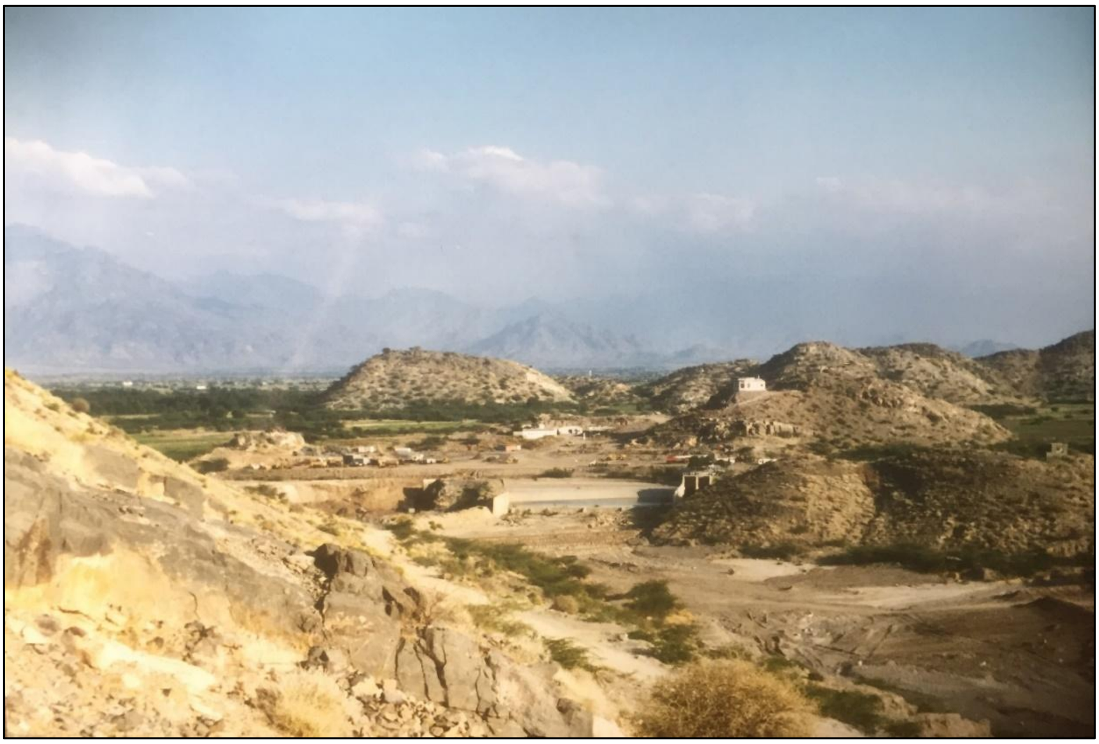


Figure 42. The location of Waqir, located on the Wadi Siham, in the midst of modern irrigation works. Photo, Richard Lee, 2000.

3.2.3 Waqir

The site of Waqir (Fig. 42) is also located along the Wadi Siham, 20km west of Al-Hamid, and was visited a number of times by Phillips team, including myself, in a purely investigatory capacity, however no excavation has ever been carried out there (Phillips 2000). The site (Fig. 42) was heavily disturbed by irrigation works and earthmoving disturbance, which is how its location became known. A roughly hewn, but highly significant, inscription on an ashlar block extends to five lines. This is the longest inscription known on the Tihamah and appears to come from a temple dedicated to the Sabaean deity Almaqah and is attributable to one of the early rulers of Saba, the Mukarribs (Abdullah 2004). The inscription (Phillips and Beeston 2005) mentions the commands of an earlier Mukarrib to protect this territory from the inhabitants of the north. The inscription also states that it is identical to one placed at Hadur Jabal Nabi Shuaib, the highest mountain in Yemen, near to the capital Sana'a. The palaeography, a comparative method of dating not an absolute one, and the names mentioned in the inscription, suggest a date of the early seventh century BC (Phillips 2000) making it later than the Al-Hamid inscription. Most importantly the inscription places the Sabaeans on the Tihamah, whilst both the inscription and the ceramics collected from the site bear strong similarities with those at Al-Hamid, and what could be recorded of the remaining built structures likewise recalls its close neighbour but potentially on an even larger scale. Whilst the site was not formally investigated, the visit and survey of the site was published in Phillips (20000a, 1998, 1997) and Durrani (2005) and which may now be all that stand as a record of the site, the current preservation of which is unknown.

Again, based on the inscription and pottery styles, Phillips places the site at roughly 700-500 BC, and asks the same questions posed at Al-Hamid regarding the relationship with the Kingdom of Saba. Philips suggests that the ceramics and the inscriptions indicate “a Tihamah with very strong Sabaean ties” (Phillips 2000, 6), part of a “Sabaean region or hegemony” (Phillips 2009, https://hal.archives-ouvertes.fr), but that it also fits into the pattern of a local Tihamah tradition based on comparisons with other Tihamah sites. Despite the little evidence available, and last visited some 17 years ago by the Tihamah Coastal survey (Khalidi 2005), the site of Waqir bears a strong resemblance to Al-Hamid in size, date and pottery types, but its inscriptions may indicate a site of greater religious significance and therefore importance. This is likely to be as close to an understanding of this important site as we ever achieve given the lapse of time, and the industrial development that has disturbed the site. Given its proximity to Al-Hamid, 20km, a day’s journey away on foot, Waqir may however have had a different function.

Although not investigated, another site, known as Al-Jahal, a similar distance away, is reported to have inscriptions and stela, suggesting that all of these sites may have been part of wider settlement pattern (Carl Phillips personal communication 26th January 2023).

3.2.4 The Gas Station site /Al-Kashawba

Two sites in particular are directly relevant to the interaction with Ethiopia in the first and second millennium BC (Ciuk and Keall 1996). These sites are Al-Midaman, as already discussed, and the site known as the Gas Station, located on the main arterial highway running north-south through the Tihamah (Fig. 45). Al-Midaman is located 2km from the Red Sea coast whilst the Gas Station site is 25km inland towards the foothills of the western escarpment.

The Gas Station site (STN) was re-named Al-Kashawba (Fig. 43) although its correct name is now known to be Wadi IGY-1, the name of a local wadi (Phillips 2009). The first known pre-Islamic pottery found on the Tihamah (Ciuk and Keall 1996) was collected at the Gas Station site from a deflated sherd scatter about 500m in diameter. A small team, including myself and Carl Phillips excavated at this site in 2006.

Figure 43. The Gas Station site, Al-Kashawba, Yemen. Photo Carl Phillips 2006.

Al-Kashawba (Fig. 43) (C Phillips 2007, 1998; Ciuk and Keall 1996) is a mounded site dense with surface ceramic scatters (Fig. 45)**,** 1.5km north of the main Zabid-Hodeida highway, 10km north of Zabid. Limited archaeological survey at Al-Kashawba indicated a site of significant size (Ciuk and Keall 1996; Khalidi 2006). Two granite megaliths are visible, partly buried but with 1.16m being visible above the ground surface, however local people claim that there used to be more stones before this time (Khalidi 2006). The site extends 2km west and 1km south with a western section that includes an uninvestigated megalithic element known as Manãsib Al-Rukbah Al-Mahbub which was damaged, ca. 2005, due to agricultural development. The surface pottery scatters across the site parallel the ceramics at Sabir (Vogt and Sedov 1998), dated to 1300 – 800 BC, and suggest that the site was occupied continuously during that period (Khalidi 2005). This date is important as it terminates just as some of the Tihamah Iron Age sites come into existence. It also becomes part of the period that was previously known in Ethiopian Tigray as prehistory, now revised as the *Early* Pre-Aksumite period (1200-1000 BC) (Table 1) (D'Andrea et al. 2018).

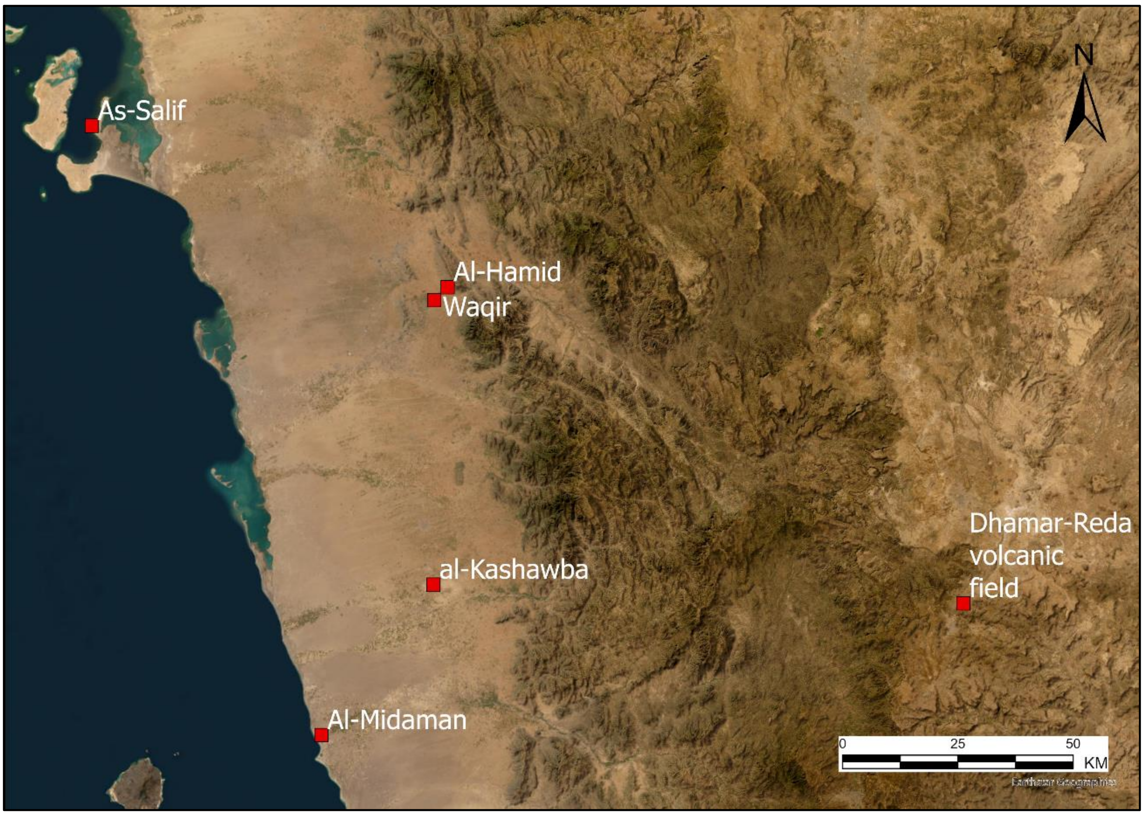


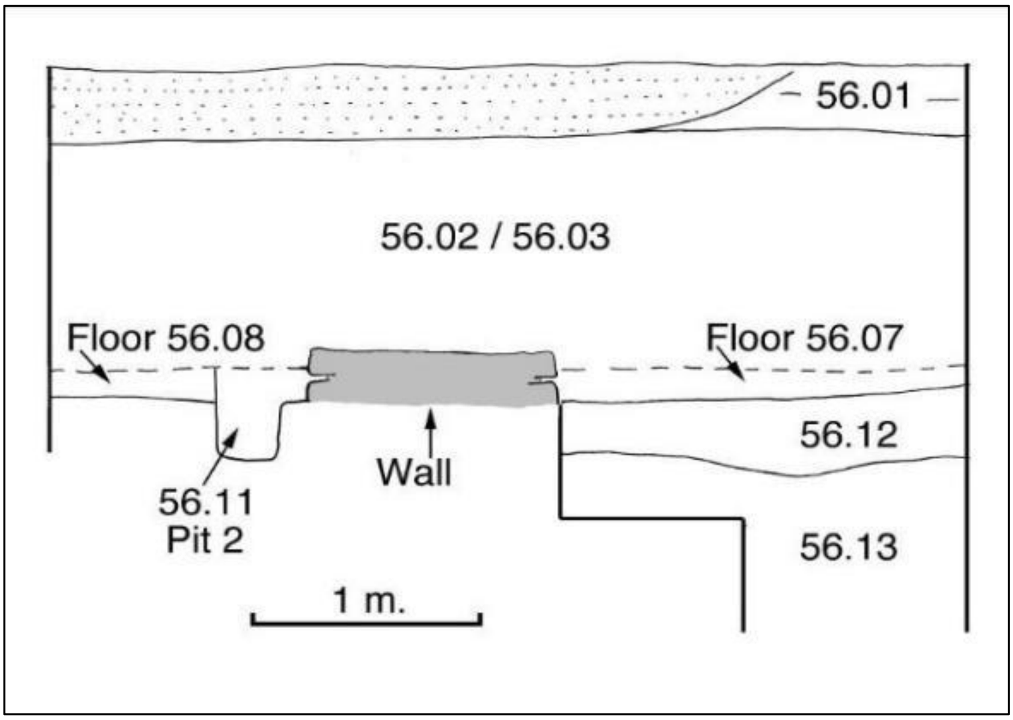
Figure 44.A map of the Yemen Red Sea coastal Tihamah showing Al-Kashawba in relation to the western escarpment to its east.

Whilst recognised as a highly significant site for the Tihamah during pre-Islamic Arabia, very little archaeological work has been undertaken there. The only excavation undertaken at Al-Kashawba was by the British Archaeological Mission to Yemen (BAMY) led by Carl Phillips, including myself, in the spring of 2006. The site spans the main Zabid-Hodeida road with our excavation taking place on the east side of the road where the pottery scatters were most dense. The primary aim of our first excavation at Al-Kashawba was to establish a chronological date for the site, based on stratigraphy, and how this might relate to other sites based on a comparison of pottery assemblages. We placed a single trial trench on the mound within the most concentrated layer of sherds, and divided into two adjacent squares (5m x 5m) established along an east-west axis. The two squares were numbered 55 and 56 (Fig. 46) with a deep trench measuring 2 x 1 m in square 55 and a larger trench, measuring 4 x 4 m, in square 56, excavated to a depth of 3m.

Figure 45. Pottery scatters cover the surface of the excavation area at Al-Kashawba. Photo Carl Phillips, April. 2006.

Our excavation in square 55 revealed the fill of a pit in which the pottery in the lower levels differed notably from that in the upper levels. Throughout the excavation of square 55 abundant pottery was recovered, along with a large quantity of animal bones. Fragments of a punctate pottery style are considered by Phillips to have a close, if not identical, parallel with ceramics found at Sabir and Sihi, but are also described as "exotic" by Phillips (2009, https://hal.archives-ouvertes.fr) meaning not Arabian.

Square 56 indicated (Fig. 46) that the deposits into which the pit was cut were above a substantial mud-brick wall orientated north-south. The wall was 1.10m wide and was built from well-formed and compacted mudbricks measuring 50 x 30 cm and 6 cm thick. On either side of the wall was a distinct layer of debris, or collapse, about 10–20 cm thick, lying above a hard clay surface that represents the floor surfaces associated with the wall. The presence of substantial mud-brick architecture at Al-Kashawba is significant since little is known of the early architectural traditions in this region with the only other examples of mudbrick being at Al-Midaman and Sabir (Phillips 2007; Buffa and Vogt 2001). The pottery associated with the wall or building in square 56 appears to be the same as that found at Al-Hamid dating from the early first millennium BC (Phillips 2007). The stratigraphy indicates three phases of occupation 1000-500 BC (Table 6).



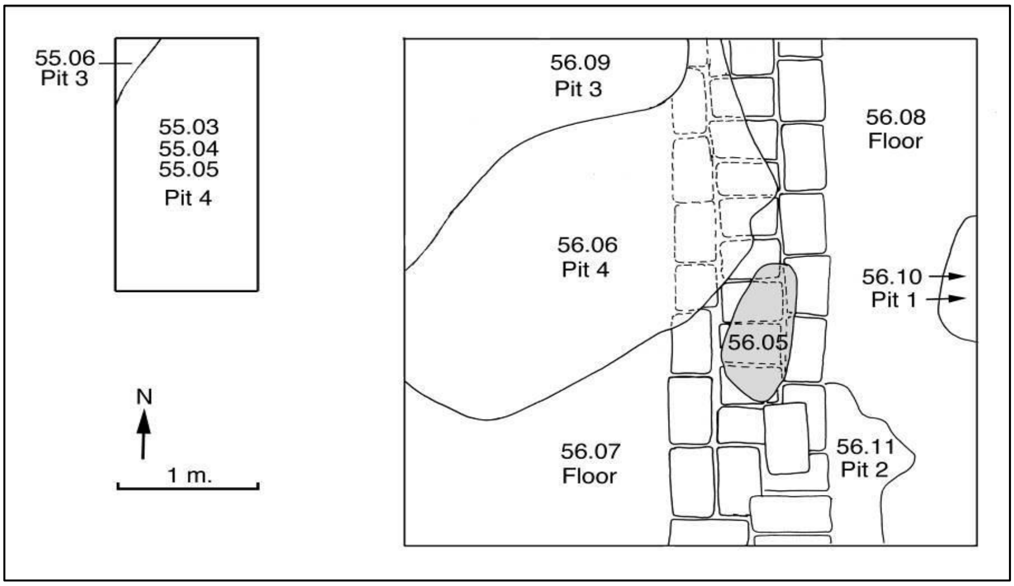


Figure 46. Stratigraphic section drawing from square 56, Al-Kashawba. Unpublished site drawings courtesy of Carl Phillips 20203.

Date	Malayba	Sabir	Al-Hamid	al-Kashawba'	Al-Midaman
500 BC			X	3	
			X		
				2	
800 BC		3	X		
900 BC					X
1000 BC	2	2B		1	
		2A			
1300 BC	1C	1			x
1500 BC	1B				
2000 BC	1A				
2400 BC					X

Table 7**:** Chronological dates and phases for the Tihamah sites (Phillips 2009; Giumlia Mair et al. 2001; Keall 1998). The stratified pottery sequence links second millennium BC (Bronze Age) Sabir with first millennium BC (Iron Age) Al-Hamid with al-Kashawba extending across both. The numbers are the agreed stratigraphic phases at Sabir, the single phase at Al-Hamid is represented by the X, and Al-Kashawba indicates the stratigraphic phases established by the 2006 excavation.

The Manasib Al-Rukbah Al-Mahbub area of the site, unexcavated so far, is suggested as a "domestic settlement" (Khalidi 2006, 240) with the northern section being agricultural fields or pasture. The ceramics here are the same as those at Al-Midaman as are the obsidian tools, specifically geometric microliths and *pièces esquillées* (Khalidi 2006, 146), although it was noted that the quantity of obsidian tools outweighs the obsidian debitage and waste. Khalidi (2006) comments that compared to obsidian activity at other sites along the wadi Rima, off the Tihamah, perhaps the smaller sites were producing obsidian tools and that Al-Kashawba was then receiving the prepared geometric microliths. Khalidi suggests that despite parallels with Sabir pottery, Al-Kashawba and the Tihamah sites have a specific local style, and that Al-Kashawba has closer similarities to Al-Midaman (Khalidi 2006) perhaps not surprisingly.

The relationship between the Tihamah Bronze Age tradition and the early Sabaean period remains to be fully established, although Phillips suggests (2009) that the first millennium BC on the Tihamah is a combination of both local and Sabaean characteristics. This distinction is a central one to this thesis in refining the relationship between the Tihamah and the Pre-Aksumite period of 1500-800 BC in Tigray (see further discussion below). At Al-Kashawba, two phases of occupation are evident from the stratigraphy (given the presence of a pit that postdates a substantial mudbrick structure) and the pottery assemblages. Its large mudbrick walls, stratigraphy and pottery sequence, and similarities with Al-Hamid and Sabir, make it an important key to the cultural and development sequence of the Tihamah.

Al-Kashawba looked (Fig 45) to be quite an unprepossessing site. Our excavation however has demonstrated that it is one of the most interesting and informative archaeological sites on the Tihamah significantly expanding knowledge of the local-Sabaean interconnectivity. That it has been demonstrated to span both the first and second millennium BC expands Tihamah history, as both phases were only previously known at Al-Midaman and Sabir, although both of those sites are quite different to one another. When the situation allows Al-Kashawba is an ideal site for us to return to for further excavation that can be expected to enhance Tihamah history.

3.2.5 Al-Mohandid

Al-Mohandid is a site with even more limited investigation, and one that stylistically presents a distinct contrast to the other Tihamah sites discussed here. The British BAMY project, including myself, mapped and surveyed the site of Al-Mohandid in December 1999.

The site is a Tihamah megalithic structure consisting of a large number of basalt pillars, between 1-3m in height, numbering in their hundreds (Durrani 2005; Phillips 2000a), arranged in an avenue, interspersed with four stone circles (Bayle des Hermens 1976; Bernadelli and Parrinello 1971). The site is located in the foothills behind the town of Hays, 85km south of Al-Kashawba and 30km from the coastline (Fig 47, 48). The remains of a small settlement were found nearby but these are so far undated, unexcavated and probably of recent date (Carl Phillips personal communication 26th January 2023). The standing stones used for the monument's construction were sourced from a small hill adjacent to the site (Fig. 47). The layout of the monument both exploits the hill-source therefore, but also respects the immediate topography (Walsh and Mocci 2011) as it was constructed around the base of the hill. Our survey discovered a further extension of the megalithic complex (Phillips 2000a) increasing the overall size of the monument to nearly 1km in length. But it also recorded a completely different plan of circles and alignments (unpublished) thereby questioning exactly what Bernadelli and Parrinello (1971) or Bayle des Hermens (1976) actually saw during their 1970s fieldwork.

Al-Mohandid has the advantage of being substantially intact, which in this case I suggest means upright, as the stones form parallel lines or avenues up to 700m in length, sometimes standing to a height of ca.3m. The aim of our 2006 survey was to record the monument, not survey for artefacts, however Khalidi's survey (2006) found occasional abraded brown ceramics including (undated, and stylistically debatable) hole mouth bowls, and what Khalidi (2006, 245) describes as "rare" obsidian lithic debitage and waste, although neither of these were seen by the British team. This discovery is particularly significant for the first millennium BC, and this thesis discussion of obsidian. Al-Mohandid's location at the edge of the foothills and the coastal plain is highly significant because it is the transition between two widely divergent environmental and geographic zones (Khalidi 2006). In assessing the monument Khalidi (2005) suggest a possible comparison with the desert fringe-tailed tombs located 500km north on the edge of the Ramlat Al-Sab'atayn desert (Braemer et al. 2001, Steimer-Herbet 2001). Khalidi refers to the site as a "naturally occurring hybrid" (2006, 246) at the juncture of two distinct environmental landscapes, the desert fringe and the highlands (Fig. 48), at the "balance of two worlds, coastal and the highland" (Khalidi 2006, 245). As such it is an architectural anomaly on the Tihamah but with possible parallels to similar standing stone structures in Eritrea (Qohaito) and Djibouti (Joussaume 1995).

No absolute date has been assigned to Al-Mohandid but Durrani (2005) suggest the Arabian Bronze Age (3200-1300 BC). Certainly, an *earlier date* in the Arabian Bronze Age fits well with what is known for the other Tihamah sites and compares to a suggested early date for the Pre-Aksumite period in Ethiopia (D'Andrea et al. 2018) (Table 5). Beyond our landscape and monument survey no excavation has ever been undertaken at Al-Mohandid with the most recent site visit being that of Khalidi in 2004, and very little indeed has been published. Future fieldwork at the site would be an ideal location in which to apply Tilley's (1994) principles of landscape phenomenology. This is a physically impressive site that has never been excavated, for which there is no known chronology, and very little is known about it. It is a prime example of a site where going beyond the evidence (Bender 1998) is almost a prerequisite for understanding the site and its setting.

Although not strictly located on the Tihamah, in the escarpment foothills, it is necessary to include another site to help understand the Tihamah. Al-Mohandid is without parallel on the Tihama except for a little-known site called Al-Suq. Khalidi (2006, 258) records the site during her Tihamah survey but describes it as a circular stone structure, at a hybrid highlands-desert fringe location. The site is littered with obsidian flakes, but undated.

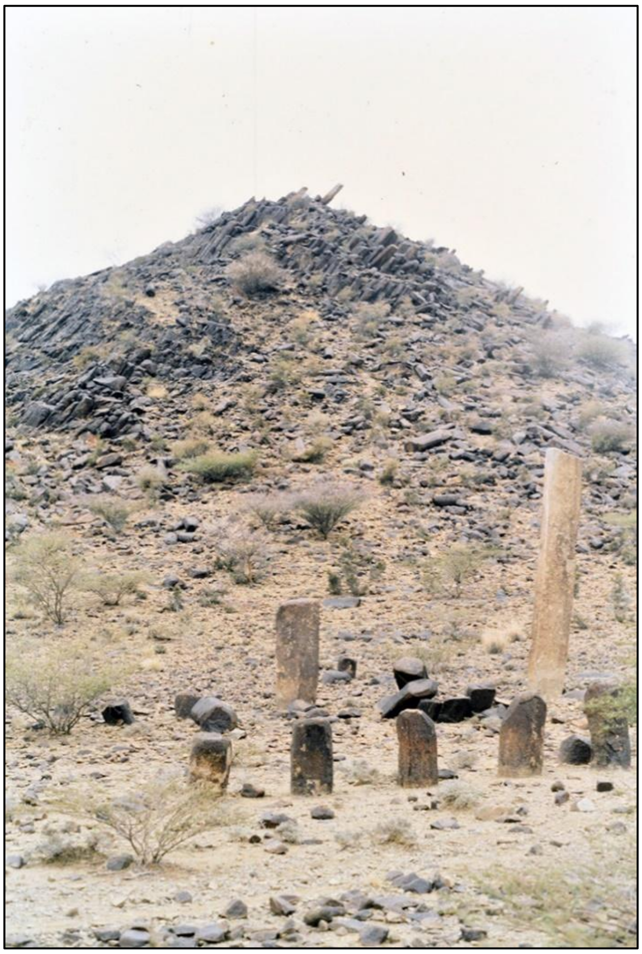


Figure 47. The site of Al-Mohandid standing stones and their hilltop source in the background.

Photo Richard Lee, 2000.

Figure 48. The site of Al-Mohandid and the standing stones, Photo, Richard Lee, 2000.

3.2.6 The Farasan islands and Sihi

The Tihamah plain extends beyond Yemen into Saudi Arabia where the Farasan islands (Fig. 49) are located 60km offshore. A number of South Arabian inscriptions have been found here dating to the first millennium BC (de Procé, & Phillips 2010). Significantly, one of the inscriptions bears a name, Athar, that is also known in the inscription at Waqir (Phillips and Beeston 2005, 48) and connecting the two sites. In the south-western part of Farasan, Al-Kabīr, in Wadi Matar, there are several archaeological sites close to one another with building foundations remaining and with further South Arabian inscriptions. The South Arabian presence here indicates interconnecvity with the Yemen Tihamah sites was extending 250km north. I suggest that the sites location implies that the Farasan islands could have been a crossing place to the Eritrean coast, possibly at Adulis.

The site of Sihi, located 60km south of the Farasan islands on the Saudi Arabian coastline, is c14 dated (specific details not provided) to 2400-1300 BC (Zarins and Al-Badr 1986; Zarins et al. 1981). Although without structural elements, the site has significant quantities of artefactual material including ceramics comparable to both the Nubian C group (2400 – 1500 BC) and with Sabir on the southern Tihamah (see below). Although suggested as part of the Tihamah wide "Sabir culture" (Vogt and Sedov 1998, 261), Phillips (1998) suggests that sufficient archaeological evidence is lacking to claim an extensive single coastal culture. There is however abundant obsidian at Sihi indicating trade from the Yemen Tihama sites, or obsidian sources, or potentially directly from sources on the African coast, which I will discuss further in chapter six. Both Sihi and the Farasan islands are sources of salt although to what degree this resource was mined during the first or second millennium BC is unknown (Breton 2021).

Tosi (1986) comments that during his 1985-86 survey, salt mining was very active on the As-Salif peninsula (Fig. 49), as it is in the Eritrean Afar desert. There was no evidence for earlier salt exploitation (Breton 2021) despite local shell midden sites being dated to 3700 BC. Such an essential resource as salt might be expected to be mined where it existed but such a natural resource does not survive well in archaeological deposits.

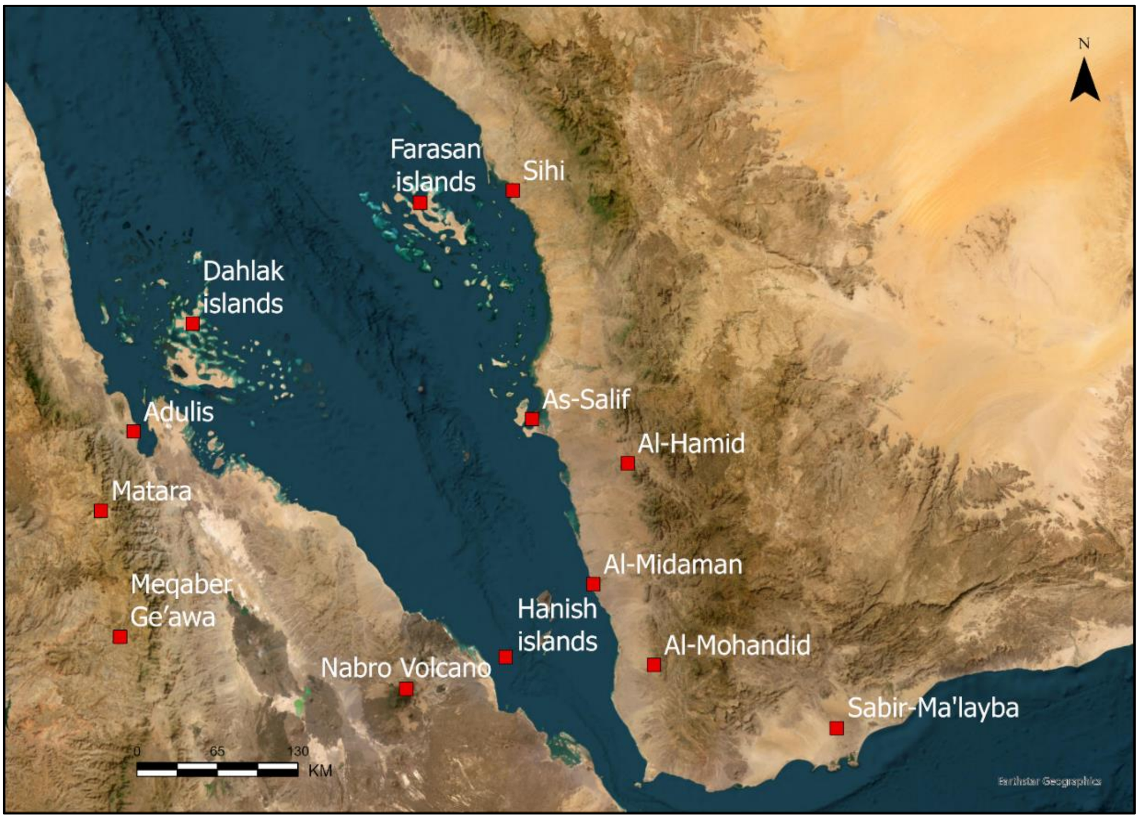


Figure 49. The Farasan islands and Sihi on the northern Tihamah coast.

3.2.7 Sabir-Ma'layba

Vogt and Sedov (1998) suggest the site of Sabir-Ma'layba to be unique, and culturally distinct from the other sites on the Tihama. Unlike other Tihamah sites it has cultural and architectural connections to the Hadhramaut valley 500km north-east, and ceramics attesting to the earliest levels of the Sabaean temple of Almaqah, Marib (Buffa and Vogt 2001). Sabir-Ma'layba (Fig.49) is two sites 5km apart in the delta of the Wadi Tuban, north of the city of Aden, in a location that provides easy access to the highlands, the central plain and potentially the Dhamar-Reda obsidian source (Khalidi et al. 2012) (Fig. 44). Buffa and Vogt (2001, 440) described the site, and it's Sabir culture, as a **"**non-South Arabian" almost wholly local indigenous culture.

Excavation at Sabir 5 revealed patterns of post-holes, and monumental mudbrick architecture (Fig: 51-52), where segments of a vast monumental complex (55m x 40m) have been exposed (Vogt and Sedov 1998). Huge quantities of pottery and "fruit-stand-like vessels"(Vogt and Sedov 1998, 64) assumed to be incense burners, were retrieved from what appears to be a kiln-site for large scale on-site pottery production (Buffa 2002; Vogt and Sedov 1998). A number of anthropomorphic terracotta figurines were found, the majority of which are of naked and obese women in a seated position (Buffa and Vogt 2001; Vogt and Sedov 1998). The figurine shown below (Fig 50), from Sabir (Buffa and Vogt (2001), not quite matching Vogt's description, but finds a close parallel with a figurine at Al-Kashawba (Fig. 56).

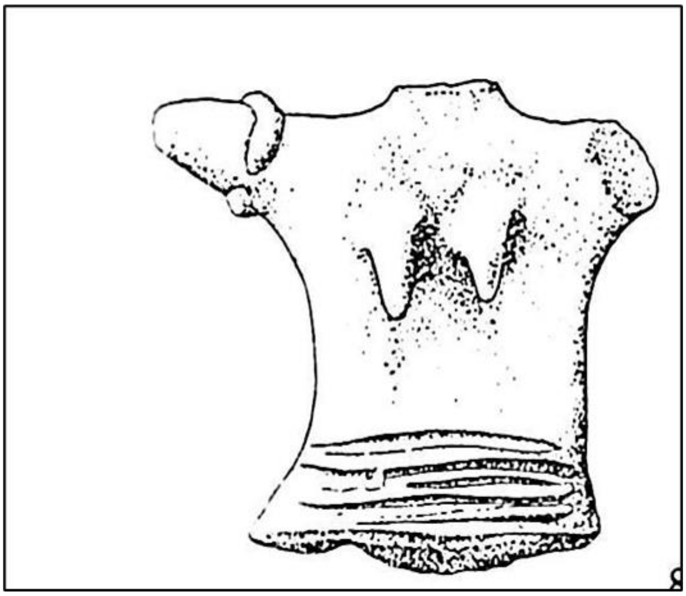


Figure 50. An anthropomorphic figure from Sabir, no scale given. (Buffa and Vogt 2001, 444). Comparisons with other figures are shown on page 121.

In terms of artefacts, the tools found at Sabir are usually made from obsidian or bone; metal is rare but finds include a dagger, whilst irrigation, agriculture and animal husbandry can be attested to. The dagger has similarities to the copper points found at Al-Midaman and Sihi, both sites which have parallels with Sabir. The obsidian is considered (Zarins 1987) as arriving by down-the-line trade originating in either the Yemen highlands, or the African coast (Zarins 1990) (discussed in the next chapter).

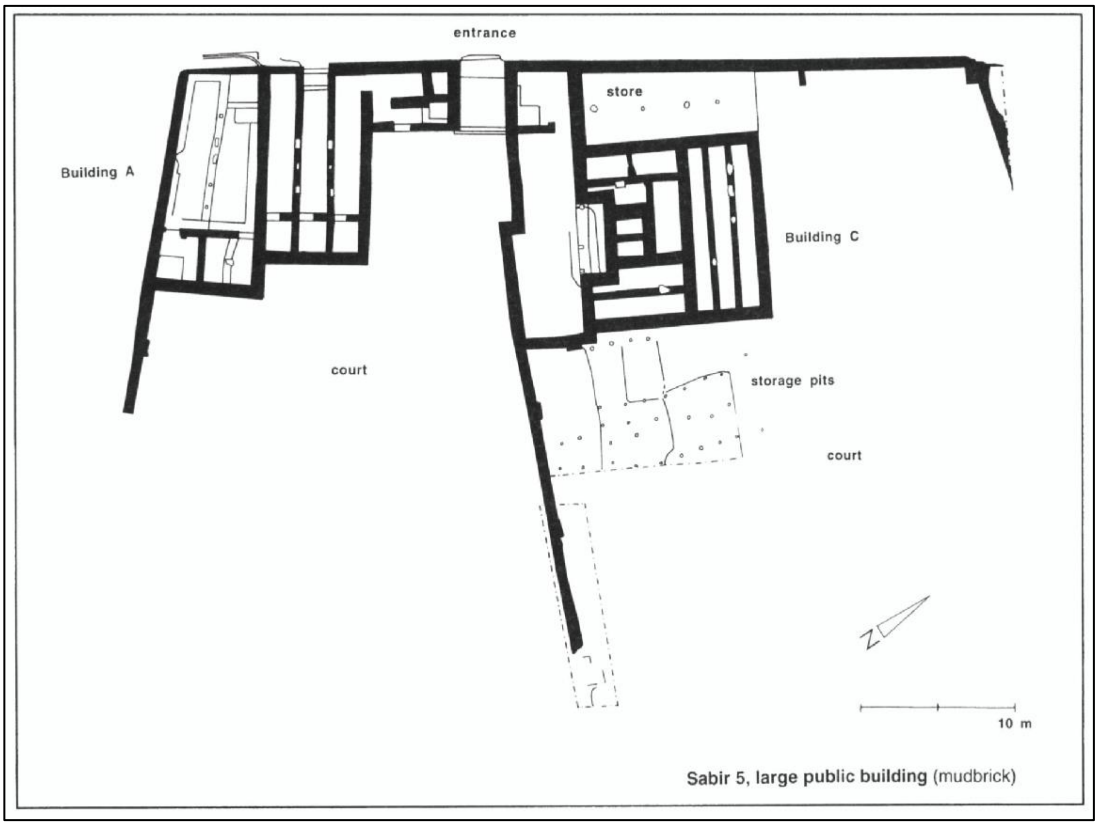


Figure 51. Plan of the monumental complex at Sabir 5 (Vogt and Sedov 1998).

Attesting to Sabir's local origins Early South Arabian pottery has been discovered sporadically around the city of Aden, and north of the site (Buffa 2002). Whilst Sabir had mass pottery production, imports, suggested as Ethiopian, or from the Ancient Ona culture, emphasise an external contact (Buffa and Vogt 2001; Vogt and Sedov 1998). Indeed, as Buff and Vogt (2001) suggest, Sabir has more in common with trans-Red Sea interaction than the "culture of the Arabian peninsula" (Buffa and Vogt 2001, 445) foreshadowing Fattovich's Afro-Arabian Interchange Circuit theory (2004). The upper 3m of stratigraphy at Sabir have been ^{14}C dated to the 13th-9th century BC (Gosdorf and Vogt 2001) (B1N-4633 3030$\pm$50 bp 1390–1250 cal BC/B1N-4892 2840 ±35 bp 1050–920 cal BC) with a possible 6th century BC re-occupation. Vogt describes the site as a "tell" (Vogt and Sedov 1998, 262), a term more often used in conjunction with Levantine sites as opposed to Southern Arabian sites.

The "ancient town site" (Vogt and Sedov 1998, 262; Gosdorf and Vogt 2001) covering an area of at least 2 x 1km, was constructed on a relatively flat plain within the delta which left it susceptible to repeated environmental degradation, and heavy flooding, leading to it later being temporarily abandoned ca 700 BC (Vogt and Sedov 1998). A unique "Sabir culture" (Vogt and Sedov 1998, 262) would make it the type-site, although similar material culture has also been found at both Al-Hamid and Sihi. Phillips (1998) suggests, correctly in my opinion, that whilst Sabir culture is unique to the site, it cannot be claimed as a Tihamah-wide cultural phenomena as Vogt and

Sedov (1998) suggest. It can probably be said that each site on the Tihamah has its own culture which gives it a unique character, partly the local Tihamah style absorbing some incoming Sabaean culture. This creates the distinctive material cultures that are apparent at Al-Hamid, Al-Midaman, Al-Kashawba, and even Al-Mohandid (Phillips 2009) although much less is known about this latter site and, as with Sabir (Buffa and Vogt 2001), exogenous influences may play a part here.

Sabir is usually cited and discussed jointly with the site of Ma'layba , which is close by, and has been ^{14}C dated (Gosdorf and Vogt 2001) to 2000-1100 BC: (B1N-5156 3550 ± 35bp 1950–1870 cal BC/B1N-5148 3010 ± 35BP 1200–1190 cal BC) which pre-dates “Sabir culture” (Buffa and Vogt 2001), by nearly 700 years. A series of occupation layers have been identified here connecting to a number of irrigation canals (Buffa 2002) which do appear to be unique to these two sites. The use of these was eventually halted due to periodic flooding, and later silting up of the canal (Buffa 2002). Ma'layba marginally predates it and the proposed Sabir culture therefore, although a nearby shell-midden site, an-Nabwa, dates to the early second millennium BC with other local shell middens dating to the Neolithic (Khalidi 2006).

Figure 52 The site of Sabir 5. Photo, Burkhard Vogt (Simpson 2002).

3.3 Discussion: Themes in the archaeology of first and second millennium BC Tihamah

Previous discussions and syntheses of the archaeology of this region, in this period, have focused on a number of themes, however other themes now emerge from the synthesis presented in this PhD. Several of these themes are interrelated, and it should be clear from the critical review of the available data that I presented above that there is often insufficient evidence to make complete assessments of each site.

3.3.1 The Trans-Arabian Incense route

Whilst the obsidian exchange network was creating an economy in Ethiopian Tigray, the Trans-Arabian Spice route (Fig. 53) was creating an even larger "global economy" (Sidebotham 2011; Peacock and Williams 2007) a few hundred miles north of the Tihamah from which the Kingdom of Saba was its fulcrum and chief beneficiary. The term "spices" includes such aromatics as frankincense and myrrh, stacte (myrrh oil), cinnamon bark, and nard, luxury goods that were in great demand for domestic and ritual users in the Levant, Arabia and Egypt (Groom 1981; Sauer, Blakely, and Toplyn 1988). The voyage across the Red Sea had been made regularly since the second millennium BC (Khalidi 2006a), as indicated by the reliefs and inscriptions on the walls of Hatshepsut's tomb in Theban Deir el-Bahri, in Egypt. Egyptians referred to incense or frankincense as 'ntyw' (Zarins 1996, 100), but is also sometimes referred to as "senetjer" (Shaw and Nicholson 2004, 158) a name that is less specific in meaning.

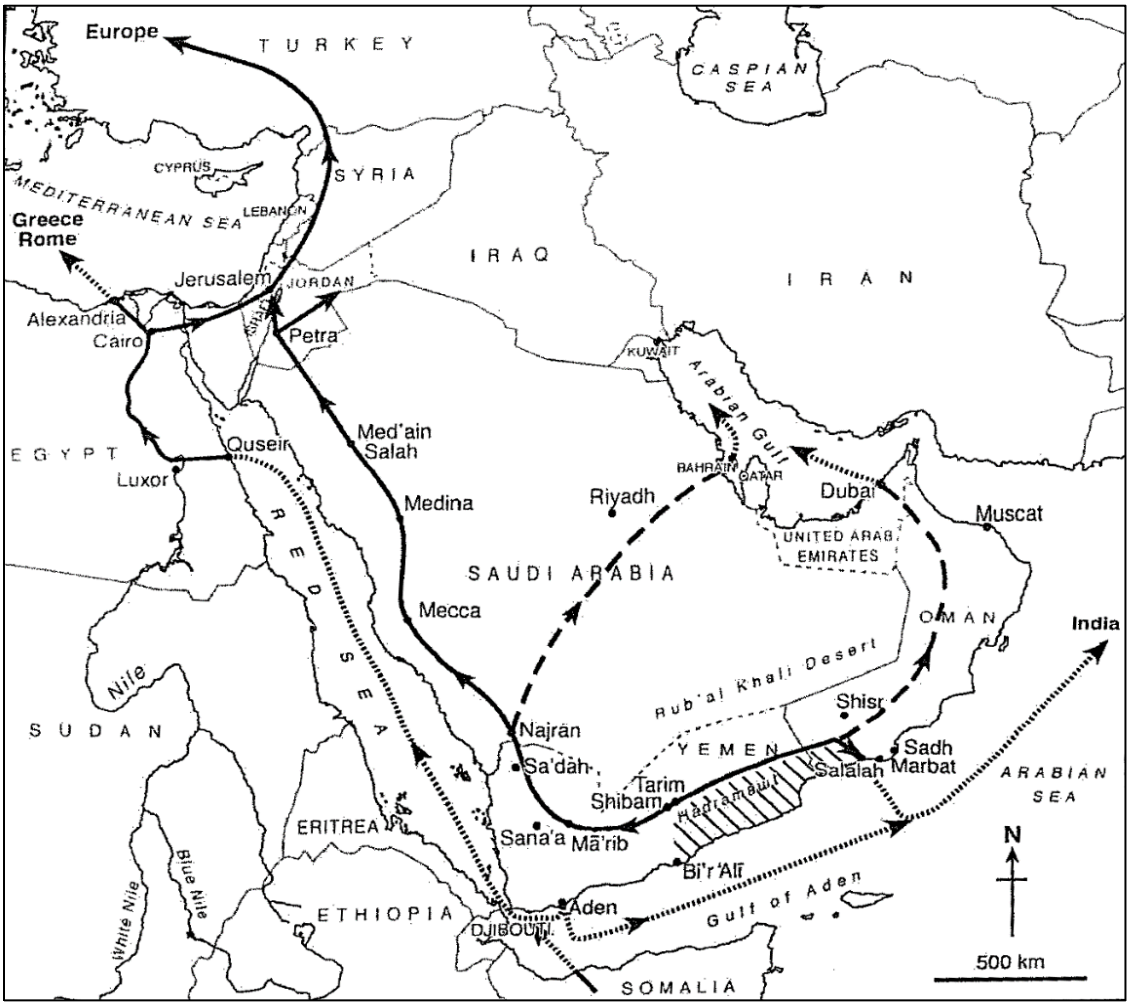


Figure 53. The ancient frankincense trading route (Peacock and Williams 2007).

Whilst Berenike, near to Quseir above (Fig 53) was the main port of entry on the Egyptian coast for the historic period, during the first and second millennium BC the harbour of Mersa Gawasis was used to access the Nile valley (Luccarini et al. 2020; Fattovich 2018; Manzo 2012). South Arabia, perhaps including Sabir, and Adulis on the African coast, could all be connected by this route.

Donkeys rather than camels were probably used as pack animals during the earlier period as camels are not thought to have been introduced to Egypt on a regular basis until the Ptolemaic period (Sidebotham 2011; Rowley-Conwy 1988). Donkeys need a significant and constant water supply, but this would have been created by desert camps with clusters of water jars for constant refreshment and donkey trains used to replenish supplies (Sidebotham 2011).

Both Sabir, and Al-Midaman, dated to the second millennium BC, therefore had the potential ,I suggest, to be part of the Trans-Arabian incense route. If so then the Tihamah section of this trade is barely recognised so far (Gerlach 2012), however a second millennium BC date places it in the chronological context of New Kingdom Egypt (Shaw 2003) and, effectively, Punt.

Whilst many different trade routes were in use in Arabia, the routes had to be flexible due to security concerns, seasonal flooding, or tribal jurisdictions over land ownership (Potts 1988) which might prevent access to some places or routes. Some historical references and maps, such as Ptolemy's Map of Arabia (Potts 1988) indicate which routes were in use, however Strabo in his Geography XVI suggests a caravan route linking Gerrha, Bahrain, to the Yemeni Hadhramaut region (Fig. 53). This route was later undertaken in 1917-18, to demonstrate political control of the Arabian peninsula, and confirmed by Harry St John Philby (Philby 1950; Massignon 1923) the British 'Arabist', and civil servant, who called it "a lonely outpost of Sheban civilization on a caravan route leading to the Persian Gulf coast" (Philby 1950, 211).

According to Pliny (XII, 32) the incense route, starting in Timna, Yemen, and ending in Gaza, Palestine, was divided into 65 stages. At the end of every stage there was a caravan station. The route was about 1487⁄2 Roman miles long, and the distance between each station was 23 Roman miles equal to approximately 34 km (Maraqten 1996: Groom 1981). The Nabataeans increasingly controlled the upper part of the incense trade route and acted as middlemen between Yemen and the Mediterranean during the second half of the first millennium BC as the Levantine economy dominated (Gerlach 2012; Potts 1988). This information dates to the later historical periods rather than the first-second millennium BC, but it acts as a useful guide rather than a record of actual activity and journeys.

None of these routes connect directly to the Yemen Tihamah, although indirectly a route from Marib could connect through the Western Escarpment to Al-Hamid, as I will discuss in chapter six. Gerlach suggests a route from the Tihamah to Adulis (2021) although the archaeological evidence at Adulis does not yet support this.

3.3.2 Camel domestication

The early first millennium BC is contemporary with domestication of the camel and beginning of camel caravans (Sauer at al. 1988), although Maraqten (1996) suggests the second millennium, with caravans of camels, donkeys, mules and horses used for trade (Trinks 2014; Uupermann 2002). The first millennium BC is characterised by the use of camel caravans which allowed travellers to cross Arabia from the south to the north creating trade relationships between South Arabia and the Fertile Crescent. The fact that the camel could carry much greater loads than the donkey had a major impact on the caravan trade although the distances and speeds that camels travel is dependent on the load that they are carrying. These factors include the age of the animal, the type of the terrain that is being travelled across, availability of water and food. Data from 19th century military use indicated that maximum loads of between 120-220kg per animal was possible covering 32-40km per day for extended periods (Sidebotham 2011). This gives a good estimation of the distances that could be traversed in the first millennium BC. It also raises the question of what quantities of obsidian could be moved by camel, particularly that in the Horn of Africa the terrain being crossed, for example the Danakil depression, or the Tigray highlands, were both formidable topographies potentially more demanding than the incense routes of Arabia. Both of these issues will be discussed in chapters four and five respectively.

A record of a 200 strong camel caravan in Arabia (Maraqten 1996) presents a glimpse of what trade in the early first millennium BC would have been like. In Egypt, Thutmose III's reign, 1479-1425 (Shaw and Nicholson 2004), hieroglyphic records mention people referred to as Genebtiu (Creasman and Yamamoto 2019; Breasted 1906) crossing the Red Sea to export spices such as incense or perishable goods. These are Arabian traders (Saleh 1972), from the Tihamah, involved in the Sabaean cultural transfer (Gerlach 2009) of goods or artefacts to Africa and Egypt. From this we can extrapolate a sense of what overland trade in Tigray and the Afar might have encompassed.

If there was a Sabaean presence in Tigray before the first millennium BC (J Phillips, 2004) it may, I suggest, have been for purposes other than the exchange of obsidian (Khalidi 2006) although that resource has been traded since the sixth millennium BC (Negash, Brown, Nash 2011). Gerlach however (2021), suggests that the early Sabaean presence in Tigray may have been for the trade of incense. Vogt and Sedov (1998, 266) refer to a "pre-Sabaean" culture being present in the Horn of Africa, although, as discussed earlier, it is highly debatable whether such a distinction can really be made from the Tihamah ceramic sequence. "Pre-Sabaean" in this case (Vogt and Sedov 1998, 266) would refer to the period prior to 800 BC which in Tigray equates to the Early Pre-Aksumite (D'Andrea et al. 2018).

When I discuss the trade routes between Tigray and Tihamah, I acknowledge the long-distance trade already occurring in the second millennium BC between Egypt, the Levant, and Arabia (Lucarini et al. 2020; Manzo 2012). Maraqten (1996) suggests that caravan trade in Pre-Islamic Arabia, the date is not more specific, was seen as a business venture hence security was an issue of paramount importance with the state making huge efforts, both diplomatic and militarily, to secure the control of its territory. Diplomatic measures recorded by the Assyrians (Maraqten 1996) included attempts to control the trade routes and caravan stations by signing political accords with local kings or rulers, with political stability being immensely important for the caravan trade during the second millennium BC (Maraqten 1996). The Sabaeans were obliged to send unofficial payments to Assur in the form of gifts as a sign of their acceptance of the domination of the Assyrians who controlled the upper part of the incense-route (Maraqten 1996). Arabian caravans returned not only with goods from Mesopotamia and Syria-Palestine, but also with cultural influence (Gerlach 2009; Liverani 1992, 111).

The incense route is not just a journey of trade and economy but also of the transformation of the societies along the route who benefitted socially and culturally from the interactivity (Maraqten 1996). Whilst the African exchange of incense is the Arabian equivalent of exchanging obsidian, knowledge of the spice route is informative in understanding how the journeys and logistics of the obsidian trade might have operated (discussed further in chapter 6).

3.3.3 The archaeology of the Tihama

In chapter two I discussed the Pre-Aksumite period and the influence of Sabaean culture in Tigray, in this chapter I discussed connections between sites in the Tihamah and the broader Red Sea region and, potentially, imported Africa obsidian. One of the unique identifiers connecting Tihamah and Tigray is the Sabaean deity Almaqah (Japp et al. 2011) who is evidenced in inscriptions at Al-Hamid, Waqir, Marib, Sirwah in Yemen and at Yeha, Meqaber Ge'awa, and Hawelti, in Tigray. Architectural comparisons are also apparent at the Yemen temple sites, notably Sirwah, Al-Hamid, and their Tigray counterparts Yeha, Meqaber Ge'awa, and Hawelti (Schnelle 2018).

The main sites that I discussed in this chapter are Al-Midaman the coastal megalithic settlement and probable Tihamah harbour location; Al-Hamid the way-station or staging post and temple site along the Wadi Siham; the nearby, and potentially similar, site of Waqir with, as far as can be ascertained, some of the same features; the central Tihamah site of Al-Kashawba which has only been tentatively investigated but appears to be one of the key sites in the region; the southern Tihamah site of Al-Mohandid with its anomalous standing stones, potentially with a connection to the southern Afar; and Sabir-Ma'layba located on the Gulf of Aden with local "pre-Sabaean" culture (Vogt and Sedov 1998) based on the ceramic chronology.

One of the challenges in writing this type of synthesis is that, particularly in Yemen, many publications are preliminary or interim reports. They cannot be taken as conclusive statements yet this is often exactly what happens in some earlier discussions and syntheses, for example (Vogt and Sedov (1998), and Keall (1998). Interim statements became hard facts, final reports are not published, and further fieldwork is not undertaken. Although trying to avoid that in this thesis, incomplete results do become established as fact without final confirmation.

The questions to be asked in South Arabia, as in Tigray, I propose, is the increasing activity during the mid to late second millennium BC. What transpires, and develops in the early first millennium BC, prompts questions about the Sabaean presence in Tigray.

If Gerlach (2021) is correct, then Yeha is significant to the Sabaeans because of its economic value rather than for purposes of ancestral heritage. It is uncertain why there is such an early Sabaean presence at Yeha before, or when, the temple is constructed. Gerlach suggests (2021) that the Yeha temple is a form of economic colonisation by the Sabaeans to take advantage of the second millennium BC incense trade between Yeha and the Nile valley i.e. that they were aiming to create a significant presence at Yeha that was already settled by local communities involved in the Nile valley trade. The trade is evidenced at Yeha by the presence of early second millennium BC ceramics identified as being from Jebel Mokram (Nubia) (Gerlach 2021). Sabaeans acquiring obsidian at Nabro had no reason to travel this far west, unless they had another purpose.

What we also see is the presence, from the evidence of incense burners (Fig 39), of incense being traded from Arabia to Tigray. The economy of the incense trail is at its peak during the first millennium BC (Groom 1981), hence I expect that it could also extend across the Red Sea at this time. Equally, on the Tihamah we see, primarily via the import of obsidian and ceramic assemblages, evidence of African cultures in Arabia (Vogt and Sedov 1989; Manzo 2010), and in Africa the early presence of Sabaean culture at Yeha (Phillipson 2009; Fattovich 2012).

3.3.4 The Red Sea activity in the First and Second millennium BC

One of the central points that I suggest in this thesis (Phillips 1998, Fattovich 1990a), is identifying activity occurring in the second and early first millennium BC in the Red Sea region. By drawing attention to the similarities between them, Fattovich (1990b) connects Mahal Teglinos, in the Sudanese Gash Delta through Nubian Kerma, Tigray, to the Tihamah across a period of 800 years. Temporally and spatially, this is the location of what the Egyptians call Punt (Kitchen 1993) although neither Fattovich (1990b) nor Phillips (1998) use the name. Perhaps it is seen as too contentious a suggestion for an already nebulous debate. The chronology of Punt, however, is now incorporated within the new Mezber Pre-Aksumite chronology (Table 5) (D'Andrea et al. 2018) where it is both spatially and temporally located. In Egypt, the Genebtiu were delivering myrrh and other products associated with Punt (Fattovich 2018; Shaw and Nicholson 2004) but Saleh (1972) saw as Arabian (Saleh 1972). Creasman and Yamamoto (2019) hypothesize that as well as being South Arabian these individuals were also Puntites actually on Egyptian soil. This hieroglyphic inscription, dated to 1400 BC (Breasted 1906) is, significantly, the only known source referring to people from South Arabia, or Punt, actually in Egypt.

The Incense trail was already active in Arabia, at least, in the second millennium BC (Sidebotham 2011) effectively creating an existing framework for the obsidian trade network to partake in. It is very likely the Egyptians traded with a harbour, or offshore, at least, on the Tihamah coast possibly at Mocha and Mawza'ah, or Sabir (Fig. 52). First millennium BC archaeological evidence for Egypt anywhere in Tihamah is elusive but later trade at Mocha, ca 1500 AD, then Yemen's principal port, suggests that earlier trade with the port may also have been possible. So far there is no evidence of this but so little archaeological excavation or survey has taken place in Mocha, hence it remains a significant gap in the archaeological record I suggest

The site of Shalao**,** on the Somaliland coast, has recently produced evidence of a burial stone with a South Arabian inscription dating to 800-500 BC (Phillips 2018, Mire 2015), corresponding to the early Pre-Aksumite in Tigray, or the Tihamah Sabaean period. Pottery from the site also confirms the date and origin. This is the furthest south on the African coast that South Arabian culture is known, adding to the evidence at Asa Koma in what is now Djibouti (Newton et al. 2018; Khalidi 2009; Joussaume 1995). The Periplus of the Erythraean Sea records incense being exported from Mundu (Huntingford 1980, 92), close to Shalao, in the mid-first Century AD. The evidence at Asa Koma (Manzo 2010) and Shalao (Phillips 2018) both indicate that activity related to South Arabia, and perhaps Ethiopian Tigray, was taking place along this coast, and perhaps connecting with Sabir on the Tihamah .

Sabir culture is "an African-inspired culture on Yemeni soil" (Vogt and Sedov 1998, 267), echoing Fattovich's earlier "Tihamah Cultural Complex" (1996, 398), and foreshadowing his "Afro-Arabian Interchange circuit" (2004, 71).

3.3.5 Obsidian

Site name	**Date**	**Bibliographic ref**	**Feature**
As-Salif (Surdud)	5000 BC	Zarins 1986; Phillips 1998; Tosi 1985, 1986	Obsidian
Sabir -Malayba	2000-900 BC	Vogt and Sedov 1998	Obsidian, ceramics. "Sabir culture".
Al-Midaman	2500-600 BC	Keall 1998	Obsidian
Al-Mohandid	1300 BC	Fattovich 1990a; Durrani 2005	Obsidian, parallels with Asa Koma.

Site name	Date	Bibliographic ref	Feature
As-Salif (Surdud)	5000 BC	Zarins 1986; Phillips 1998; Tosi 1985, 1986	Obsidian
Al-Kashawba	1000 BC	C Phillips 2006; Khalidi 2006	Obsidian
Al-Hamid	850 BC	C Phillips 1997; Durrani 2004	Obsidian
Waqir	700 BC	C Phillips 2000a	Very small quantity of obsidian

Table 8: Tihamah sites with evidence of obsidian from possible Afar sources.

Two factors highlight the distinction between South Arabia and the Tihamah: firstly, the type of obsidian found on the Tihamah is not found beyond the Western Escarpment (Khalidi 2010). The second factor is that the Tihamah has its own distinctive culture, as discussed, that, likewise, does not extend east beyond the Tihamah escarpment.

As is detailed above, on the Yemen Tihamah obsidian is found, sometimes as surface scatters, sometimes in excavations, at Al-Midaman, Al-Kashawba, Al-Mohandid and in very small quantities at Al-Hamid. The latter site may have been a waystation along the trade route linking the Red Sea coast, at Al-Midaman, with inland Tihamah, Al-Hamid, and the Western Escarpment along which obsidian may have been transported. It is possible that obsidian could be found at Waqir but unless excavation can take place there this is speculation.

Yemen sites with obsidian cores or artefacts provide dates that are often earlier than might be expected, as I indicate in table 7. This is exemplified by dates on the As-Salif peninsula, on the northern Tihamah coast, and Sabir on the Gulf of Aden. The dates here, ca. 5000 BC at the former (Tosi 1985), are considerably earlier than the dates at Al-Hamid, Al-Midaman, and Al Mohandid. Al-Midaman is the only site on the Tihamah coast that, based on the available evidence, can be suggested as a place of arrival of obsidian from the Horn from Africa, during the second and first millennium BC. I make this observation based on the large quantity of obsidian, which is unknown anywhere else on the Tihamah coast, and the chronology of the site. I will discuss the quantities of obsidian found at Tihamah sites in the next chapter (Table 9).

3.3.6 Sabir

The term "pre-Sabaean" has been suggested for the material culture at Sabir prior to 800 BC (Vogt and Sedov 1998, 266). This distinction cannot be made at Al-Kashawba (Phillips 2009) however, despite there being two different chronological phases at the site. There is continued occupation of the Tihamah from the end of the third millennium BC to the mid first-millennium BC with the Al-Hamid inscriptions (Phillips and Beeston 2005) indicating that local people were paying taxes to a Sabaean ruler by the mid-first millennium BC (Carl Phillips personal communication 26th January 2023). Fattovich (1990a) finds a close comparison between the Sabir ceramics and Pre-Aksumite wares in Ethiopia and Eritrea, whilst Vogt and Sedov (1998, 266) suggest, specifically, a close parallel with their "pre-Sabaean" contexts at Yeha and Matara, potentially late second millennium BC. The extended Pre-Aksumite chronology at Mezber (D'Andrea et al. 2018) underscores this probability.

Sabir has parallels with Al-Midaman, 250km to the north, whose rectilinear buildings, megalithic foundations, and mudbrick correspond to Sabir's final phase. Al-Midaman produced a radiocarbon date of 1320-970 cal BC (Khalidi 2006; Keall 2004) corresponding to Sabir's later phase. Rather than trying to identify "Sabir culture" (Vogt and Sedov 1998, 261) at Al-Midaman it is better, as Khalidi suggests (2006), to assign both sites to distinctive local cultural sequences in which parallels, ceramics or inscriptions, to one another can be found. A ceramic parallel with Al-Kashawba (Phillips 2006) can also be identified although, once again, with unique local identifiers.

The Sabaeans moved south from the highlands arriving on the Tihamah in the early first millennium BC (Phillips 2009, 1998, 1997). Here they co-existed with the local population (Vogt and Sedov 1998) for some time before either amalgamating, or perhaps being expelled, during the expansion of the Kingdom of Saba. It is unknown whether the Sabaean culture moved south through the highlands to Tihamah, via Al-Hamid perhaps, or arrived at Sabir via the highlands and Taiz mountains. Vogt and Sedov suggest the former with a general migration south along the Tihamah towards Sabir. Carl Phillips (personal communication 30th January 2023) suggests that the Tihamah was made up of many regional groups, or tribes, and it might be more beneficial to ask when the Tihamah tribes became Sabaean rather than when large groups of Sabaeans arrived on the Tihamah, although this is well beyond the scope of this PhD. Considering Sabir's location (Fig 54) , it would have been an easier journey from Marib via the central plain, having taken it myself, than traversing the western escarpment and the Tihamah.

Figure 54. Map of Yemen indicating the probable route connecting Marib with Sabir.

Buffa suggests (2001) that Sabir has local origins, with a strong external influence. Durrani (2005) suggests a connection with the Horn of Africa is less likely but without excavation of the lower deposits at Sabir, a local origin is more probable. In attempting to connect Arabia and Africa, second millennium BC ceramics at Asa Koma have parallels with the Sabir phase-I ceramics (Manzo 2010). I suggest that the Sabaean evidence at Shalao (Fig. 55) indicates that both it, and Asa Koma, should not be dismissed as being beyond the accepted geographic boundaries of either Pre-Aksumite or Sabaean trade circles.

Obsidian has also been found at Asa Koma (Joussaume 1995) (Fig. 55) which, if it were to originate from the Afar sources, or Nabro volcano specifically, would create a direct link between Nabro, Asa Koma and Sabir. The nearest crossing point to southern Arabia on the Red Sea would have been the Bab el-Mendab straits where Sabir can then be reached by following the coastline along the Gulf of Aden (discussed in chapter 6). Sabir-Ma'layba was potentially a central trading hub, an interface of the Arabia and Africa connection (Fig 55).

Figure 55. The Gulf of Aden showing the potential interface between Arabia and Africa via Sabir and Asa Koma and Shalao.

3.3.7 Overseas influences

The African influence at Sabir-Ma'layba, Phase 1, has ceramic parallels with Mahal Teglinos, in the Gash Delta, late 3rd millennium BC (Buffa and Vogt 2001). This indicates (chapter 6) that Sabir-Ma'layba may well have been the recipient of long-distance trade connecting the Nile valley with Tigray and the Tihamah, hence "an African-inspired culture on Yemeni soil" (Vogt and Sedov 1998, 266). Third and second millennium BC interaction across the Red Sea "can be assumed" (Buffa and Vogt 2001, 447). This is a bold statement to make but a valid one I suggest, as the evidence for African influence is significant. The distance here is only short and the pollination of African and Arabian cultures could easily migrate across the Red Sea.

At Sabir, Buffa and Vogt (2001, 440) cite "South Arabian imports" which is striking language as most people would understand this area *to be* South Arabia. For the Tihamah sites discussed throughout this chapter there is no single characteristic Tihamah culture. Rather, each site almost, has its own distinctive material and architectural tradition: a Sabir culture, or a Hamid culture for example, and that regional trade has dispersed these idiosyncratic feature throughout the Tihamah. There is an Africa influence, a Tigray influence, from the obsidian trade (Buffa and Vogt 2001), but also, to a lesser degree, an influence from the south, potentially Asa Koma or even Shalao in Somaliland at Al-Mohandid and its characteristic standing stones.

A fragment of an anthropomorphic figurine was found at our Al-Kashawba excavation (Fig 56) and Al-Midaman, so the Sabir fragments are not as unique as claimed. Buffa and Vogt (2001) compare the Sabir fragments, perhaps optimistically, with the figure depicted in the hieroglyphic representations at Queen Hatshepsut's Deir el-Bahri temple showing the Queen of Punt, who is notably obese, or possibly disfigured (Fig 57). Whilst relatively unusual in Yemen similar human figurines have been discovered in Ethiopia at Mai Adrasha in Shire c. 700 BC (Fig. 58), which could potentially be connected to Sabir through long-distance trade. The three examples cited here, and shown below, have what can only be described as broad parallels. They can all be said to be female figurines, with the Sabir (Fig 50) example finding the best comparison with the Al-Kashawba figurine (Fig 56). Other angular terracotta objects find parallels with the Ancient Ona culture where they have been interpreted as abstract sculptures of bulls-heads (page 69) Schmidt et al. 2008).

Figure 56. Figurine from Al-Kashawba. Photo, Carl Phillips.

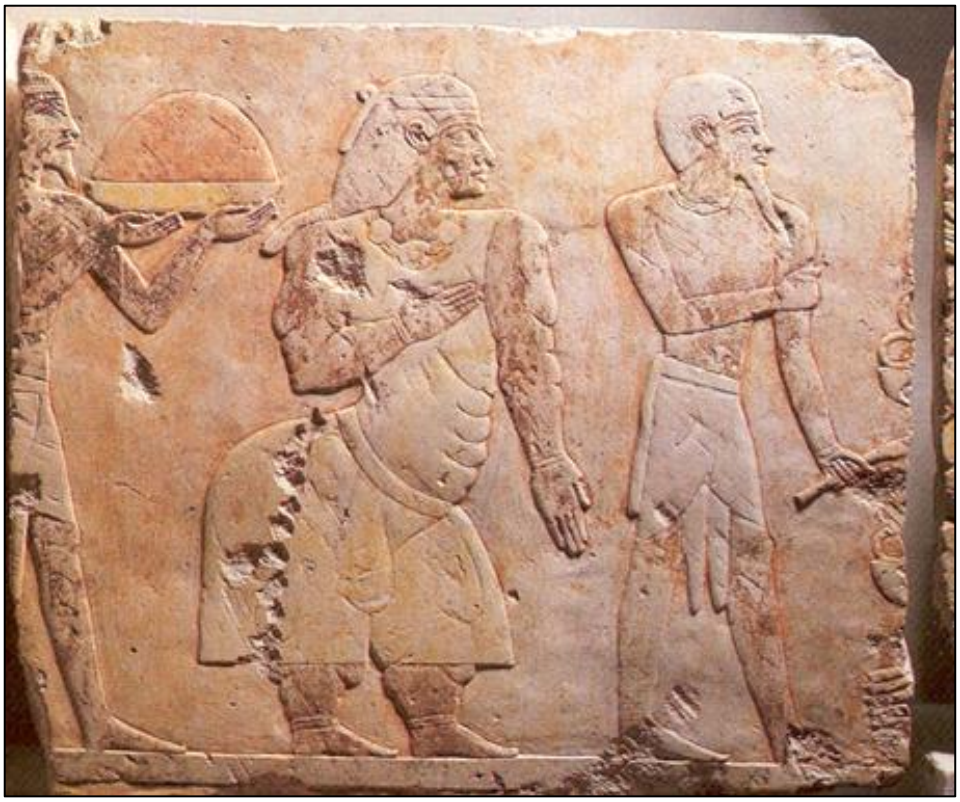


Figure 57. The Deir el-Bahri mural showing the Queen of Punt visiting Egypt (https://landofpunt.wordpress.com/tag/lady-of-punt)

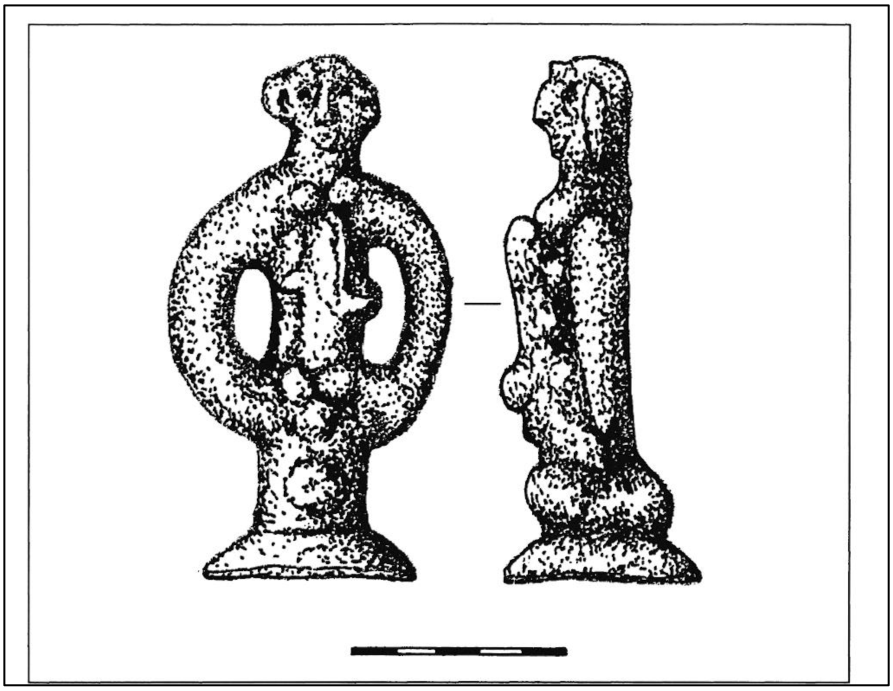


Figure 58. The Mai Adrasha figurine, scale 5cm (Finneran 2005c, 22).

3.3.8 Al-Mohandid

Most of the Tihamah sites have a similar character but the megalithic standing stones of Al-Mohandid have a palpably different emotional sensibility owing to both it's style but also its location. This is a phenomenological expression of the site, but a good example of that theoretical framework in this thesis. When I visited the site (Fig. 48), it appeared both physically and emotionally different from other Tihamah sites, which it clearly is. There is also the presence of "rare obsidian debitage and waste" (Khalidi 2006, 245) at Al-Mohandid, indicating obsidian working is taking place at the site.

A possible Tihamah parallel maybe found at the western escarpment site of Al-Suq**,** as mentioned earlier (Khalidi 2006a), a stepped four-ring circular tomb built of large megalithic stone slabs. It is located, like Al-Mohandid, at the juncture of two zones, the highlands and the foothills, and at the source of the wadi Zabid (Khalidi 2006a, 2005). Al-Suq is suggested as a parallel on grounds of being an anomalous hybrid on the Tihamah and as such representing a comparison with Al-Midaman (Khalidi 2006). Based on physical evidence alone however it should be said there is not much of a resemblance, Al-Suq is more like a stone circle rather than a linear avenue. Stylistically the nearest parallel for Al-Suq is Al-Mohandid, 50km to the east, but without any known connection between the sites. There are almost no published images of this site.

The distinctive character of Al-Mohandid (Fig 47) may find a parallel in the southern Afar site of Asa Koma. The site, of a predominantly second millennium BC date, has ceramics resembling a Sabir-Ma'layba style (Buffa and Vogt 2001). As I will suggest in chapter six, Asa Koma *may* be (Khalidi 2009) part of a trade route connecting the obsidian sources in the Danakil depression with Tigray, and with southern Arabia. Having connected with Sabir-Ma'layba, the unique characteristics may then having migrated up the Arabian coast to Al-Mohandid indicating an African influence, but not Tigrayan, on the Tihamah. This route is part of the regional journey that I propose and will discuss in more detail in chapters 5 and 6.

3.3.9 Cultural Complexes

As I discussed in chapter two cultural complexes are a way of defining whether there are distinct cultures within a region, in this case the Yemen Tihama. Whilst the term "Sabir culture" (Vogt and Sedov 1998, 266) is overstating the case for a Tihamah-wide culture, there are sufficient similarities in material culture on the Tihamah to show that the sites are interconnected. This interconnection is significant because it is informative not just about the cultures present on the Tihamah, and their chronologies, but also about the relationship they may, or may not, have with exogenous influences. Tihamah-Sabaean material culture is distinctive and is very recognisable in Tigray as evidenced by Sabaean inscriptions, incense burners, and architectural temple styles (Dallas 2020) as discussed in this chapter. A recognisable culture therefore travels across the Red Sea.

Ibanez (2016, 9) introduces a "complex network model for obsidian exchange" for the Neolithic Near East whilst the term "interchange network" (Sernicola 2017, 178; Fattovich 1997, 85) describes the Tigray-Tihamah relationship in the fifth millennium BC. Fattovich (1997) defines the Red sea trading zone as including Egypt, to the Horn of Africa, and Arabia. Fattovich introduces the term "Tihamah Cultural Complex" (Fattovich 1996, 398) and "Afro-Arabian interchange circuit" (Fattovich 2004, 71) the latter having emerged between the fifth and first millennium BC. The Tihamah Cultural complex is a neat summary of something that perhaps did not exist in quite the inclusive way that its author intended.

Fattovich's (2004, 71) "Afro-Arabian interchange circuit" is a better description for what he proposes. Perhaps he does too as this definition comes eight years after the first. Yes, it can be said that there are archaeological parallels between Fattovich's suggested sites, there are commonalities in their cultural styles. But there are also many unique cultural features at all the Tihamah sites such that a Tihamah wide culture is an oversimplification however gratifying it might be to neatly ascribe it to a single descriptor.

3.4 Conclusion

3.4.1 Yemen Tihamah

What is apparent from my synthesis presented in this chapter is that the Tihamah is populated by both local and exogenous characteristics. The Tihamah is a regional culture that has been influenced by a relationship with the Sabaean culture of the Kingdom of Saba to the north. But it has also been influenced by an African presence that extends across the Red Sea during at least the 1st-third millennium BC. As I discussed earlier a prominent Sabean influence becomes visible on the Tihamah and mixes with the local inhabitants, probably in the early first millennium BC. How this takes place is uncertain, whether the local Tihamah population invited a Sabaean migration or whether an act of acculturation gradually took place.

The Tihamah has two sites, Al-Midaman (Keall 1998) and Sabir (Vogt and Sedov 1998), that date to the earlier third millennium BC but have perhaps their strongest presence during the second millennium BC. Both of these sites share some similarities in their material culture, although both have individual cultural traits that identify their unique qualities (Phillips 1998, 2007; Durrani 2005). The sites of Al-Kashawba, Al-Hamid, and Al-Mohandid exist across the late second and early first millennium BC, each with its own singular attributes; for example mudbrick walls at Al-Kashawba, a Temple at Al-Hamid, and the standing stones of Al-Mohandid. Some of these characteristics can be attested to at Sabir, along with African styled figurines (page 125-26). Despite the barrier of the western escarpment, Tihamah culture is both local and Sabaean

(Phillips 2009), pertaining to the Saba Kingdom at Marib and Sirwah**,** but Sabaean is the term frequently used when discussing the Tihamah. The local Tihamah style helps in distinguishing it from what might be genuine Sabaean material also found on the same sites.

By the first millennium the epigraphic inscriptions found at Al-Hamid and Waqir indicate (Phillips 2009) an economic connection to the Kingdom of Saba resulting in the mixed local-Sabaean culture of the Tihamah. This is the culture that is then exported across the Red Sea and visible in Tigray. This is Gerlach's (2009, 259) "culture transfer", or "intercultural entanglement" (Creasman and Yamamoto 2019, 348), represented by the evidence for the Sabaean deity Almaqah. This name is present at, and connects, Sirwah, Al-Hamid, and Waqir in Yemen to, Meqaber Ge'awa, Hawelti, and Yeha, in Ethiopia, a direct link to some of the most important sites in both Yemen and Ethiopia (Japp et al. 2011).

Fattovich refers to a "Tihamah cultural complex" (1996, 398), which is a useful term for describing the relationship between the Tihamah and some of its Red Sea partners. But the term is too broad to really identify the more nuanced relationship that the Tihamah is a part of. Fattovich then introduces his "Afro-Arabian interchange circuit" (2004, 71) which is a better descriptor for the long-term trans Red Sea relationship, including the exchange of obsidian, that the Tihamah is involved in. It is one which I appropriate to describe the interconnectivity that I discuss throughout this Phd.

By the second millennium BC, although further research is required to fully corroborate this, the Arabian incense trail is moving through the Tihamah and crossing the Red Sea to Tigray (Gerlach 2021). The incense trail is expanding west from Arabia to Africa, whilst obsidian is being transported west to east from Tigray to Tihamah. Hence the Tihamah is an integral part of the Afro-Arabian interchange circuit. It is the most visible aspect of African culture that is arriving in the Tihamah.

3.4.2 Africa in Arabia

There is less material evidence for Tigrayans in Tihamah, beyond than the presence of obsidian (Oppenheimer et al. 2019) and discussed in the next chapter. There are African, or exotic ceramics (Phillips 2009), meaning not from the Tihamah, at Kashawba evidenced by the punctate style pottery found there. Sabir is "African-inspired culture on Yemeni soil" (Vogt and Sedov 1998, 266), a perfect description for the material culture that is found in parts of the Tihamah. The punctate pottery found at Al-Kashawba is also in evidence at Sabir (Vogt and Sedov 1998). Sabir may have a connection with Asa Koma, Djibouti, as a potential second millennium BC influence (Khalidi 2009) which, if so, would both extend its trade activities and its exogenous influence beyond the sphere usually associated with the Tihamah. Activity on the Djibouti coast at Shalao (Phillips 2018; Mire 2015) is further evidence for this and that, I suggest, the Tigray-Tihamah relationship may expand further into African than previously acknowledged.

Fattovich suggested (1990a) that the ceramics from the Tihamah share an affinity with Nubian C-Group and Kerma pottery thereby indicating a second millennium BC date, a trait which can also be witnessed in Pre-Aksumite Tigray. Fattovich (1990a) noted that few of these characteristics were to be found in the Sudanese Gash Delta sites, but that the Red Sea coasts of Arabia and Africa both played a role in connecting Nubia with the Horn of Africa *(*Durrani 2005).

Sites that can be dated to the second millennium BC (Table 8) on the Tihamah are Sabir, Al-Midaman, and Al-Kashawba, all with some element of an African influence, usually in the form of African styled ceramics. Hence an Africa presence on the Tihamah can be suggested, perhaps linking Nubia with Sabir, and potentially further south to Djibouti.

3.4.3 Obsidian

From the evidence that I present throughout this chapter the presence of obsidian in the Tihamah is the most obvious representation of Africa in Yemen. African obsidian from the volcanic regions of the Danakil depression is traded from the sixth millennium onwards (Zarins 1996, 1990). Chemical analyses indicate that Afar sourced obsidian (Oppenheimer et al. 2019), as discussed in the next chapter, is present in the Tihamah in the late third-early second millennium BC. Obsidian can be found on the As-Salif peninsula (Tosi 1986) at an earlier date but is unprovenanced.

Whilst Afar sourced obsidian crosses the Red Sea and arrives on the Tihamah, it doesn't however, appear to be traded further east to Marib, hence the African connection to Tigray ends on the Tihamah (Khalidi 2009). Considering that Al-Hamid is located on the Wadi Siham, connecting to the highlands and the north, this is surprising. Especially as Sabaean culture from the Kingdom of Saba has penetrated to the Tihamah. So, whilst the Wadi Siham is a route to the north from the Tihamah, the Tihamah western escarpment forms both a physical and perhaps a cultural boundary.

Having discussed Sabaean first millennium BC culture, the African influence present in the archaeological record, in the next chapter I will investigate the role and relationship of obsidian between the Horn of Africa and Arabia.

3.5 Outcomes from this chapter

South Arabian

- The site of Al-Midaman is a Tihamah anomaly with potential African influences (Keal 2004).
- Sabir has significant exogenous influences in its material culture (Vogt and Sedov 1998)
- The Sabaean deity Almaqah connects Al-Hamid, Waqir, Sirwah in Yemen, with, Yeha, Meqaber Ge'awa, and Hawelti, in Ethiopia (Japp et al. 2011; Gerlach 2009, 2012)
- Tihamah is a distinctive local first millennium BC culture with a Sabaean influence (Phillips 1998).
- Al-Kashawba is a key site on the Tihamah, during both the both 2nd and 1st millennium BC.More fieldwork and excavation is required at Al-Kashawba to investigate the two-phase chronology and culture of the site.
- Waqir is an important, possible temple, site, and excavation here is desirable if in fact the site still exists following the irrigation work undertaken at the site.

Tihamah cultural context

- Tihamah is part of an Afro-Arabian interchange circuit (Fattovich 2004).
- The Tihamah Cultural Complex is an untenable proposal (Fattovich 1996).
- The Tihamah is Sabaean, as opposed to South Arabian, from ca 8th century BC (Phillips 1998).

African influence in Tihamah

- Punctate pottery at Sabir and Al-Kashawba may have exotic or African influence (Vogt and Sedov 1998).
- Sabir is an "African-inspired culture on Yemeni soil" (Vogt and Sedov 1998, 267) with third and second millennium BC connections across the Red Sea.
- African sourced obsidian is present at sites including Al-Midaman (Oppenheimer et al. 2019), perhaps also As-Salif, Sabir and Al-Kashawba.

Tihamah in Africa

- I suggest that the Al-Hamid temple is a model for the Yeha temple.
- Tihamah style incense burners are present at Tigray sites (Wolf and Nowotnick 2010).

- The incense trail must extend from South Arabia to Tigray, potentially by the first millennium BC.
- Sabaean influence found in Somaliland dated to ca. 800 BC (Phillips 2018) indicates probably trade route extension as proposed here.
- The Sabaean influence in Tigray is an “intercultural entanglement” (Creasman and Yamamoto 2019, 361).
- Obsidian in greater quantities at coastal sites, specifically Al-Midaman (Keal 2005) which, I suggest, is where it was brought ashore after being transported across the Red Sea.

<u>Chapter 4</u>

"Pieces of places" Richard Bradley

4 Obsidian

4.1.1 Introduction

The previous chapter concluded with a series of research outcomes foremost amongst which was obsidian's unifying regional presence. In this chapter I will examine the sources of obsidian in the Danakil desert and what the evidence there says about the connections that stem from its source. I will argue here that the economic and cultural expansion of Ethiopian Tigray and the Yemen Tihamah were both partly a consequence of the burgeoning trade in obsidian and its regional value.

The archaeological evidence demonstrates that trade in obsidian began in the sixth millennium BC, (Khalidi 2007) becoming more ubiquitous by the early first millennium BC (Table 8). As I argue here, at some time midway between the two, Ethiopian Tigray becomes the regional hub that acts as a link in the exchange network. This is increasingly so by the first millennium BC when obsidian becomes progressively more visible at the sites discussed in the previous two chapters 3 and 4). What is apparent is that there is obsidian at sites in Tigray and Tihamah and at the site of Mahal Teglinos, in the Sudanese Gash delta, connecting the Nile valley (Bavay et al. 2000) to the Horn of Africa, and Tigray.

Human-obsidian relationships in East Africa can be traced back 2 million years (Goldstein, James & Ranhorn 2022) with long distances travelled and high-quality sources selected. Whilst acknowledging that Pleistocene foragers used social networks to obtain obsidian (Brooks et al. 2018) this Phd focuses on Holocene interconnectivity across the Red Sea linking Ethiopian Tigray to the Yemen Tihamah during the first and second millennium BC. Climate change in the early Holocene was an additional factor in the emergence of the down-the-line obsidian trade (Goldstein, James & Ranhorn 2022). The cumulative effect of increasing regional Holocene mobility, and demand for obsidian in the Tihamah, may have played a role in the increasing amounts of obsidian arriving on Yemeni shores. It may even have extended to the choice of specific source preferences (Ambrose 2012) as can be seen in the Tihamah's preference for Afar rather than Dhamar-Reda obsidian (Khalidi et al. 2010). Geochemical and physical sourcing research, notably that of Oppenheimer et al. (2019) and Khalidi et al. (2010), has specifically enhanced regional knowledge of obsidian acquisition and utilization across the Red Sea. The procurement of this resource since the Pleistocene has led to the outcomes and conclusions of this Phd.

4.1.2 Obsidian sources, provenancing and dating

Obsidian is formed under specific geological and physical circumstances (Fig 58) during the cooling process of silica-rich lava; hence sources are limited and each sample is characterised by specific geochemical composition which can be analysed by different methods (Bavay at al. 2000). Obsidian sources have distinctive chemical fingerprints (Tykot 2002) ideal for tracing mobility, interaction, and exchange patterns in eastern African prehistory (Ambrose 2012) and elsewhere. The late Middle Stone Age (Negash, Brown and Nash 2011) saw an increase in the amounts of obsidian transported over long distances in eastern Africa (Negash et at. 2011), with a further development occurring with the advent of Neolithic pastoralism (8000-3000 BC) in Kenya and Tanzania (Marshall et al. 2011). The characterisation of Ethiopian sources of obsidian *(*Kuzmin et al. 2020) are still some way behind research in the rest of Eastern Africa, but high-quality sources are known from lava flows within and adjacent to the main Ethiopian Rift and the Afar Triangle (Oppenheimer et al. 2019; Negash et al. 2011; Khalidi 2009; Negash and Shackley 2006) and are ideally located for trade in the Tigray region. In the Ethiopian south, the sites of Melka Konture and Balchitt (Ambrose 2012), are the primary sources, however obsidian characterisation suggests that many other sources are still to be identified (Ambrose 2012). Twenty-five sources of obsidian in Ethiopia are listed in the International Association for Obsidian Studies Catalog (IAOS) however this just names the sites by country with no further details provided: **http://www.sourcecatalog.com/sourcecatalog/s_africa.html#ethiopia**)

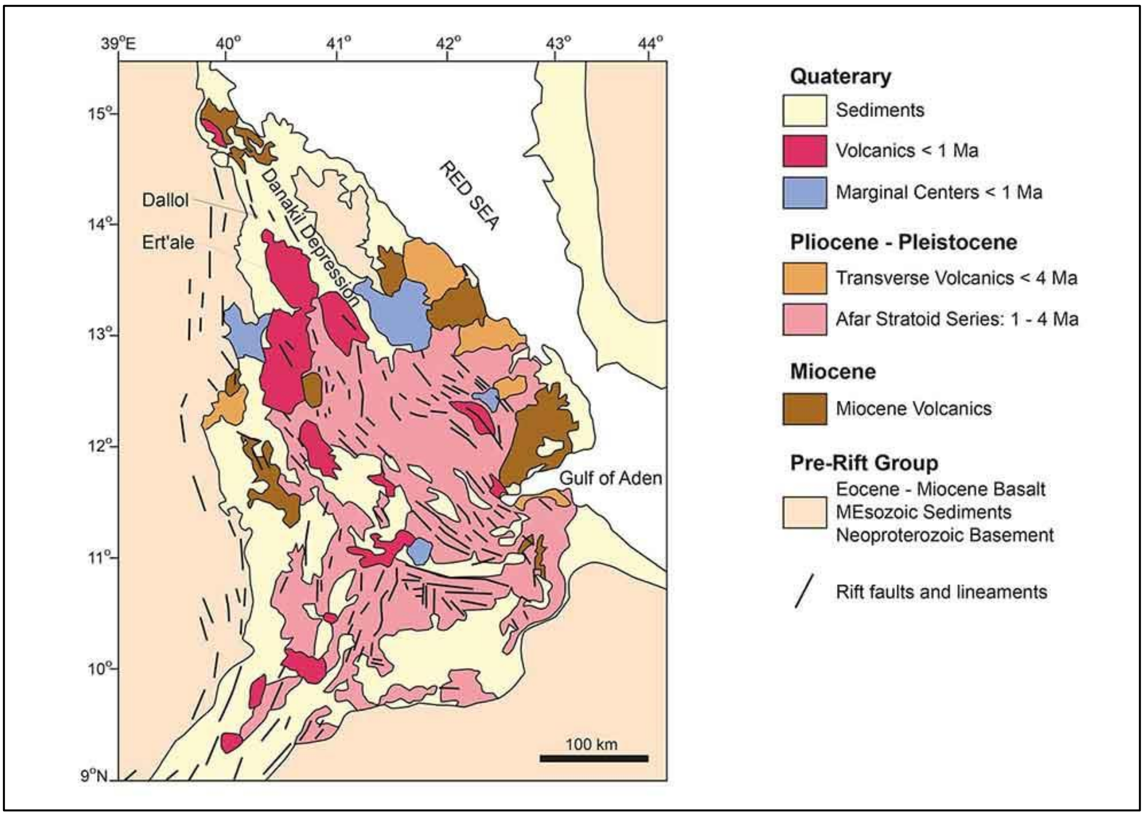


Figure 59. The geology of the northern Afar and the Danakil depression, Ethiopia and Eritrea. (https://iugs-geoheritage.org/geoheritage_sites/the-danakil-rift-depression-and-its-volcanism).

Although now 60 years old the seminal work of Renfrew, Cann and Dixon (1965) established a benchmark which all obsidian analysis has built upon (Oppenheimer et al. 2019; Ambrose 2012). Renfrew and Dixon's (1976) Group 4d type obsidian sourced in Ethiopia/Djibouti, Chad (Tibesti), Southwest Arabia, and Saudi Arabia, is the type found in Tigray, as are the examples known in Egypt. Recent research in the Afar and Yemen (Oppenheimer et al. 2019; Khalidi 2009) has demonstrated that whilst Renfrew and Dixon's assessment was broadly accurate, new trace element analysis is now able to specifically identify the source of obsidian. All obsidian from the northern Afar has chemical ratios greater than 4.7, where the ratios are plotted against latitude in identifying source location (Negash et al. 2020). Any ratio above 4 indicates a source found at high altitude. This characterisation therefore can identify possible sources and provide a benchmark provenancing artefacts.

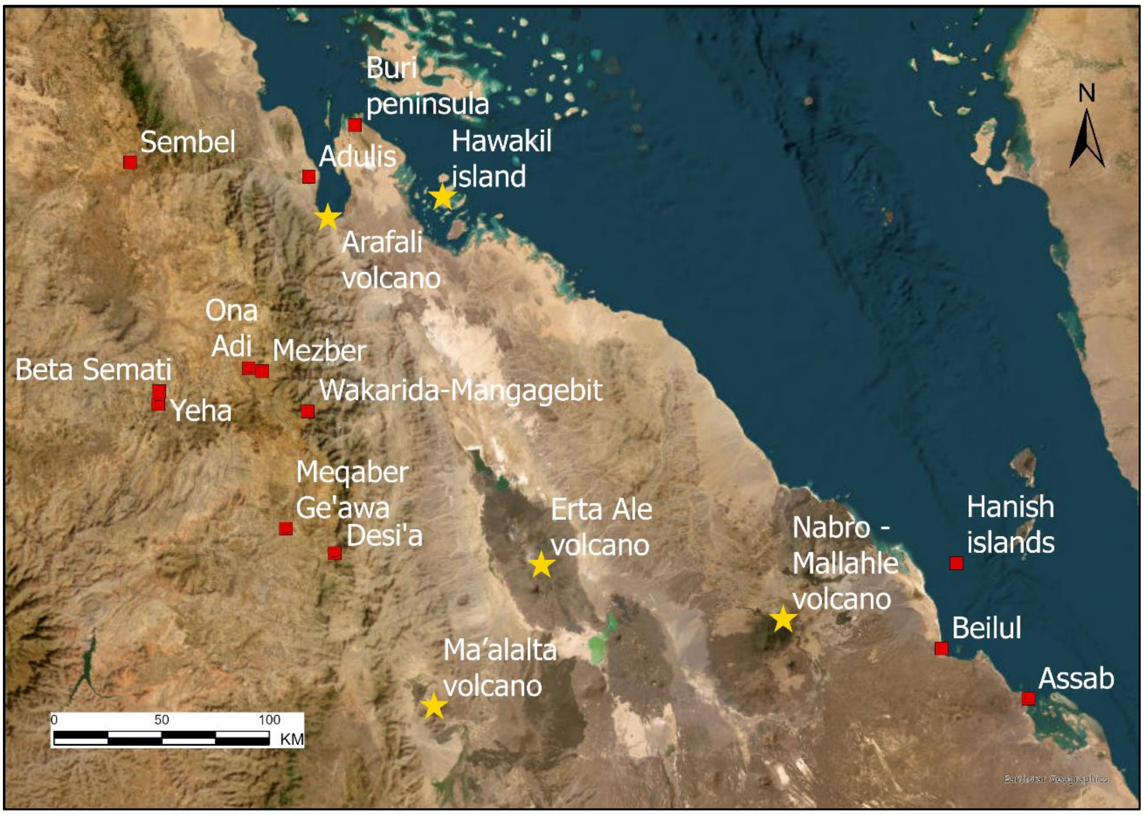


Figure 60. The Afar volcanic sources (yellow star) and the main archaeological sites in Tigray with obsidian, in the first millennium BC.

This more recent research refines the earlier results of Cann and Renfrew (1964) and Zarins (1990) which concluded that, of the five obsidian sources identified in Ethiopia and Djibouti (Negash et al. 2020; Zarins 1990; Cann and Renfrew 1964) three of these, the Alid volcano, Waldia, and Asa Ale, are located in the Danakil depression to the east of Tigray. The potential sources identified at Waldia, and Ma'alalta, and Arafali (Fig 60), on the edge of the Tigray escarpment (1989; J Phillips 2004) are where Zarins (1990) initially presupposed the Red Sea obsidian trade to have begun in the second millennium BC. No subsequent research has been undertaken at these locations to confirm this. The Dahlak islands, close to Adulis, were thought to be a further source of obsidian (Finneran 2005) although this identification was due to deposited obsidian rather than an actual source, the source probably being Arafali (Zarins 1990).

Archaeological site	**Date**	**Source**	**Country**	**Bibliographic reference**
Tihamah	5000 BC	Ado Ale	Yemen	Khalidi 2006
As-Salif peninsula/Wadi Surdud	5000 BC		Yemen	Tosi 1986

Archaeological site	Date	Source	Country	Bibliographic reference
Dalol, Lake Assale	5000 BC		Ethiopia	Sahle and Beyin 2017
Sabir	4000 BC		Yemen	Vogt and Sedov 1998
Naqada	3100 BC	Arafali or Porc Epic	Egypt	Aston, Harrell, Shaw, 2000. Bavay et al. 2000.
Abydos	3100 BC	Arafali, or Porc Epic	Egypt	Aston, Harrell, Shaw, 2000. Bavay et al. 2000.
Mahal Teglinos	2700 BC		Sudan	Gimenez et al. 2015.
Erkowit	2500 BC		Sudan	Wahida and Khabir, 2003
Al-Midaman	2400 BC	Nabro volcano	Yemen	Keall 1998.
Agordat/Kokan	2300 BC		Eritrea	Brandt, Manzo, Perlingieri 2008.
Er Rih	2000 BC		Sudan	Callow and Wahida 1981
Mezber	1600 BC		Ethiopia	D'Andrea 2005
Adulis	1500 BC		Eritrea	Manzo 2010, Zarins 1990
Matara	1000 BC		Eritrea	Curtis, Habtemichael 2008.
Al-Kashawba	1000 BC		Yemen	C Phillips 2007, Khalidi 2006
Mai Hutsa	850 BC		Eritrea	Curtis, Schmidt 2008
Al-Hamid	850 BC		Yemen	Phillips 1997, 1998
Sembel (Ona)	820 BC		Eritrea	Curtis and Schmidt 2008
Ona Adi	800 BC		Ethiopia	D'Andrea et al. 2008
Ziban Adi	800 BC		Ethiopia	Wolf, Nowotnick 2010.
Beta Sammati	800 BC		Ethiopia	Harrower et al 2019.
Yeha	700 BC		Ethiopia	Robin, de Maigret 1998
Aksum D-Site	700 BC		Ethiopia	Phillipson 2000
Wakarida	395 BC	Nabro volcano	Ethiopia	Gajda et al. 2015

Archaeological site	Date	Source	Country	Bibliographic reference
Mai Adrasha	300 BC		Ethiopia	Finneran 2005
May Ayni	50 BC		Ethiopia	Benoist et al. 2020
Beilul	prehistoric		Eritrea	Khalidi 2009
Farasan islands	Late prehistory		Saudi Arabia	Zarins 1989; Khalidi 2006
Desi'a	Date and quantity unknown		Ethiopia	Woldekiros 2019

Table 9. An archaeological chronology of the obsidian evidence in the Red Sea region.

4.1.3 Analysis techniques

A core factor of this Phd is the identity of the sources of obsidian found in archaeological contexts in Ethiopia and Yemen. It is on the basis of this source identity that the interconnectivity of the region, and therefore the subsequent outcomes and conclusions of this Phd, are based. It is crucial to this thesis that the work of Oppenheimer et al. (2019) specifically, but also that of Khalidi et al (2009) and Luccarini et al. (2020), have identified sources for some archaeological obsidian. Whilst not all materials can be easily sourced, notably some metals and organic substances, obsidian is an ideal resource for sourcing (Kolb 2014).

In discussing the sources of obsidian the "provenience postulate" (Weigand et al. 1977, 24) is a core element of the study in the origins of archaeological material and that "chemical differences within a single source of material must be less than the differences between two or more sources of the material if they are to be differentiated" (Kolb 2014, 6174). This means that the materials moved from the source must retain the same chemistry and have not been altered in anyway, that there are more than one possible sources, at a minimum, and that these are adequate for analysis, which obsidian is (Kolb 2014). As Oppenheimer et al. (2019) indicate, having twin sources of obsidian close together, Nabro and Mallahle volcanoes, does, in this case, mean that a 100% source identification is not possible. These two sources are so interleaved (Oppenheimer et al. 2019), ca. 16km across their adjacent calderas, that even with a strong geochemical fingerprint there is still a margin of error in distinguishing between them. It is not possible to say for certain that either Nabro or Mallahle is the exact source of the obsidian identified in archaeological contexts at Al-Midaman, Yemen, and Wakarida, Ethiopia, but we can be confident that either Nabro or Mallahle are the source.

As will be discussed in the next section, five analytical methods for identifying obsidian have been used in the Red Sea region. These are Spectrographic analysis, Neutron activation analysis, obsidian hydration dating (at Yeha), and Hyperspectral satellite imagery for identifying sources and outcrops. Laser Ablation Inductively Coupled Plasma Mass Spectrometry (LA-ICP-MIS), a near non-destructive analysis, was used successfully by Oppenheimer et al (2019) in the Danakil, and by Luccarini in Egypt (page 145) although with more generic results. Hyperspectral satellite imagery proved successful in identifying source outcrops in Oman (Dumitru and Harrower 2019) but has not, so far, been used in the Danakil although the volcanic sources here are easier to identify.

Renfrew and colleagues first attempted thin section analyses of obsidian but rejected this as "inadequate" (Renfrew and Cann 1964, 119), and subsequently employed chemical Spectrographic analysis, which works by identifying trace elements in the sample. Oppenheimer et al. (2019) refined this approach using Argon isotopic measurement, comparing isotopic ratios of obsidian recovered from archaeological sites with samples from possible obsidian sources, with, in most cases, multiple samples taken from each, and the results averaged in an attempt to correct for heterogeneity within single artefacts.

Significantly, examples of the three primary sources of obsidian identified on Nabro volcano are found in archaeological lithic assemblages. Of the 37 archaeological lithics sampled, Oppenheimer et al. (2019) found comparisons with Nabro obsidian in all 37 samples, with these relating to two archaeological sites: Wakarida in Ethiopia (page 58)) and al-Midaman in Yemen (page 87). Wakarida (Gajda al. 2015), located in the escarpment between Tigray and the Danakil, has one single artefact that matches the IC source (Intra-caldera) of group 5 Nabro lithics in the Danakil volcanic field (Oppenheimer et al. 2019). At Al-Midaman (Keall 1998) in the Yemen Tihamah, a distance of around 190 km from Nabro, all of the 36 artefacts analysed can be matched to Nabro. It is unknown if the large chunk of obsidian used as foundation deposit at Al-Midaman (page 91) was amongst the samples used for analysis. Indeed, although of a much later date, Oppenheimer et al. (2019) conclude that artefacts from the Yemen Himyarite period (110 BC - 570 AD) site 181 at Dhawran, in the Dhamar region are, also from Nabro (Wilkinson and Edens, 1999). If Nabro sourced obsidian is indeed found at site 181 that would be the first time that its presence is confirmed in a context further east than the Tihamah. Dhawran is however close to the Yemen Dhamar-Reda obsidian source (Fig. 55) from which it could potentially originate.

Neutron activation analysis is an analytical technique that relies on the measurement of gamma rays emitted from a sample that was irradiated by neutrons (https://www.usgs.gov/usgs-triga-reactor/neutron-activation-analysis). This works by using geochemical characterisation linking artefacts to specific obsidian outcrops, suggesting that obsidian from the Eritrean or Ethiopian sources (Gimenez et al. 2015), can be found in archaeological contexts on the southern Arabian Tihama coast as early as the sixth millennium (Khalidi 2009; 2007). This obsidian is chemically distinct from local Yemeni sources on the Dhamar-Reda volcanic field (Zarins 1989) 200km north-east of Tihamah, despite being a much closer source than the Afar. It is also discounted as the source for Egypt which has been sourced to the Danakil or Arafali sources (Bavay et al. 2000; Aston et al. 2000). Gimenez et al. (2015) suggest Porc Epic as the source rather than Arafali, indicative of some uncertainty in provenancing, or in the interpretation of the analysis.

To assist with obsidian sourcing, Dumitru and Harrower (2019; Dumitru 2020) employed Hyperspectral satellite imagery to produce detailed and precise maps of the distribution of raw materials in Oman and Ethiopia enabling them to model interactions between humans and their raw materials (Harrower et al. 2022). This method is an advanced tool that uses the analysis of data for producing high precision maps of obsidian in remote areas although ground truthing is still required to confirm remote observation. Obsidian exploitation maps the distribution of sites "illustrating the early dynamics of economic interaction and…….assess the role of socioeconomic networks in development of early political landscapes" (Dumitru and Harrower 2019, 94).

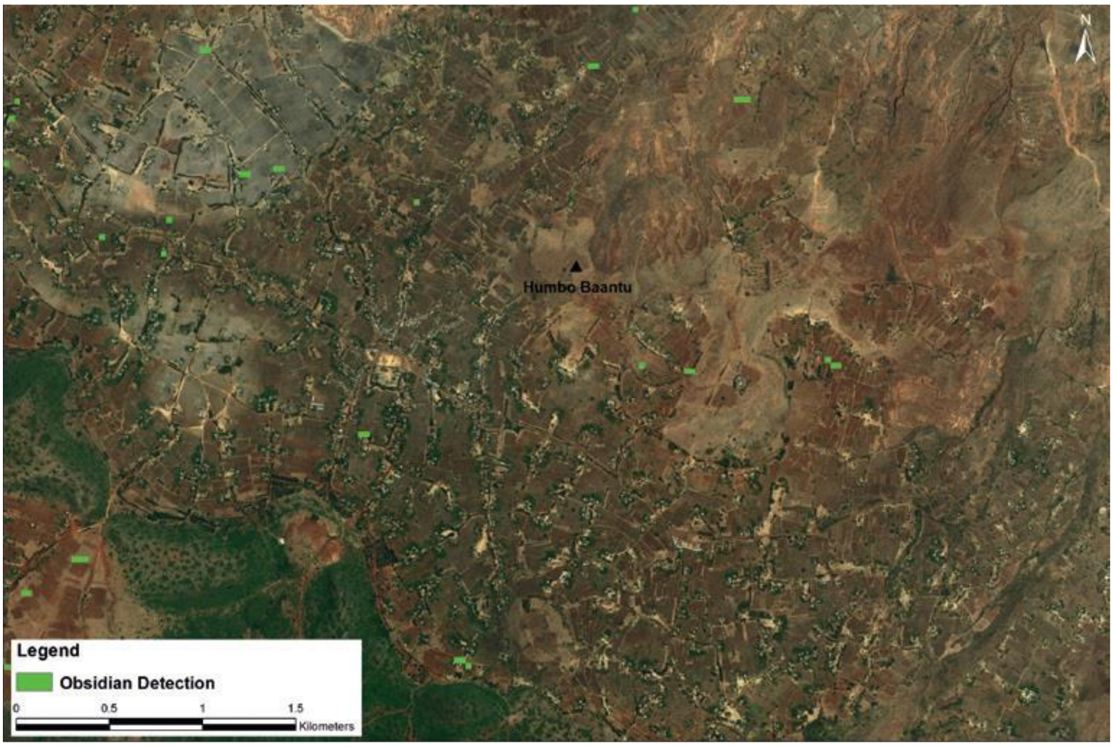


Figure 61. Obsidian detected in Hyperion imagery at Humbo Baantu, Ethiopia, obsidian exploitation site, Wolaita Sodo (Dumitru and Harrower 2019).

Both of these methods are potentially useful tools for identifying sources, or depositions, of obsidian. Writing as a non-scientist, both techniques seem to achieve similar aims with the former able to connect obsidian artefacts to sources and the latter able to identify sources of raw materials which can then be matched to artefact samples. Technology having developed, the Hyperspectral imagery also seems better equipped for direct source identification.

Dumitri (2020) also analysed obsidian samples from 84 Ethiopian sites collected during the last decade by the Southern Red Sea Archaeological Histories (SRSAH) Project. Using a Bruker Tracer III-V non-destructive instrument, 328 samples were analysed for elemental source data which could then be compared to the chemical groups of the artefacts. The analysis indicated a lack of elite control of the obsidian supply network (Dumitri 2020), a surprising result when what appears to be visible in Tigray at this time is a gradual unification of economy and trade as part of the development of the Pre-Aksumite, and creation of a polity or state, D’mt. This maybe an indicator of down-the-line trade rather than a state sponsored direct exchange.

The hydration dating of obsidian at Yeha (Michels 2005) has received considerable critical attention (Finneran 2005b; Ambrose 2012), despite the fact that Michels chronological results still compare with those of Fattovich (DiBlasi 2005; Fattovich 1990a). Obsidian hydration dating can be applied when a fresh surface is created on a piece of obsidian in the tool manufacturing, or flintknapping, process (Ambrose 2012; Michels 2005). When a piece of obsidian is fractured, atmospheric water is attracted to the surface and begins to diffuse into the glass. The thickness of the hydration rind can be identified in petrographic thin sections cut at right angles to the surface and observed under a microscope. It may be used in two ways: as a relative dating method to determine if one artifact is older or younger than another, or as an absolute dating method where a calendar date (BC/AD) is produced. The concern about the process is twofold: it appears to be restricted to obsidian sites that are younger than 120,000 (Ambrose 2012), and that temperature histories must be known in order to calculate accurate hydration ages. Weathering and spalling of the obsidian will influence the dating process potentially providing an inaccurate date (Ambrose 2012). Whilst there is great scope for hydration dating in Africa, the technique is still in its infancy (Ambrose 2012), hence it could be said that Michels, in 1974 (2005), was ahead of his time.

Zarins is frequently cited in discussions of obsidian sourcing however his publication (Zarins 1990) is a broad synthesis of previously published results. Zarins creates a series of source and artefactual obsidian clusters using Rittman’s Sigma and Tau plotting (Zarins 1990a) applied across Africa and the Red Sea region demonstrating sources and probable distribution routes.

The paper expresses an element of doubt about some of the suggested outcomes and indeed it would be interesting to test them in light of some of the more advanced techniques now in use.

Khalidi (2009) undertook the most extensive survey of obsidian from all parts of the Yemen Tihamah. Nearly 500 cores, flakes and other debitage, a representative sample, were collected at each “activity area” (Khalidi 2006, 283) with 34 samples from the total selected for analysis. All the samples showed a homogeneity of colour, bottle green, one of the only occasions that obsidian colour is mentioned in any of the sources cited in this PhD. The sources identified are all in Eritrea (Khalidi 2006), although this allows for a number of volcanic sources in the Afar-Danakil region. None were found to be from the Yemen sources 150km to the north. The analysis of archaeological obsidian samples suggests an “African origin for all the periods documented” (Khalidi 2009, 285; 2010). This is a very specific result citing source area and, of particular interest, the colour of the obsidian being “bottle green” (Khalidi 2006, 286). It is unclear what level of certainty can be applied to Khalidi’s results, as geochemical analysis has not been carried out on all the samples found in Tihamah. The deposits of obsidian are highest near the Tihamah coastal littoral and remain “consistently moderate to high” (Khalidi 2006, 319) along the wadis’, although the quantities are not specified, but decreasing further inland. Khalidi et al. (2010) used LA-ICP-MS chemical analysis when sampling archaeological obsidian from the Yemen highlands. Here however a more specific result was achieved with the outcome clearly suggesting that the Yemen sources of Jebel Lisi and Yafa Ridge (Khalidi 2010, 2335) were supplying archaeological sites in the north of the country, but not those on the Tihamah.

4.1.4 Nabro volcano

Only Nabro volcano (Fig 61) has been identified as the source for some of the obsidian that is found in archaeological contexts at Wakarida, Tigray, and Al-Midaman, on the Yemen Tihamah, during the first and second millennium BC (Oppenheimer at al. 2019; Khalidi et al. 2010). Although other northern Ethiopian sources are known at Fentale, Kone, Gedemsa, Aluto, Shala and Corbetti (Oppenheimer et al. 2019; Cann and Renfrew 1964), and in the immediate vicinity of Mallahle, further research is necessary to identify if these sources are present at archaeological sites. Adjacent to Nabro, and part of the Bidhu massif, the volcano of Mallahle**,** is also a possible source but with a similar chemical identity to its neighbour (Oppenheimer et al. 2019). The Nabro volcano (Fig 62, 63), is located in a remote and difficult to access part of the Danakil depression hence procurement and trade was a challenging task. 110km east of Tigray, it is also the highest topographical feature in the Afar and Danakil depression area of the northern Rift Valley.

Figure 62. Nabro volcano viewed from the south. Photo, Professor Clive Oppenheimer, University of Cambridge, 2012.

Nabro volcano had no historically reported eruptions until 2011 after a series of earthquakes of a magnitude 5.7 in the Eritrea-Ethiopia border region. Prior to this eruption, Nabro was thought to be extinct (Donovan et al. 2018) although there was activity elsewhere in the region. In the western Afar, the Ma'alalta volcano (Wiart and Oppenheimer 2005) has produced recent pantelleritic obsidian domes and lava flows on its southern flank indicative of activity. Ma'alalta is located very close to the Tigray escarpment (Fig. 60), hence the nearest obsidian source, but has not yet been identified as a source of archaeological obsidian.

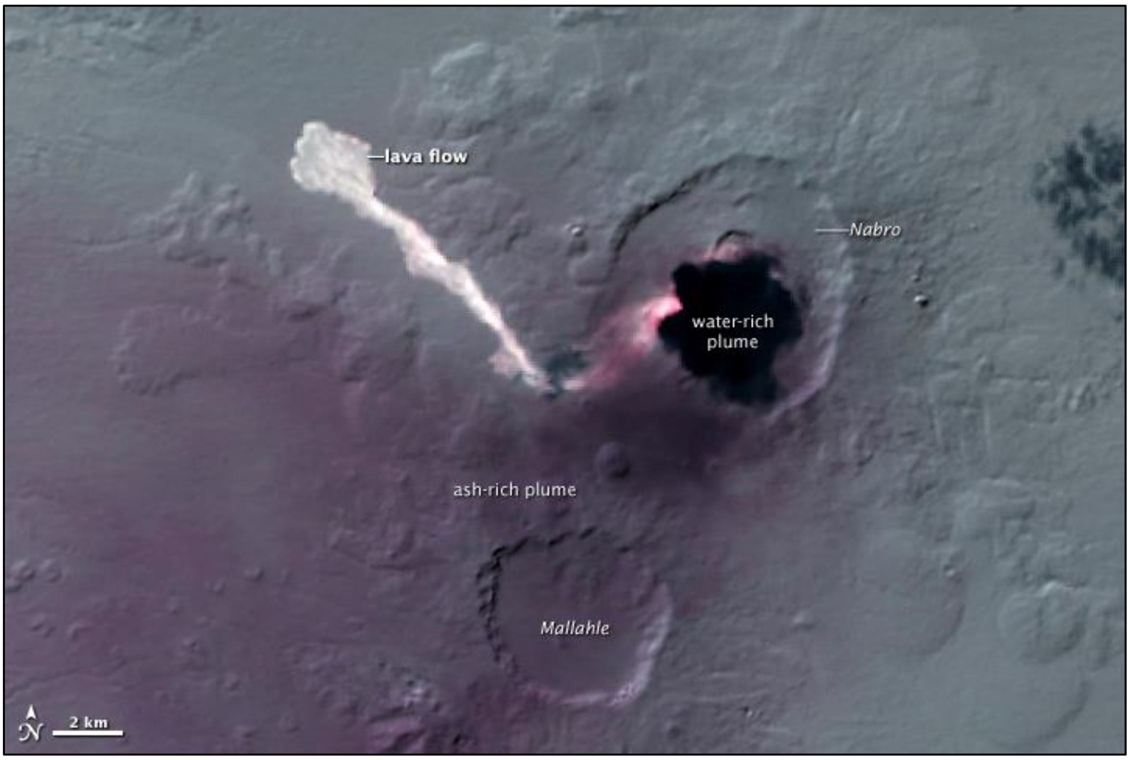


Figure 63. Nabro and, close by, Mallahle, June 19th, 2011. One week after eruption. Photo NASA Earth Observatory image by Jesse Allen and Robert Simmon (https://earthobservatory.nasa.gov/images/51135/eruption-at-nabro-volcano).

When I visited the Danakil depression in 2018, 'Erta Ale volcano (Fig. 64 and Fig 75) had continuous low-level activity which, typically, is a swirling molten red-hot lava visible in the caldera and continuous fumarolic gas emissions emitting from the caldera rim. Whilst 2011 was Nabro's first eruption in recorded history, 'Erta Ale, had erupted in 2010 (Donavan et al. 2018). Although 'Erta Ale is a close obsidian source to Tigray, and to Adulis, little research has been undertaken analysing and identifying its chemical composition (Oppenheimer and Francis 1997).

Figure 64. The igneous part of the lava lake within the 'Erta Ale volcano. Photo, Richard Lee 2018.

The volcanos of Nabro and Mallahle (Fig. 63), part of the Bidhu massif, are "visual anchors" (Bernadini et al. 2013, 3946) dominating the landscape stretching to the Red Sea and representing sacred places or supernatural realms, territorial markers, as per the "smoking mountain" of 'Erta Ale (Oppenheimer and Francis 1997, 1661). Volcano Alid, 160km to the north, and 30km south of the Gulf of Zula, has had no recent eruptions, but vast lava fields remain against its NW and SE flanks. Although suggested as a source (Zarins 1990) no archaeological obsidian has been identified from Alid volcano. The same is true of the Arafali volcano on the Gulf of Zula, although the obsidian found at Abydos, in Egypt, may originate here (Bavay et al. 2020). Using LA-ICP-MS trace element analysis on eleven obsidian objects from Abydos, Naqada, and Hierakonpolis, Bavay et al. (2000) concludes that all samples correspond to the Ethiopian Rift volcanic system but is unable to be more specific than that. Their results suggest that perhaps LA-ICP-MS is not the best system for accurately identifying obsidian sources. The Ethiopian Rift valley is a very broad outcome to the analysis, and as discussed throughout this chapter, there are numerous volcanic sources within it.

Following its 2011 eruption, two seasons of fieldwork at Nabro volcano identified it as the source of the obsidian found in a 3rd - 2nd millennium BC context at Al-Midaman on the Yemen Tihama (Oppenheimer et al. 2019). Oppenheimer's work has been essential in identifying the source of archaeological obsidian found in Yemen and Ethiopia, and as such makes the hypothesis of this PhD possible. Nabro's location (Fig. 65), and its favourable microclimate, compared to the desert plain, meaning cooler and wetter, was therefore a favourable environment for settlement (Oppenheimer et al.2019). Its proximity to Tigray and the Red Sea coast, made it a practical, logistical possibility for acquiring obsidian.

Figure 65. Nabro volcano seen from the south-east. Photo, Professor Clive Oppenheimer, University of Cambridge, 2012.

4.1.5 Archaeology, Egypt and early sources

Afar obsidian, from the Danakil depression to be specific, has been found in Egyptian Predynastic-dynastic burials (3100 BC) at Hierakonpolis, Abydos, and Naqada (Aston et al. 2000; Bavay et al. 2000) including the Tomb of Djer (Naqada IIIc) and Tomb UJ (Bavay et al. 2000; Lucas 1989). The source of the obsidian in Egypt was initially unknown but thought to be from northern Ethiopia, the Eritrean Arafali source on the Buri peninsula (Bavay et al. 20020; Aston et al. 2000;

Tykot 1996), with Ethiopia's Porc Epic cave (Gimenez et al. 2015) also been suggested. During the later Pharaonic period obsidian is used to manufacture the inlaid eyes of statuary, coffins and masks (Shaw and Nicolson 2004) however it appears that whilst Upper Egypt was using African sources of obsidian, Lower Egypt was obtaining its source from the Mediterranean (Aston et al. 2000), and possibly Anatolia (Lucas 1989).

The earliest written record for the Red Sea region, *The Periplus of the Erythraean Sea* dating to the first century AD records obsidian, referred to as "opsian stone" (Huntingford 1980, 60). Obsidian was found by Henry Salt during his 1816 expedition to Hawakil, or Arafali, island (Fig 59) north of Mersa Fatma, where it occurred in lumps of 2 to 4 inches in diameter (Salt 1814), although Salt was told that larger pieces could be found further inland. Deposits of archaeological obsidian flakes have also been found near Dallol in northern Afar, 80km south of Hawakil Bay, Ethiopia (Sahle and Beyin 2017) however these were very small samples, not a source, and perhaps on a trade route.

4.1.6 A review of the obsidian in Ethiopian Tigray, and the Yemen Tihamah.

With the exception of Nabro volcano almost no archaeological research has been undertaken on any of the Afar volcano's partly due to recurring military conflict in the region but also the difficulty, in the case of Eritrea, for international researchers to even be allowed to visit the area. Both of these are contributory factors as to why it is only in the last fifteen years that obsidian research and, therefore, its potential impact on the Pre-Aksumite, has progressed. Khalidi and Oppenheimer developed this research (Khalidi at al. 2010), the former as a consequence of the Yemen Tihamah coastal survey, the latter from his research as a seismologist at 'Erta Ale (Oppenheimer et al. 2019; Oppenheimer and Francis 1997).

Although obsidian is found on the As-Salif peninsula at 5000 BC (Tosi 1986), Nabro sourced obsidian, specifically, must have been both well-known and highly regarded to be the dominant source, from those analysed, at al-Midaman (Oppenheimer et al. 2019, 12). Five thousand pieces of obsidian were retrieved from the site excavation (Edward Keall personal communication 29th January 2023) the highest quantity found on any Tihamah site (Table 9). Of the 36 samples analysed (Oppenheimer et al. 2020), all of them were found to be sourced from Nabro volcano. Al-Midaman is a coastal site on the Tihamah, and probably therefore one of the landing places when crossing from Africa to Arabia.

Oppenheimer et al. (2019) suggests that, at the very least, and correctly so in my opinion, aspects of the regional late prehistoric economy were anchored on Nabro indicating its importance during the first and second millennium BC. Travelling east from Tigray, Erta Ale is 100km, Nabro another 125km east, hence the Tigray region could have been receiving Nabro obsidian that was being traded both west, towards Yeha, and north to the ancient Ona culture in Eritrea.

Whilst a commodity is found at its source and its destination, the route that it takes in between can be identified by the archaeological trail that it leaves. Although unprovenanced, the archaeological obsidian at Mahal Teglinos, in the Gash delta, is, I suggest, a potential route indicator and is present there alongside Egyptian ceramics (Gimenez et al. 2015). Mahal Teglinos was active during the second millennium BC (Early-Middle Gash phase 2700-1900 BC), much earlier than the pre-Aksumite period, most likely an entrepot for overland down-the-line trade with the Nile valley (Gimenez et al. 2015; Fattovich 1997a). The Gash Delta sites existed for 1400 years, declining ca.1400 BC in what would be, in the newly extended Mezber chronology (D'Andrea et al. 2018), the Early Pre-Aksumite. So, whilst there was a chronological overlap, the Gash delta sites would also have connected to the Ancient Ona culture, and possibly Adulis, as part of the larger exchange network that I propose in this thesis.

4.1.7 Arabian obsidian

Studies of a small assemblage of obsidian from Mersa Gawasis on Egypt's Red Sea coast (Lucarini et al. 2020), the major port of the Pharaonic period, attempted to identify the source with mixed results. No definite source could be attributed for all of the obsidian, which was found in different archaeological contexts across the site, and had been in storage since the 1970s. Dating of the obsidian was based on the date of the artefacts in the same archaeological contexts, indicating the examples all dated to the Egyptian Middle Kingdom (2055-1650 BC) (Shaw 2003). Outcrops in Eritrea, at Kusrale, on the Bay of Zula, and in Yemen at Yafa'3 near the Isbil volcano in the Dhamar-Reda volcanic field, were identified as the source (Luccarini et al. 2020). Dhamar-Reda however (Fig.66), has been discounted as the source for the obsidian found in Tihamah and Tigray first millennium BC sites (Gimenez et al. 2015). This is not surprising as the Tigray archaeological evidence, presented in chapter 2, is beginning to suggest greater second millennium BC activity than research has previously demonstrated. It is also pertinent for placing Yemen obsidian sources in the regional exchange network. Lucarini et al. (2020) has connected Mersa Gawasis, on Egypt's Red Sea coast, with the Yemen highlands which is a significant advance in identifying Yemeni obsidian sources, although his research has been twenty years in publication. Analysing obsidian from the Dhamar-Reda source (Khalidi et al. 2010) compared to samples from archaeological sites north of the Tihamah indicated that the Dhamar-Reda source is not found on the Tihamah. Hence there is a second system of obsidian exchange in operation (Khalidi et al. 2010) that is traded to Egypt but not, evidently, the Tihamah.

Figure 66. The location of Nabro volcano and archaeological sites in Yemen discussed in this chapter.

The earliest date for obsidian found on the Yemen Tihamah, As-Salif peninsula, is ca. 5000 BC (Tosi 1986). Sometime between the late Neolithic (8000-3000 BC) and the Iron Age (1200-300 BC) obsidian becomes more accessible with evidence found in Early Neolithic Yemen Tihamah shell middens in the form of geometric microliths (Khalidi 2009), and a dramatic increase of obsidian debitage (Khalidi 2005). Increased amounts of obsidian became apparent closer to the coastline which is where most shell middens were located (Tosi 1985, 1986). Inland, the sites of Al-Midaman, Sabir, al-Kashawba (aka the Gas Station) and Al-Hamid date, respectively, from the mid third to early first millennium BC, with obsidian present at each site. Whilst the Tihamah sourced African obsidian (Oppenheimer et al. 2019), a second system circulated obsidian in the Yemen highlands, where trace element analysis matches sources and archaeological samples (Khalidi et al. 2010). It is from this system that examples including Egypt's Mersa Gawasis (Luccarini et al. 2020) were being obtained.

4.1.8 The Mekelle source

The Pre-Aksumite site of Kidrane Mehret (D-Site), at Aksum (Phillips 2004; Phillipson 2000) has an abundance of obsidian that Phillipson says originates from an unspecified source 150km south-east of Mekele where it is “found in abundance at outcrops” (Phillips 2004, 81) initially identified by Zarins (1990) without giving a specific location. Obsidian analysis (L Phillipson 2009) indicates that the character of the assemblages from the Aksum D-site are similar to those found in the ETAP surveys in Gulo Makeda (Sernicola and Phillipson 2011) and potentially deriving from the same source east of Mekelle, which means, presumably, Nabro or Ma’alalta.

Excavation in the Shire region, 100km to the west of Aksum, has found obsidian at a prehistoric site near Indaselassie which Phillips (2004) and Finneran et al. (2003) assume to have been traded through Aksum from the aforementioned Mekelle area. Once again the term prehistory comes with the caveat of what we mean by the term (chapter 1, p.32), but also where prehistory belongs within the new Pre-Aksumite chronology (D’Andrea et al. 2018). Geographically Shire is the furthest west in Tigray that obsidian and the Pre-Aksumite material culture has been found. Its presence indicates, I suggest, that a route from there may have linked Yeha with the Nile valley via Mahal Teglinos (Fig 67). Based on data from the 1950s Finneran (2005) suggests that the obsidian in Shire was sourced from the Dahlak islands but allows that other sources, not stipulated, are in fact closer. Although Finneran doesn’t cite them so he is probably referring to Zarins (1990) and Phillips (2004) suggestion of the Mekelle source, which, as discussed above, could be Nabro, Ma’alalta, or Arafali, although no provenancing of the Shire samples has been undertaken. In the years since these claims were made, only Nabro volcano has been conclusively proven as a source for some of the Tigray obsidian.

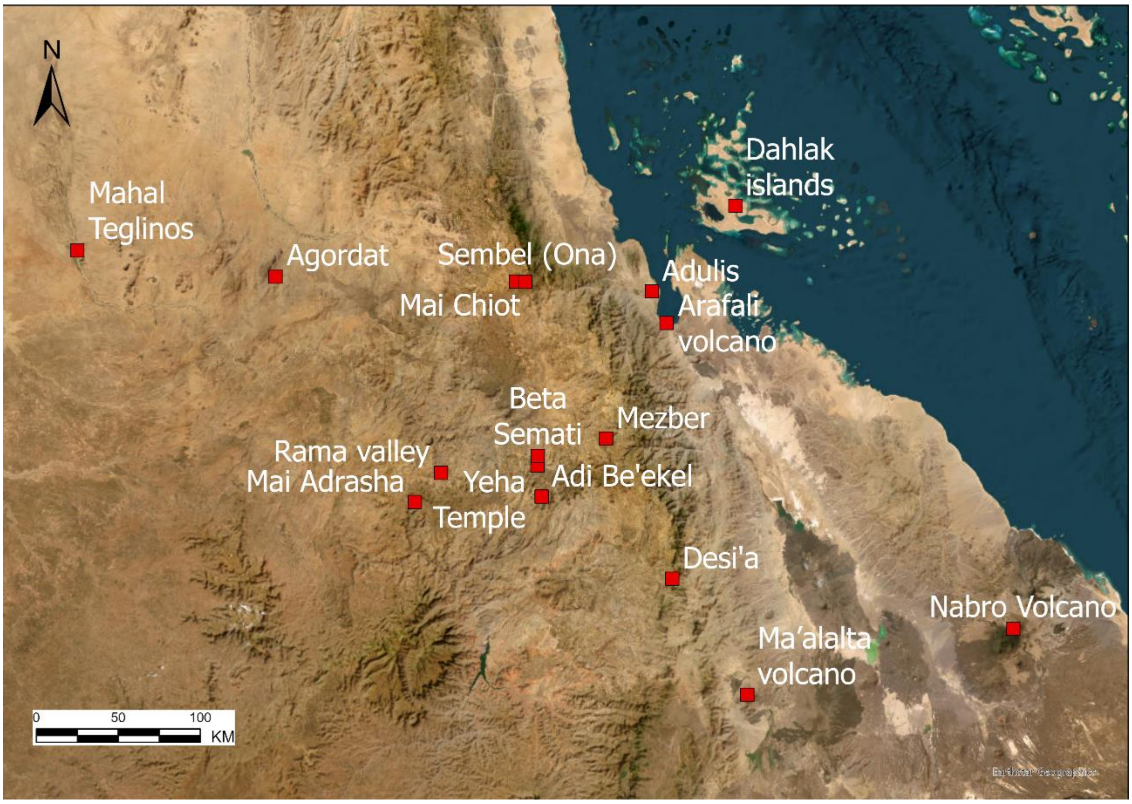


Figure 67. Map showing Mahal Teglinos in relation to Nabro volcano.

4.1.9 The second millennium BC

The Tihamah coast of Yemen is, at its closest point, the Bab el-Mendab straits, only 32km from the Horn of Africa in Djibouti, with good intervisibility between them on a clear day. Crossing the Red Sea here is a narrow channel with very strong seasonal currents (Facey 2004) and it would have required knowledgeable sailors in order to make the crossing in safety. Archaeological evidence indicates that obsidian was not exploited by coastal communities on the Red Sea coast of Yemen prior to the emergence of herding in South Arabia around the 6th millennium BC (Khalidi 2009).

4.1.10 Tihamah obsidian

The Tihamah site of Al-Midaman, as discussed in chapter three, has some cultural affinity with Sabaean (Kingdom of Saba) material culture, implying a date between the 12th and 8th century BC but is primarily a local Tihamah tradition, there being a marked difference between them. Al-Midaman is a key to the early regional contact between Arabia and the Horn of Africa (Keall 2004). A series of standing stones were erected here in the late third/early second millennium (2400-1800 BC). These are particularly notable for a block of quarried obsidian (Giumlia-Mair et al. 2000) found below one of the stones (Fig. 68), along with scatters of obsidian microliths around many of the other stones (Rahimi 2001; Keall 2000, 1998, 2000). Although the size of the obsidian is not recorded, from the image published (Fig. 68, below) it appears to be ca. 10x7cm in size, which fits comfortably into the palm of one's hand and weighs, approximately, I estimate, based on comparative examples, 320g. The lithic industry here, and across the Tihamah, is characterised by obsidian geometric microliths and "pièces esquillées" *(splintered pieces)* (Khalidi 2006, 9; Rahimi 2001). Both tool types indicate an expedient lithic technology, whereby the shape of the blanks available determine the shape of the tool (Khalidi 2006), dependent on the availability of the obsidian. Al-Midaman is 190km, as the crow flies, from Nabro, where the majority of its sampled obsidian artefacts originated (Oppenheimer et al. 2019) giving an idea of the weight of obsidian and distances involved in its transportation.

Figure 68. A "large, squared hunk of obsidian" below on of the fallen monolithic stela in the excavation at Al-Midaman (Keall 1998, 114).

Keall (2004) suggests Al-Midaman had an archaeological parallel with Mahal Teglinos as both site's had similar monolithic stelae, not as single grave markers, but as pillars placed randomly in cemetery areas in the early third-mid second millennium BC (Fattovich 1993). The people of Al-Midaman were an "enigma" and that it is "a tempting alternative to seek possible connections with the Horn of Africa" (Keall 2009, 52). This is a fascinating statement that clearly has consequences for the culture that we see at Al-Midaman and, potentially, at other Tihamah sites. Nabro volcano is located midway between Al-Midaman and Mahal Teglinos. It is unclear exactly who, or when, an influx of people, a "cultural transfer" (Gerlach 2012, 259) effectively, arrived on the Tihamah and merged with local "tribes" (Carl Phillips personal communication 30th

January 2023) creating the culture recognisable in the first millennium BC. As discussed in the previous chapter a migration of people from either, or both, the Kingdom of Saba, to the north, or from the Horn of Africa to the west, is possible. I use the term tribe advisedly, but it is a contemporary one used to describe the large regional groups, 15-20,000 population, which occupy parts of Yemen today.

The Canadian ETAP survey, in Tigray, recorded obsidian at 29 of 39 Gulo Makeda sites surveyed (D'Andrea 2005, 20) as a resource of both a utilitarian and exotic character. Utilitarian due to its increasing presence in the inhabitants lives, but still exotic due to its unusual origin. Obsidian represented 20% of the stone tool assemblage at Mezber (D'Andrea 2005) (table 9) which also has a significantly earlier date, mid second millennium BC, than the other sites recorded by the survey. Mezber's second millennium BC date, and the high quantity of obsidian (Table 9), make it the principal foci of the revised Pre-Aksumite chronology as discussed in chapter two (D'Andrea et al. 2018).

Name of site	**Quantity**	**Bibliographic reference**
Al-Midaman	5000 pieces of obsidian	Keall per comm 2023
Mezber	7015 pieces	Johnson, Brandt 2011
Al-Hamid	8 (flakes, blade fragment)	Phillips pers comm 2023
Yeha (Michels 1974 survey)	2000 pieces.	Michels 2005
Al-Kashawba	High density scatters, geometric microliths.	Khalidi 2006
Asa Koma	4000 obsidian microliths from a total of 16000 lithics	Joussaume 1995, 33-6. Khalidi 2006
Beta Semati	Area A: 129 obsidian lithics, 43% of 301. Area B: 161 obsidian lithics, 33% of 490.	Harrower et al. 2019
Wakarida (Mangagebit)	Nabro sourced flakes, quantity unknown	Oppenheimer et al. 2019
Ziban Adi	Large amounts surface flakes	Wolf and Nowotnick 2010
Sefra Tourkui (north Adigrat)	high density of obsidian microliths	Harrower et al. 2020

Table 10. Quantities of obsidian at sites discussed in this chapter.

4.2 First millennium BC

4.2.1 Tigray obsidian

The development of the archaeological record of Tigray over the last sixty years has been a protracted undertaking with periods of intense research disrupted by periods of regional conflict. The site of Aksum became the most archaeologically investigated site in Tigray which is where we first start to become aware of the presence of obsidian (Munro-Hay 1989). As I have gradually amassed data relating to obsidian sources, this process has also begun to suggest to me the routeways that were being used in Tigray during the first and second millennium BC. Phillips (2004) and Zarins (1990) do not state the exact source of the obsidian, near Mekelle, as it had not been provenanced. As Oppenheimer et al. (2019) has identified Nabro volcano as the main source for the Afar obsidian examined in Tigray and Tihamah it is possible therefore that it, rather than Ma'alalta (near to Mekelle), is the source for Kidrane Mehret (p. 149). Whilst Nabro volcano is not strictly close to Mekelle, when viewed relatively from the perspective of long-distance trade, it is the closest obsidian source known that was being procured, although as already mentioned, Ma'alalta cannot be ruled out. Indicative of the route being used out of the Danakil depression, the town of Desi'a, located on the upper ridge of the escarpment (Fig. 67) has obsidian present in archaeological contexts albeit undated (Woldekiros 2019). The obsidian at Desi'a was discovered during ethnographic fieldwork researching the modern salt trading routes of the Danakil (see chapter five), hence quantities and dating for the obsidian were not recorded.

Archaeological survey of the Meqaber Ga'ewa temple site (chapter two, p.53), close to Mekele, found another 27 archaeological sites within 3km, some of which are contemporary, based on pottery styles (Wolf and Nowotnick 2010). Of particular note is a small mound called Ziban Adi where large amounts of obsidian flakes were observed. The location, west of the Afar, and in southern Tigray, is indicative, as I propose, of the route that the obsidian was passing along.

By the time the obsidian arrived in Tigray it would be a highly valued raw material (Zarins 1996) which would have been reduced as much as possible using bipolar reduction techniques when being worked at its source (D'Andrea 2005). The ETAP survey however recovered evidence of lithic workshops at the sites of Adi Kesho 1 and Grakasa, (D'Andrea 2005) indicating working of the material was still being undertaken at its destination. From a practical point of view this seems like a logical undertaking as the recipients of the obsidian can then work the cores to their choosing without them being damaged in transit.

4.2.2 Eastern Tigray

At the eastern edge of Tigray, within the mountainous escarpment that separates it from the Danakil depression, is the site of Wakarida (page 61) around which are numerous smaller sites.

Many of these are of a historic Aksumite date but two sites have significance for this research, that of Mangagebit and Alakile Daga. Both of these sites are close to the Mey Weini valley, a possible route between the Danakil depression and Tigray. The earliest stratigraphy at Alakile Daga, radiocarbon dated to 2480+30 BP (774–482 cal BC) (Benoist et al. 2020, 31) include ceramics with parallels to the Ancient Ona culture of the early first millennium BC that makes is a significant location linking Tigray and Tihamah, albeit a site without obsidian. There are also possible Pre-Aksumite ceramic parallels with Mezber in the earliest stratigraphic deposits (ca 700 BC) thereby enhancing a connection to sites further north.

Mangagebit, a hilltop site overlooking the valley, has obsidian flakes and tools radiocarbon dated to 2245+30 BP (392–206 cal BC) which is the end of the Pre-Aksumite period in what is now known as the PA-A (Pre-Aksumite-Aksumite) transitional period (Taddesse 2019). Whilst these dates are not an ideal complement for the Pre-Aksumite, the presence of obsidian here is significant for this PhD research as it supports my proposal for a route connecting Tigray, the Danakil depression and the Red Sea coast.

Beyond Tigray, archaeological survey has found obsidian microliths, and evidence of archaeological ruins, at Arsile and Raheita, near to Beilul and Assab (Fig. 69), on the Eritrean coast (Fattovich 2012). The evidence of obsidian at these coastal sites is, I suggest the location from which obsidian could be shipped across the Red Sea to the Yemen Tihamah. These sites, although little known or investigated, are potential central links in the route that connects Tigray, and Tihamah, as I will discuss further in chapter 5. In 2003 Khalidi (2009) undertook a walkover-only survey of Beilul and Assab, on the Danakil coast, identifying prehistoric antecedents including a number of circular stone-built tomb structures, rock art and obsidian debitage. The nearest source of obsidian to Beilul or Assab is the southern Danakil region. Further work is needed here to confirm a chronology for these significant sites.

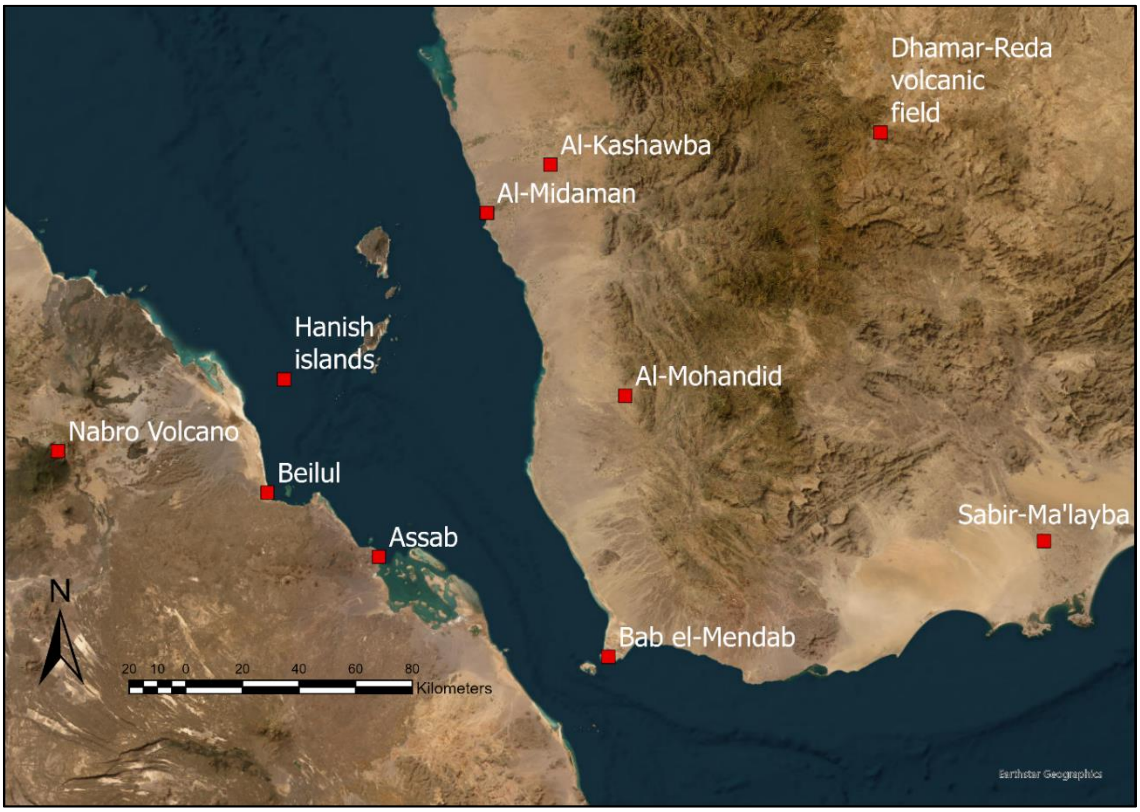


Figure 69. Map showing Assab and Beilul in relation to Nabro volcano and Al-Midaman.

4.2.3 Yeha

Michel's (2005) Yeha chronology was primarily based on obsidian hydration dating derived from 253 sites located between Yeha and Aksum. Although his use of obsidian hydration for dating techniques has been questioned (Ambrose 2012; Finneran 2005b), Michel's Middle pre-Aksumite sequence aligned with Fattovich's (2009) suggestion for the same chronology, the 7th-5th centuries BC. DiBlasi (2005) acknowledges the differences between Michels and Fattovich but suggests that it is the nature of the data used to construct each chronology and the approaches used to differentiate the chronology that make the difference (DiBlasi 2005, X). Fattovich presents a fine-scaled phasing synthesising stratified and dated ceramic assemblages from others' fieldwork, often Anfray's at Matara (1967) but drawing supporting evidence from many sites.

Michel's chronology (2005) uses obsidian hydration dating, primarily, and associated ceramics collected from the surface of the survey sites. Surface pottery collection is not an ideal method for accurately dating a site, being an unstratified deposit, unless all the finds should be of the same date; however, dates derived from obsidian hydration are also problematic because of the difficulty in obtaining the temperature histories which must be known in order to calculate accurate hydration ages (Ambrose 2012). Whilst there are weaknesses in both approaches, the suggested dates broadly correspond to the Pre-Aksumite chronology suggested by Phillipson

(2000) so whilst neither method is ideal, because of their inherent margins of error, the conclusions reached are very similar, and match other established chronologies (Phillipson 2000).

Excavating at Hureidha, in the Yemen Hadhramaut (Fig 66), 450km north of the Tihamah, and the Gulf of Aden, Caton-Thompson (1944) retrieved significant quantities of obsidian tools but, despite the availability of local sources, suggested that most of the examples originated in Africa. This was because “it is difficult to believe obsidian and chert microliths to be an indigenous growth” (Caton-Thompson 1944, 136) given the absence of blade industries in the Hadhramaut. This is a particularly interesting, still unsubstantiated claim, that if accurate suggests that potential Nabro obsidian might be travelling considerably further than has so far been demonstrated. Zarins suggested that the Hureidha examples derive from the Arafali source near Adulis (Zarins 1990). The actual nearest obsidian source to Hadhramaut is 500km to the north in the Oman Dhofar region (Dumitru 2020; Dumitru and Harrower 2019; Khalidi et al. 2010), also an established incense source (Groom 1981). Hureidha dates to the 5-4th century BC, and is 450km north of the Tihamah, and north of the Gulf of Aden, a significant distance from all the other sites discussed here. Clearly, either Nabro, or Dhamar-Reda, or Omani, sourced obsidian could be travelling to Hadhramaut. It would be useful to have a confirmed source for the Hureidha samples indicative of the distances obsidian was being transported.

4.3 Quarries and Extraction

Nabro volcano

The survey of Nabro volcano found that obsidian lithics, a scatter of cores and retouched flake, were frequently found at the surface (Oppenheimer et al. 2019), whilst unworked geological specimens, were collected only from within the caldera. The unworked surface finds were the consequence of high-quality obsidian having been exposed on the landscape for tens of thousands of years (Fig 70, 71 below). Depending on the spatial and temporal extent of the eruption, some areas within a caldera can remain partially dormant/active but can still be visited, as I experienced at ‘Erta Ale in 2018. This indicates that lithic procurement could take place on the slopes and within the caldera at Nabro, even if a dormant/active state persisted. Oppenheimer et al. (2019) found a suite of obsidian lithics on Nabro including blades and flakes up to 5-7 cm in length, scrapers, a bladelet core, and a 9-cm-long bipolar core, plus debitage (waste material from the making of stone tools), and transported cores of raw material (Fig 71 below). The blocks of obsidian indicated in the survey are quite small, approximately 8x5cm. The largest of the lithic tools recovered from Nabro in this survey are 7cm in length and 2.4cm in width, the typical size of Neolithic (7000 BC) cores in the Afar (Oppenheimer et al. 2019).

Figure 70. Examples of in-situ sources of obsidian on Nabro volcano. Photo, Professor Clive Oppenheimer, University of Cambridge, 2012.

One of the central questions pertaining to obsidian procurement and trade is what was the size of the blocks of obsidian that were being moved? The examples found at Nabro and al-Midaman are quite small (Fig 70) however these are just two example. The block size logically relates to the size of the raw material as it is found on Nabro, but also to the size and amount of obsidian that could be moved. We know for example that the obsidian sourced here, or at Arafali, was travelling significant distances. At the very least, as I indicate in this chapter, it was being moved to locations in the Tigray highlands; it was being moved to the Red Sea coast at Beilul (Fattovich 2012; Khalidi 2009): it was being shipped overseas to Yemen and in the fourth millennium BC obsidian was being transported as far north as the Egyptian Nile valley. So far it appears that only small pieces or blocks of obsidian cores were being transported (Khalidi 2006), based on the examples found. A systematic archaeological survey of Nabro is required in order to locate quarries and tool manufacture sites (Oppenheimer et al. 2019), but also areas of settlement or areas of encampment as demonstrated at stone extraction sites in Egypt (Heldal et al. 2009).

Figure 71. Examples of obsidian lithics retrieved from Nabro volcano workshops. Photo, Professor Clive Oppenheimer, University of Cambridge, 2012.

Afar sourced obsidian appears in the archaeological contexts of most first and second millennium BC sites on the Yemen Tihamah (Khalidi 2006) indicative of its value. That it originates overseas also (Khalidi 2009) testifies to the exchange networks in place to bring it to Yemen. As the evidence I present in this chapter shows, the process that led to regional growth and trade must have begun earlier in the third millennium BC, at least, to have such a singular impact both temporally and spatially.

We know that the Nabro, or Afar, obsidian is found in third millennium BC Yemen (Oppenheimer et al. 2019) and fourth millennium BC Egypt (Bavay et al. 2000). Trade in obsidian had been taking place since the sixth millennium (Khalidi 2007), so although we currently lack evidence of its presence in the following millennia, we might speculate that the trade was still taking place throughout the region, especially with the development of Egypt, Yemen and Nubian cultures at this time. When we record its presence again, for example at Mahal Teglinos (Manzo 2020), this is a location that functions as a regional entrepôt connecting the Nile valley with Tigray and, potentially, the Danakil obsidian sources, which would assist in continuing the trade already taking place.

4.3.1 Comparable fieldwork in the Georgia Caucus

In this section I present comparable fieldwork examining obsidian procurement in Central Asia, the Georgian Caucasus mountains (Biagi, Nisbet and Gratuze 2017) as a parallel for the activity of the Afar sources. Obsidian mining pits and workshops (Fig. 72-73) were located on a 2417m trachyrhyolitic dome—a source of high-quality obsidian—emerging from the plain 300m north-east of Lake Paravani. The site was exploited from the Middle Palaeolithic onwards with intense use during the Neolithic (7000 BC) and particularly the Iron Age (1200 BC) periods. Examples of the obsidian were found as far away as the Black Sea, 200km westwards and the Caspian Sea 400 km east, similar distances that Nabro obsidian was being transported. The extraction sites range across ca. 5km of the mountain but due to heavy winter snowfall, are only seasonally accessible. Workshops of scattered obsidian debitage were found measuring ca. 2x2m. Around 240 mining pits were found, mostly 2-5m in diameter often clustered together (Fig 73). The pits are recorded as being “round or oval in shape, surrounded by low banks of excavated debris, frequently containing knapped obsidian flakes” (Biagi et al. 2017, 3). In some areas obsidian is observed having been washed down mountainside tributaries due to heavy snowmelt. The obsidian scatters include sub-conical blade cores, flakes, blades, a few retouched tools and debitage, comparative to what has been found at Nabro and in the archaeological contexts of al-Midaman (Oppenheimer et al. 2019; Keall 2004).

Figure 72. Mining pits at Mount Chikiani in the Lesser Caucasus, Georgia. Photo, Dr Paolo Biagi, San Polo, Venezia.

Figure 73. Mining pits at Mount Chikiani in the Lesser Caucasus, Georgia. Photo, Dr. Paolo Biagi, San Polo, Venezia.

Procurement, and preliminary knapping, were undertaken very close to the extraction sites before being transported elsewhere (Biagi et al. 2017). Workshops where significantly more knapping work was undertaken are located “some distance” (Biagi et al. 2017, 6) from the source. This relatively rare opportunity to study extraction and workshop areas for obsidian complements the lack of similar knowledge at Nabro. The primary difference is that the Caucasus source is an area of relatively easy access in gently undulating hillsides at an altitude of 2400m. The comparison with Nabro is contrastingly different: one is an arid volcanic landscape, whilst the other is a temperate mountain environment. But the subsequent obsidian lithics are similar in both instances, suggesting, perhaps, that methods of obsidian extraction, at the scale found in the Caucasus and Nabro at least, do not notably differ, with the distance that the resource is transported also being similar. The primary difference between the two sources is the environment in which the mining or procurement took place with the Afar desert presenting a considerably more challenging landscape in which to work. For the miners, the temperate Caucasus mountain environment was an easier place to both work and live, perhaps for an extended period of time. Dwelling within the vicinity of Nabro, as I have experienced when visiting ‘Erta Ale, is a considerable challenge, and in contrast to the Caucasus, much more of an expedition even down to the basics of providing water supplies. In temperate Caucasus water would be easily accessible, whereas in the Afar water would need to be brought along or could perhaps be retained from the rainy season, in natural cisterns, but this would probably be a limited supply. So although we see contrasting environments, the Caucasus seems a good comparison for what is potentially taking place at Nabro volcano, both in terms of extraction and procurement and long-distance transportation.

4.3.2 Types of obsidian

Specific types of obsidian, for example black, grey, or green, could have contributed to the evolution of diverse local identities and a gradual development of regional social complexity (Marshall et al. 2011). Specific settlements could have been held in high esteem because of the type of obsidian that they used thereby enhancing their regional status. This as an interaction sphere (Caldwell 1964) whereby the movement of material within a geographically defined region can be archaeologically documented (Caldwell 1964), and within that "sourcing studies" (Summerhayes 2008, 538) are applied for identifying exotic or valuable materials in archaeological sites distant from the objects.

The Yemen obsidian that Khalidi (2006, 2009) finds on the Tihamah is bottle green in colour, whilst the examples from Nabro appear to be black (Oppenheimer et al. 2019). There is no discussion in related publications cited throughout this PhD about why certain colours might be preferable to others, if there is a choice, indeed colour is almost never mentioned. Renfrew and Dixon's (1964) Group 4d type obsidian sourced in Ethiopia/Djibouti, is also described as green. It maybe that black was a preferred colour because it is a stronger colour than green; perhaps black lends itself more to ideas of being a sacred/aesthetic source. Given their location between two obsidian sources, African and Arabian, the people of the Tihamah may have had a choice in their obsidian colour. This is possible, but it is an answer that I am, so far, unable to confirm, and is not discussed in any of the literature cited here.

Obsidian both looked different to most stone tools, more attractive it might be said, but also unlike anything else people had experienced, *and* was able to be used in a practical way. Its procurement involved long distance travel to a landscape, the Danakil depression, which was completely unlike Tigray, and potentially, threatening. When we discuss the procurement and trade of obsidian during the first and second millennium BC, we are talking about individuals, miners, being present at the volcanic source as in the Caucasus. Whilst Oppenheimer et al. (2019) identifies the Nabro volcano source he does not wholly discount Mallahle because of its proximity to Nabro. It is unknown is whether the volcanos were active, dormant or extinct, at the same time. From the Afar desert extending north to the Gulf of Zula is a region of volcanic activity in which obsidian was being collected potentially from different sources including Arafali and Alid volcanos (Cann and Renfrew 1964; Negash et al. 2020). This is a harsh and demanding landscape that miners were highly familiar with, and spent periods of time working, and potentially living, in, or at least close to.

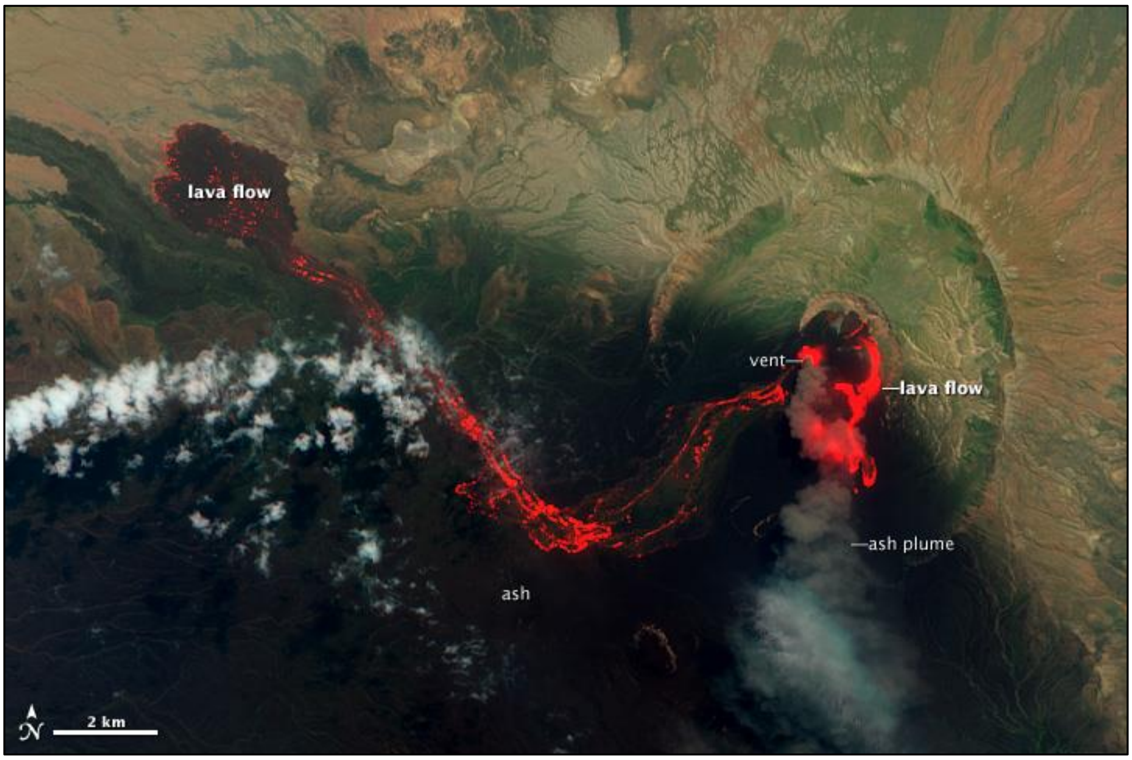


Figure 74. Nabro volcano, June 29th, 2011, showing lava flowing out of the erupting vent and down the slope of the volcano to the west. Photo NASA Earth Observatory image by Robert Simmon (https://earthobservatory.nasa.gov/image.51253/lava-flows-at-nabro-volcano)

4.4 Obsidian Discussion

The Nabro volcano, 110km east of Tigray, is the highest topographical feature in the Danakil depression, and had, increasingly throughout the preceding millennia, become a central focus as a primary source of obsidian on the Horn of Africa (Fig. 74). This is demonstrated by the analysis of obsidian from Al-Midaman and Wakarida (Oppenheimer et al. 2019) indicating Nabro volcano as the source. Other sources of obsidian were available throughout the Horn of Africa, and Arabia (Cann and Renfrew 1964; Khalidi et al. 2010) but this specific source had found favour across the region. There are a number of factors as to why this is so, the foremost of them being, most likely, both the relative ease of access to the volcano but also the ease with which the obsidian could be procured, collected and transported. Both first millennium BC Pre-Aksumite Tigray and the Tihamah Iron Age were experiencing periods of growth and development with obsidian being a core component of the economy, a core suggestion that I make in this thesis

The quantities of obsidian artefacts known in the fourth millennium BC, in Egypt for example (Aston et al. 2000), are very low, perhaps suggesting small-scale extraction. Egypt is also however on the periphery of this exchange network; hence smaller quantities might be expected. But by the early first millennium BC the extraction process significantly increased (Khalidi 2009). Within this period of growth, a sense of ownership must have been sensed by those involved with the extraction and exchange. This may have started out as an individual sense of property, as one can envisage, a few local people collecting pieces of obsidian from the mountain whilst they are walking, or wayfaring (Clack and Brittain 2011). But once it became apparent that the obsidian had an economic and an aesthetic value, presumably the community that the individuals were a part of would have expressed an interest.

4.4.1 Ethnographic studies

Ethnographic studies (Topping 2022) of Native Americans and Aboriginal Australians indicate that community involvement is a common pattern with group ownership becoming the norm. The artefact is recognised as a unique object, then the source itself has special recognition (Bradley 2000), and the extraction process becomes a significant activity, a taskscape (Ingold 1993). Therefore, as Ingold identifies a taskscape, the extraction process becomes an "array of related activities" (Ingold 1993, 158) – the labour of the extraction process. Personal ownership, perhaps by prestigious individuals, led to items becoming family heirlooms effectively, items of value. The significance of the source, or the place, however, is part of the phenomenological theory about why a site like Yeha was important prior to the Temple's construction. It is the natural landscape that is initially significant (Pikirayi 2013; Bradley 2000) due to the importance of what may already be associated with it. A quarry is important due to the artefacts emerging from it and then becoming significant, either economically or socially. Topping's (2022) ethnographical work indicates that local extraction teams are formed but with group ownership of the resources and elders or ritual specialists having overall control over access. Hence it seems logical to suggest that the miners were seen as special individuals with a unique role in their community. This maybe what we see taking place within the community extracting obsidian at Nabro.

As a significant contribution to the outcome of this discussion I propose that from being a raw material valued for its symbolic or aesthetic value, obsidian became an economic product on an industrial scale. From the available evidence, and the amounts of obsidian being moved across the Red Sea, at Al-Midaman for example (Keall 2004), I see a first millennium BC economic mindset taking over from the earlier aesthetic mindset. Does the economic value further enhance the aesthetic value, or were both values maintained simultaneously? The archaeological contexts in which obsidian is found during the first millennium BC, and primarily used as tools in utilitarian environments, suggests that some of its worth in relation to its acquisition, and aesthetic-source value, may have gradually declined. In contrast to that is the presence of the single piece of obsidian intentionally placed below one of the megaliths at Al-Midaman (Keall 2000, 1998) as a valued foundation deposit. If the objects have daily use, then some of their aesthetic value declines, as with any artefact or object. The majority of the obsidian retrieved from excavations in Tigray is not from burial contexts whereas in fourth millennium BC Egypt (Aston et al. 2000; Bavay et al. 2000) it only occurs in high status burials. Therefore, its status or value may have changed in the interim millennia, and different cultures may have had a different perception of obsidian.

It is probable that the value of the obsidian increased the further away from the source that it was transported, and the more unique it became. Hence the presence of Afar obsidian in high-status Egyptian burials at the most important cemetery sites of the Predynastic period (Aston et al 2000; Bavay et al. 2000). In Yemen the obsidian had crossed the Red Sea which again likely imbued it with an extra significance: it was from overseas, not just symbolically another land but somewhere, a place, that most people could not, or would not, be able to visit or potentially even be aware of. It was alien to their environment and therefore of increased value.

4.4.2 Artefacts and origins

For individuals wanting to obtain obsidian precisely because of its high value, whether economic or aesthetic, the journey was challenging. For those travelling from the Tihamah, the journey was fraught with danger. First, they had to cross the Red Sea which must have been a perilous journey at best (Facey 2004). They then had to cross the Afar desert, a far more challenging environment than they were used to in the Tihamah. Then they approached the Nabro volcano, which may have been active, and threatening. So the difficulty and challenges of the journey itself become a part of the object's cultural significance (Topping 2022). It is unknown whether South Arabian traders were arriving directly at Nabro, or traders from Nabro were crossing the Red Sea to Yemen. We know from the Sabaean evidence in Tigray, as I discussed in chapter three, that Sabaeans were at least present in Tigray.

Does the inaccessibility of the obsidian source enhance its value, as with, for example, the British Langdale Neolithic hand axes, sourced and made in a difficult to access place (700m altitude) on the mountain (Bradley and Watson 2021; Edmonds 2004)? The Langdale volcanic tuff, a pale green stone, only occurs at that precise location, hence there is a strong sense of place associated with it (Bradley 2000). The Nabro obsidian is retrieved, or extracted, from a volcano, although whether it was understood to be a volcano or just another mountain peak is unknown.

If Nabro were an active volcano expelling water vapor (H2O), carbon dioxide (CO2), sulfur dioxide (SO2) and lava (Donovan et al. 2018), one can understand, it might be suggested, how a link with origin myths could be developed. But even without that Nabro is a striking feature of the landscape, and a source of obsidian, both of which would have embedded its relationship with local populations. It was an underworld link to spirits, and portals, as we see with other indigenous cultures (Topping 2022; Walsh and Mocci 2011), and to deities who may have been perceived , suggests Pikirayi (2013) to be the guardians of the raw materials. This is another example of the phenomenological approach that I take throughout this Phd, and a way of reaching beyond the purely physical evidence. An association with spiritual elements might have enhanced the value of the raw material and the artefacts that it eventually became, whether a utilitarian object in Tigray or something of value placed as a foundation deposit at Al-Midaman (Keall 2004). This value undoubtedly enhanced its status making it a desirable artefact to acquire.

Identifying Nabro volcano as the source of obsidian found in Yemen has been integral to knowledge of long-distance trade, and the "culture transfer" (Gerlach 2009, 259) of the Pre-Aksumite first millennium BC. The foothills and escarpment dividing the Yemen Tihamah and the Yemen highlands act as a "natural barrier between two spheres of obsidian circulation" (Dumitru and Harrower 2019, 63). The mountain chain was not impenetrable however, the Wadi Siham cuts through it, and today can be driven along, but it may have functioned as a political and cultural boundary, even a barrier to procurement of local obsidian. Khalidi et al. (2010) suggests that a second system of obsidian circulation was operating from the Dharma-Reda region, 150km north of the Tihamah. Obsidian from this region is found on sites north of the Tihamah but none of it appears to have found its way to the Tihamah, and none of the obsidian analysed on the Tihamah has been found further north. Hence, physical or otherwise, the Tihamah escarpment was a boundary.

This reinforces the fact that the inhabitants of the Tihamah were using a foreign rather than local obsidian source. It also raises the question of where Dhamar/Yafa'3 obsidian was being transported to Egypt from? Presumably this was not through the Tihamah as it is not found, or at least has not been identified, there. It might be suggested that Sabir on the Gulf of Aden, active in the third-second millennium BC, 170km south of the source, as a possible export location. This is yet further evidence for second millennium BC activity along the Red Sea between Arabia and Egypt.

In the UK and Europe, large-scale prehistoric quarry and flint mining emerged more abruptly than was first thought (Schauer et al. 2020) and occurred simultaneously with the arrival of immigrant farmers from north-western Europe, and that long-range connections developed as colonisation rapidly expanded. The incoming populations brought with them skills for extraction and developing exchange networks. This pattern is visible for the English Neolithic Langdale hand axes (Bradley and Watson 2021) which were transported throughout the UK, Ireland and overseas to Europe. In Egypt, for example, gneiss from the quarries on the Egypt-Sudan border was being transported seven hundred miles to the Giza pyramids (Heldal et al. 2009). Long distance distribution networks in the first millennium BC Horn of Africa were also more commonplace than was once thought, with the trade in obsidian (Khalidi 2009) being an example of that.

I suggest that this is what we see in the Horn of Africa with the arrival of South Arabian migrants and their more advanced technical abilities and the simultaneous transformation of the obsidian exchange network. Given the abundance of South Arabian cultural indicators in Tigray (Benoist et al. 2020), and the growth of the obsidian trade, one has to give credence to this theory.

4.4.3 Hand axes and mining

Whilst this discussion is firmly in the realms of phenomenological theory (Bruck 2005; Tilley 1994, 1996), it is worth considering the source of the Langdale hand axes, compared to Nabro obsidian, in the 21st century. As the Langdale quarry source has become better known through the archaeological excavations and surveys of the last thirty years (Claris, Quartermaine and Wooley 1989), so the site has become the focus of collectors. These are individuals looking to find a Neolithic hand axe to add to their personal collection, or to sell on eBay for a high price. This has had a direct impact on the main Pike O' Stickle quarry source with hundreds of pieces of stone being removed from the quarry zone. At the front of the cave location, on the side of the Pike 'O Stickle scree slope, which I have visited numerous times, the ground level has been reduced by over half a metre in recent years as individuals remove significant quantities of stones and flint whilst searching for greenstone hand axes. The hand axes embody just as much value now, both economic and symbolic, as they did to those making and exchanging them in the fourth millennium BC. The Langdale site has been stripped, in recent decades, of what the Neolithic population didn't use, or discarded, mostly by the public and collectors. Due to being a popular hiking destination, there are now more Langdale hand axes in private hands, heirlooms potentially, than at any time since the source was first discovered 6000 years ago. This tells us, even in contemporary terms, about the perception and the value of unusual natural resources. Whether Nabro obsidian, or Langdale volcanic tuff, it is unique and different enough to what is familiar, so that the source, and the artefact, retain, or are even enhanced, with the passage of time.

4.4.4 Nabro mining

It is uncertain who was mining the obsidian at Nabro but we might assume that, most likely, it was local people. The nearest communities that we know of to Nabro volcano lived either in the Tigray highlands, at Wakarida (Benoist et al. 2016), perhaps on the eastern margins of the escarpment, or on the coast potentially at Beilul or Assab. Khalidi (2006) suggests that obsidian was *procured* in the coastal area of Beilul, in Eritrea, and arrived in small quantities as small pre-

prepared nodules on the shores of the Tihamah. Prior to that it must have been moved from Nabro to Beilul. The examples of obsidian in Egyptian burials in the fourth millennium BC indicates only small quantities (Zarins 1996) were being transported, or arriving, that far north. Similar amounts are known on the As-Salif peninsula (site MUN 1/Wadi Surdud) in Yemen in the fifth millennium BC (Tosi 1986). It is unknown whether these quantities reflect a limited source, or limits in the ability to extract the obsidian, or limits in the ability to transport the raw material. Oppenheimer et al. (2019) at Nabro, and Biagi in the Caucasus (Biagi et al. 2017) suggest, in this instant at least, that obsidian could be found as loose chunks, or rocks, within the margins of rhyolitic lava flows, known as obsidian flows, and could simply be collected from the ground surface. This was presumably not always the case and indeed some mining, or quarrying, may have been required to extract cores of obsidian from the lava flow presenting more of a technical challenge. It is unknown if obsidian was transported directly from the volcanic sources to sites in Tigray, to central places of distribution, for example Desi'a (Fig. 78) in the Tigray escarpment (Woldekiros 2019) and, if so, whether they were unique places specifically intended for that purpose.

It is not known why Nabro obsidian (Oppenheimer et al. 2019) is more prevalent in archaeological contexts than obsidian from Mallahle or Alid for example. Mallahle is part of the same Bidhu range, almost adjoining Nabro. Although inland and further from the coastline, Nabro is located 250km further south than Alid, or Arafali (Fig. 67). It is therefore closer to the narrowest point for crossing the Red Sea, for example from Beilul to Al-Midaman, or via the Bab el-Mendab straits (Fig. 69). This must have made a significant difference for those involved in moving the obsidian, particularly so if it was moved in bulk quantities, as will be discussed in the next chapter. But it made no difference to someone transporting the obsidian north to Adulis for example. Crossing the Red Sea further north, from Africa to Arabia, the channel is much wider, therefore a longer and more dangerous sea crossing would be involved (Facey 2004). Further excavation at Adulis (Manzo 2010; Peacock and Blue 2007) could make a significant additional contribution to this discussion, particularly if access to the earliest stratigraphic levels at the site could be reached, and a full chronology established.

4.4.5 Natural Landscapes

The manipulation of the natural environment (Pikirayi 2013) was a significant factor in the procurement of obsidian, elements of which were then perhaps perceived to be spiritual or economic, or potentially both. Being able to extract this natural resource indicated a power over the natural environment (Pikirayi 2013) which led to lives being enriched by the obsidian as a tool used in their everyday lives, or for some as an item of trade and therefore, economic value.

If Nabro was an active volcano what did the individuals obtaining the obsidian think when they looked into the caldera and saw the stormy red-hot lava-lake? What was their understanding of what they saw and how did they explain the phenomenon? Having stood at the rim of the 'Erta Ale volcano in Ethiopia (Fig. 75) I can sense that, at the very least, they would have an intuitive response to seeing the earth's molten lava churning and swirling below them. It is such a visceral experience that no explanation is really necessary in comprehending what it is that one is staring down into. Although the 2011 Nabro eruption was the first in recorded history, the Afar rift has a history of large explosive eruptions (Donavan et al. 2018) although it is unknown whether eruptions occurred during the first millennium BC. Apart from how it looked, there are the physical voluminous clouds of gases billowing from the caldera which at close proximity are overwhelming if inhaled. I have experienced this myself, and clearly more than a few seconds exposure to it is enough to heavily constrict ones breathing and respiratory system.

Even when approaching 'Erta Ale at a distance there is, as can be said of Nabro (Oppenheimer et al. 2019), and perhaps was 3000 years ago, a layer of jet-black tephra across the otherwise sandy desert. The obsidian miners would have realised that the tephra field was produced from within the volcano at an earlier time. Although the lava cools into igneous rock, its path leads directly to the rim of the volcano, so the miners would have had no doubt what had produced it. And yet, from this toxic alien environment, was produced shiny black obsidian, as exotic an artefact as any they would likely encounter. A shiny black razor-sharp reflective resource that had a practical function as a lithic tool, but also had an aesthetic element too. 'Erta Ale volcano, 120km east of Tigray, "smoking mountain" in the Afar language (Oppenheimer and Francis 1997, 1661) has erupted three times since 2005, and its southern pit, a lava lake within the caldera (Fig 64), is known as the 'Gateway to Hell' not surprisingly (Fig 75). This is the, almost perpetual, environment, which is largely the same today as it was in the first millennium BC. To use a phenomenological metaphor, we are standing in the footsteps of the Nabro miners, one of the rare occasions on which that claim can be made. It is a fact of archaeology that in remote, and perhaps difficult areas to access, that there is a sense, occasionally, phenomenologically, that we can be very close to the ancient past.

Figure 75. The "gateway to hell" at 'Erta Ale volcano. Photo, Richard Lee, 2018.

I propose that the trade in obsidian complemented the social complexity of first millennium BC Tigray, assisting in an accumulation of wealth and power, and in the creation of D'mt, the regional state or polity (Fattovich 1990; Phillipson 2009). Whilst the evidence for D'mt is slim, but accepted (Phillipson 2009), the obsidian trade would have been a contributory factor to its development. This brought foreigners into the D'mt domain who reciprocated with unusual artefacts, writing, technical ability, a Sabaean "cultural transfer" (Gerlach 2009, 259). It is difficult to overestimate, I suggest, the impact that the discovery and trade in obsidian had on the Tigray region. Whilst there was an extant obsidian trade (Ambrose 2012) it took an external partner, the Arabian visitors, to develop the procurement of obsidian, leading to an economic stimulus to the Pre-Aksumite D'mt polity.

The process of sedentarization associated with Nabro trade, as alluded to earlier, establishes routines, operational processes, which would change individuals, and perhaps the greater Tigray populations, attitude towards obsidian. This is the chaîne opératoire (Shaw 2013) process by which a sequence of events can be followed involving the technical process and social acts transpiring from its acquisition to its discard. With the procurement of obsidian from Nabro volcano we are able to follow this process step-by-step; we know where the source is, we can demonstrate archaeologically where obsidian is being moved to, and we can also see a destination where obsidian is in burials in Egypt, in ritualistic deposition in Yemen, and in utilitarian spaces within Tigray settlements.

4.5 Conclusion

As an indicator of the protracted development of obsidian studies in the region however we can still only point to five archaeological examples where the obsidian has been conclusively provenanced (Table 8). Abydos, Naqada and Hierakonpolis, ca. 3100 BC in Egypt, have a probable Arafali/Danakil source (Aston et la. 2000; Bavay et al. 2000). Al-Midaman in Yemen, and Wakarida in Tigray have Nabro sourced obsidian (Oppenheimer et al. 2019). Mersa Gawasis, the Egyptian Red Sea harbour site, has obsidian from the Yemen Dhamar-Reda region (Luccarini et al. 2020), dating to the second millennium and an example of Khalidi' et al.'s (2010) second system of obsidian trade in Yemen.

The gradual development of obsidian research (Oppenheimer et al. 2019; Khalidi 2009), combined with the newly revised Pre-Aksumite chronology (D'Andrea et al. 2018), are innovatingly reformulating Tigray with a new spatial and temporal awareness since 2000 BC. Fifth millennium BC evidence (Khalidi 2009; Zarins 1986) however, demonstrates that there is more activity than archaeological evidence has yet shown. Considering the greater regional picture encompassed by this PhD, I tentatively suggest that further obsidian provenancing would identify more Pre-Aksumite and Sabaean sites associated with Nabro volcano. It may also indicate other sources being used, broadening our knowledge of the obsidian exchange network.

Obsidian tools and source rocks yield an exceptional means to track human mobility, interaction, and exchange systems (Khalidi et al. 2018; Ambrose 2012; Khalidi 2009) and Tigray presents perhaps the best opportunity to do this. Further work is required mapping obsidian in the Horn of Africa (Phillipson 2012) providing data about sources and, specifically, trade routes. Aiming to achieve this, a significant database of obsidian geochemical analyses has now been established enabling further research to take place (Khalidi et al. 2010). The geochemical provenancing of artefacts for understanding colonisation strategies and the changing dynamics of trade and exchange (Weisler 2008) is a singularly useful tool for this in both Tigray and Tihamah. Indeed, geochemical provenancing, as demonstrated by Oppenheimer et al. (2019), is the most informative technique necessary for greater clarity of the obsidian supply networks across the Red Sea.

Whilst it has proven difficult to research and develop the Eritrean archaeological record, the glimpse of archaeology at Beilul and Assab (Fig. 76) (Fattovich 2012; Khalidi 2006), suggests that they were integral parts of the first millennium BC exchange networks. The area around Assab is surrounded by extensive salt flats, as in the Afar, hence salt, discussed in the next chapter, was one of the main items traded to Tigray although leaving little archaeological evidence.

The presence of obsidian in Egypt in the early Dynastic period (Shaw and Nicholson 2004), although minimal, raises the question of its virtual absence in Nubia which is more surprising considering its proximity. There is also the question, as I will discuss in the next chapter, of whether the obsidian reached Egypt by river, sea, or overland. If we follow the trail of obsidian along the Sudanese littoral a Red Sea route looks favourable (Bavay et al. 2000) with eventual overland access through the Egyptian Wadi Hammamat. An overland route via Mahal Teglinos and the Nile valley probably functioned from the third millennium BC onwards as the evidence that I presented in chapter two and four indicates. Whether this was a direct route from Ethiopia, or down-the-line trade, will be discussed in chapter six.

4.5.1 Movement, mobility and trade

The obsidian trail indicates networks of interaction between the coastal lowlands and highlands on both sides of the Red Sea, which shifted and intensified over millennia and present us with a region representing the twin aspects of trade and human activity in the region (Oppenheimer et al. 2019).

4.5.2 Places and Exchange

Obsidian as a driver for the emerging social complexity, as I argued in this chapter, had already been demonstrated in the Near East (Ibanez et al. 2016) and is the closest geographic parallel that can be drawn for the Horn of Africa. Renfrew et al.'s (1968) innovatory work on obsidian exchange models is now seen as insufficient to fully explain the economic and cultural model emerging in the Levant during the Neolithic and Chalcolithic (Ibanez et al. 2016). As social complexity emerged at a slower pace in the Horn of Africa, Renfrew's framework is still relevant there. At this stage of Afar obsidian research, and the locations connected with it, we are not yet at a point where definitive statements can be made about procurement and distribution. It is not clear for example if we can apply Central Place Theory to our distributive, or redistributive, practice. Christaller (1933) proposed Central Place theory in the 1930s, that in a flat landscape a central place, town, or city, will dominate a hexagonal territory with secondary centres spaced at regular intervals around it. The Danakil depression is flat with Nabro as a central place, effectively, but in other respects it does not quite fit Christaller's model. We do not know where the Central Places in the Afar or Tigray are.

Nabro is a confirmed source of obsidian in Tigray and Tihamah so all of the journeys from there are going to be, by definition, long distance. The nearest settlements are 75km east at the coastal sites of Beilul (Fig 76) or 230km to the west in the Tigray escarpment where Wakarida is located. A northern journey may have been made to the harbour of Adulis on the Gulf of Zula and perhaps further north still to the Ona culture sites. The direct journey from Nabro to Adulis is 300km and would pass very close to Arafali, or Alid, volcano although obsidian from here is not currently known at any of the sites discussed in Ethiopia or Yemen Tihamah. Analysing obsidian supply networks in Tigray during the first millennium BC, Dumitru (2020) concludes that "a decentralised network with low degrees of centralization was characterised by little variation in rank or power of individual nodes" (Dumitru 2020, 272). An absence of central place distribution, effectively, and a loose network of peer-to peer trade. This is surprising given the centrality of the volcanic source, and the opposite of Topping's findings (2022) on Native Americans and Aboriginal Australians. But perhaps, therefore, not so surprising for the gradually emerging social complexity of the late second and early first millennium BC.

4.5.3 Settlement at Nabro

Given its remote location, and the nature of the activity taking place, one would expect some form of settlement at Nabro, which may yet be archaeologically located. The primary obstacle to settlement here, beyond the challenging environment, would be a water supply, this being one of the most arid regions of the world (Fazzini et al. 2015). It is possible water could be brought in but this necessitates a long journey to begin with. It is possible that rainwater could be stored in a form of rock hewn cistern for later use, as practised at Debre Damo (Matthews 1959). The modern settlement of Sireru is located in the southern part of the Nabro caldera. Might this be the site of an ancient settlement? The establishment of a settlement at, or close to, Nabro volcano implies a "sedentarization" (Ibanez et al. 2016, 21) which establishes a very different process in how the source of obsidian is understood by those engaging and living closest to it. The resource then becomes an economic provider that, as we know, is highly valued by others in the Tigray region but also in Yemen and beyond.

Figure 76. Map showing the location of Beilul and Assab in relation to Nabro volcano and the Yemen site of Al-Midaman.

When speculating about the settlement in the Nabro region there is a recent experience that maybe indicative of practices 3000 years ago. Oppenheimer et al. (2019) noted that following the 2011 Nabro eruption most of the inhabitants of the villages Sireru, Mindig and Maebele, located on the Nabro slopes, were evacuated close to Assab (Fig. 76). A small number of people however, eventually returned to live on the lower slopes of Nabro and began using a cavern in the caldera to keep their goats in. Until, that is, a 2016 rainstorm left nearly 300 goats dead from volcanic CO_2 poisoning (Oppenheimer et al. 2019). The "risk and reward" (Oppenheimer et al. 2019) of living on the fringes of a volcano has indubitable rewards but with this occurrence we may also be witnessing a replay of historic events with ancient populations perhaps having had similar experiences. It demonstrates however that an area as challenging as Nabro can be dwelt in, albeit with difficulty, and perhaps was three thousand years ago.

4.5.4 Trade

Whilst the down-the-line model of trade is an attractive one (Renfrew et al. 1968; Gimenez et al. 2015) perhaps it is a little too convenient for the Tigray and greater Red Sea region in this case (Ibanez et al. 2016; Dumitru 209). As Ibanez et al. (2016), and Manzo (2020), have suggested, and with which I agree, a complex network model, an Afro-Arabian interchange circuit (Fattovich

2004), as discussed in chapter 2, is a better explanation for the Horn of Africa in the first, or the second millennium, BC.

The actual mechanism of obsidian exchange is unknown in Tigray, but we can look to the acculturation model (Japp et al. 2011), as I discussed in chapter two, and see the evidence for Arabian cultures leaving their imprint in Tigray (Gerlach 2009) in what was not a like-for-like exchange. What we see in Tigray I suggest, paralleling the growth in obsidian exchange is language, building skills, and artefacts, enabled by the network which allowed communities to have a more dynamic interaction than a strict down-the-line model would (Ibanez et al. 2016). Perishable commodities are also assumed to have been traded (Khalidi et al. 2015) – cloth, food, perfumes, cosmetics, oils, unguents – but leaving little or no trace in the archaeological record. This is why, here at least, the down-the-line model is a simplification of what is occurring in Tigray and does not allow for, perhaps, a more nuanced understanding, considering the broader factors in the equation. As I suggested in the previous chapter, and as cultural transfer implies, Tigray was not isolated, as Connah (2001) has suggested, but was a busy regional crossroads, which in this chapter I go some way to evidencing.

Alternatively, does a down-the-line model of exchange function within the complex exchange network? Gimenez et al. (2015) suggests that an overland terrestrial route from Tigray to the Nile valley through the Gash Delta is more likely than a sea route. The character of the trade or the exchange between, for example, Mahal Teglinos and the Ancient Ona sites in northern Eritrea consists of quite different dynamics than the trade that links Nabro volcano with Tigray. Whilst the latter exchange is taking place against a backdrop of a developing state, the Pre-Aksumite D'mt, the former is taking place against Pharaonic establishment in the Nile valley. The trade mechanisms of the Pre-Aksumite are being formulated, whilst in the Gash Delta established methods of exchange are already in place between Nile valley cultures of Nubia and Egypt. Mahal Teglinos was already well established when the Pre-Aksumite begins, bearing in mind the suggested chronology (D'Andrea et al. 2018), and possibly a part of the elusive Punt in the second millennium BC. Therefore, it would seem that the complex network model does incorporate, potentially, down-the-line trade in certain areas. This is not a one-size-fits-all paradigm however, it needs to be applied individually to the different areas of the equation.

Ibanez et al. (2016) propose that long-distance exchange of obsidian plays a role in the establishment of a complex network of interaction, which is a model that is suitable to the Nabro exchange network. Unless central place theory can be demonstrated specifically in relation to Nabro obsidian, this model is more appropriate for what was occurring in the Danakil depression. The next chapter will develop this topic and investigate the routes and journeys that were being established throughout the region as a consequence of the increasing obsidian trade. What can be categorically stated however is that archaeological sites on either side of the Red Sea, in Ethiopia and in Yemen, were both receiving obsidian from the Nabro volcano. This is one of the few facts that it is possible to establish in this network of potentialities.

4.6 Outcomes

- Nabro volcano is identified for two sources of obsidian: Wakarida in Tigray, and Al-Midaman in Yemen (Oppenheimer et al. 2019)
- Al-Midaman has the highest percentage of obsidian at the Tihamah sites (Edward Keall personal communication 29th January 2023).
- Three sites in Egypt have obsidian from the Danakil area, probably from the Arafali source (Aston, Harrell and Shaw 2000).
- Yemen's Dhamar-Reda obsidian is found in Egypt, at Mersa Gawasis (Luccarini et al. 2020), but not yet identified on the Tihamah (Khalidi et al. 2010).
- The obsidian at Beilul and Assab is indicative of route used for transporting overseas.
- Obsidian at Desi'a undated and unprovenanced but maybe pre-Aksumite (Woldekiros 2019).
- There is obsidian at 29 of 39 Gulo Makeda (ETAP) sites surveyed (D'Andrea 2005)
- Other obsidian sources are known at Arafali, Mallata, Alid volcanos, but no analysis has been undertaken yet (Zarins 1990).
- There is an African origin for all the Yemen sites documented (Khalidi 2006).
- Survey and Fieldwork is required to the east of Nabro volcano (co-ordinates: 13.312642°, 41.805398°) to locate potential ancient settlements and confirm their chronology.
- The Quantities of obsidian vary significantly at Tihamah sites.

Chapter 5

5 Routeways

5.1.1 Introduction

In the previous three chapters I established the chronology and the connections between Tigray and Tihamah, and discussed the locations where obsidian of known, or probable origin, are in Ethiopia and Eritrea, it is now necessary to investigate how the movement of this resource was occurring across the region. Although based on a set of 37 samples (Oppenheimer et al. 2019), Nabro is the only confirmed source of obsidian found at Wakarida, in Tigray, and Al-Midaman on the Yemen Tihamah. With Nabro volcano as the source, a central place, around which the trade takes place, connections are then established throughout Tigray with links to the Ancient Ona culture in Eritrea, and sites in the Nile valley. In both areas second, and a first, millennium BC chronology has been established with evidence pointing ,I suggest, towards earlier activity in the second millennium BC, a theory supported by the Pre-Aksumite chronology at Mezber, in Tigray (D'Andrea et al. 2018). In establishing which routes and journeys were being undertaken, in this chapter I will examine the evidence, archaeological, and cartographical.

In the Danakil desert today, elevated caldera floors at Nabro receive sufficient rainfall to support farming and pastoralism, although the 2011 eruptions at Nabro forced most of the inhabitants away from the area. The Danakil volcanoes dominate the topography to the Red Sea and, in the past, probably represented sacred places or supernatural realms (Oppenheimer et al 2019). This is a sacred space within a remote, distant landscape that produces a unique resource that was obtained by people for either ritual or everyday use, with increasing ubiquity. Its presence in archaeological sites, however, demonstrates that exchange networks were functioning as early as the sixth millennium BC (Khalidi 2007), whichever volcanic source in the Danakil was being used (Zarins 1990). This is an example of applying phenomenological theory (Tilley 1994) to move beyond the physical reality of the landscape and understand what Nabro volcano might have meant to those within its axis. We might be looking at a Pre-Aksumite sacred landscape, not that the landscape tells us this, but because we can imaginatively place ourselves in the footsteps of those coming here and seeing what they saw: a unique physical region producing an artefact, obsidian, directly from the earth (Pikirayi 2013). We can then propose the idea of Nabro and Yeha being part of a Sabaean pilgrimage to a sacred landscape defined by the obsidian at Nabro and the ancestry at Yeha (see p.218).

Five sites can be cited as having a confirmed provenance for their obsidian - Al-Midaman in Yemen, Wakarida in Tigray (Oppenheimer et al. 2019) and Abydos, Naqada and Hierakonpolis, in Egypt (Aston, Harrell and Shaw 2000). Whilst this is a small number of sites within those identified as having archaeological obsidian present (Fig 77), it does indicate that the expanding obsidian trade of the first millennium BC was extant at a much earlier date and already included the three main regions of this study. So whilst I speculate about which routes were in use during the first millennium BC is required, the early evidence already suggests what might be occurring.

Figure 77. Map showing the sites with obsidian provenanced to the Danakil depression. Mersa Gawasis indicates the probable sea route. Mahal Teglinos indicates an overland route to the Nile valley.

5.1.2 Egypt

The obsidian found in Egypt, 3100 BC, at Abydos, Naqada and Hierakonpolis are the earliest examples that have been conclusively sourced to the Danakil (Aston et al. 2000; Bavay et al. 2000). At this early date it is unknown, precisely, which trade routes were in use but both an overland and a sea route were possible (Fig. 77). On the cusp of the Pharaonic period Egypt's sea faring was thought (Shaw and Nicholson 2004) be by a form of small boat, as indicated on the walls of the tombs at Hierakonpolis, although whether this was a seagoing vessel or intended just for Nilotic use is not known. There are, however, numerous boats, of different types, depicted in hieroglyphic inscriptions and tomb walls in the late Egyptian Predynastic. Some of the boats are symbolic, and some more realistically practical (Ward 2000). A sea journey in a small boat would be challenging in the strong currents of the Red Sea even if sailing close to the sea-shore (Facey 2004). It is a distance of approximately 1600km from the coast of the Eritrean Danakil, close to Nabro, to Mersa Gawasis, on the Egyptian coast, followed by a land journey of 100km along the Wadi Hammamat leading to the Nile valley and further short journeys to Abydos, Naqada, and Hierakonpolis. Only small quantities of obsidian were found in the burials at these sites. This may indicate that Egypt was on the periphery of the exchange network, or that only small quantities of obsidian were being exchanged at 3100 BC. It may also suggest that the journey was an excessive one for both the resource and the distance travelled. Other resources may have been traded during these voyages but the archaeological record of 3100 BC is not always forthcoming on this matter.

I argue here that an overland route is more plausible than a Red Sea route, as discussed in the previous chapter, because there was greater opportunity for interacting with trading communities. A Red Sea coastal route was possible but this coastline is lacking archaeological evidence. 3100 BC is early for activity in Tigray, which is not to say that it was not taking place, but the archaeological evidence is does not support it. We can, however, point to trade activity in the early third millennium BC for evidence of possible trade routes. The best evidence here is at Mahal Teglinos, in the Sudanese Gash Delta, located equidistant between Nabro volcano and the nearest point of the river Nile, at Meroe. From 2700 BC onwards Mahal Teglinos (Manzo 2020) appears to have functioned as an entrepot for Egyptian trade on the Nile valley, evidenced by the presence of Egyptian ceramics (Gimenez et al. 2015), and functions as an overland gateway to the Horn of Africa. It would make sense if this interactive hub was already functioning at 3100 BC linking Nabro with Egypt and enabling its access to other resources. From Mahal Teglinos the Nile valley can be followed all the way into Egypt. Alternatively from Meroe, north of Mahal Teglinos, a direct Beyuda desert route could be taken re-connecting to the Nile in the region of Kerma (Nubian A Group 3500 -2800 BC) (Shaw and Nicholson 2004; Shinnie 1994).

5.1.3 Yemen Tihamah

1000 years later obsidian is present at Al-Midaman on the Yemen Tihamah, in the late third-early second millennium BC (Giumlia-Mair et al. 2000) with Nabro as the confirmed source (Oppenheimer et al. 2019). The distance from Nabro to Al-Midaman is much shorter, in the region of 130km, but does involved a Red Sea crossing (Bard and Fattovich 2018). Three different options were possible for this crossing (Fig. 78), one at the narrowest point between Africa and Arabia, the Bab el-Mendab straits, although archaeological evidence is not present on either coastline to indicate this. Obsidian is known at archaeological sites on the Yemen As-Salif peninsula (Wadi Surdud) at 5000 BC (Tosi 1986) although unprovenanced, however an African source is proposed (Khalidi 2009). Allowing for the obsidian that is present on the As-Salif peninsula, I suggest that it was initially moved north from Nabro. This might have been directly through the Danakil depression to the Gulf of Zula and onto the Dahlak islands and from there a direct eastern sea crossing could land at As-Salif in Yemen (Fig 78). This would be a long sea crossing, at 126km, with strong sea currents to contend with, hence a direct west to east crossing would be unlikely. An alternative would be to sail from the Dahlak to the Farasan islands, where settlement and obsidian is present in the first millennium BC (De Procé and Phillips 2010), but this is an even longer sea crossing. From the Farasan however a short crossing is possible to the mainland then travelling along the shoreline, past As-Salif and on to Al-Midaman. This journey is approximately 350km.

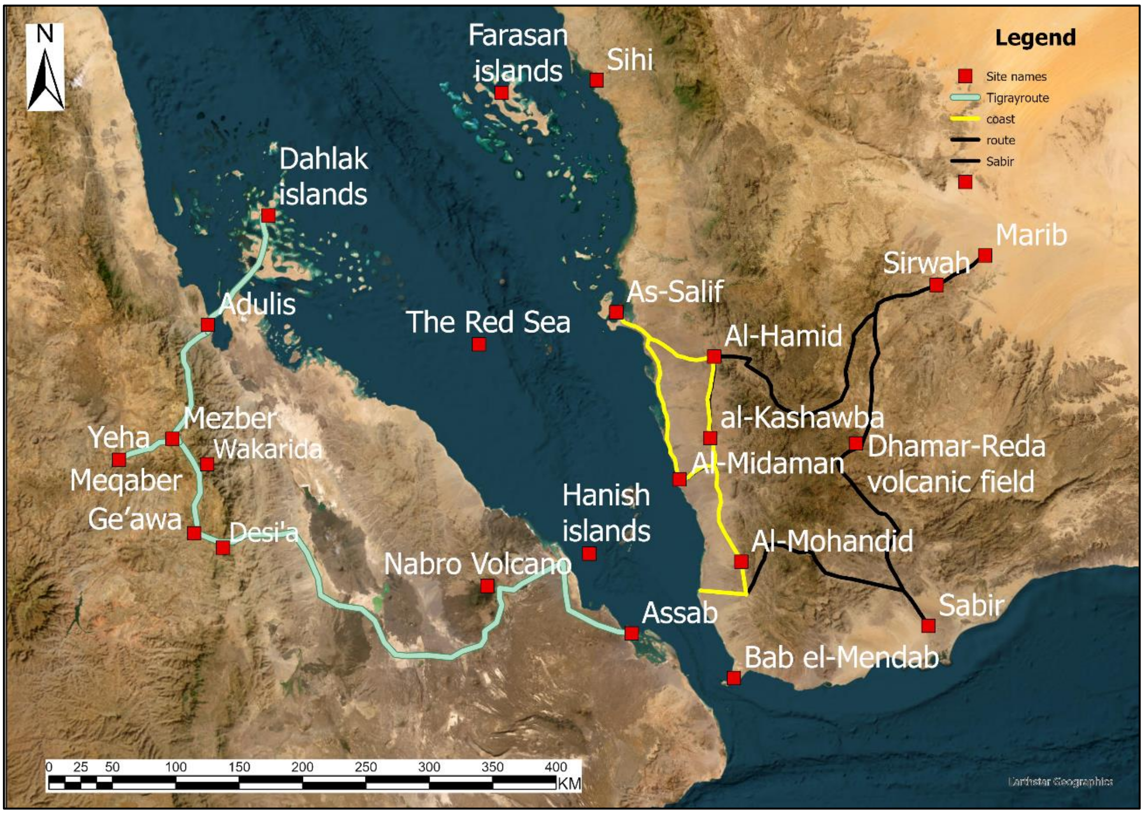


Figure 78. A map showing the routes around the region as discussed in this section.

Alternately, and perhaps more practically, I anticipate that the obsidian might be moved from Nabro 90km across the eastern Danakil to the Red Sea shore and transported across the sea to Al-Midaman (Fig 78). The full distance for this journey is ca 200km, with the sea crossing of 125km able to utilise the Hanish islands for a safer passage. Although it is undated there is obsidian at Assab and Beilul on the Red Sea coast (Fig 78), probably dating to the first millennium BC (Fattovich 2012; Khalidi 2009), and indicative of the starting point for this crossing from the African coast. The Hanish islands, politically claimed by Yemen, are a series of volcanic vents although virtually no research has taken place here, hence an obsidian source is unknown (Gass et al. 1973).

5.1.4 Tigray

The evidence from remote sensing suggests that travelling west from Nabro volcano across the Danakil depression into Tigray is a considerable challenge for anyone transporting obsidian to Pre-Aksumite settlements. Obsidian at the site of Wakarida (Oppenheimer et al. 2019) indicates that this was taking place, however obsidian at sites throughout Tigray, although unprovenanced, suggests this route remained in use. At ca. 220km this is a journey across difficult terrain that ends with an incline up the escarpment to Wakarida (Fig. 78) which is located on the Tigray side of the topographical divide. The route from Nabro is a circuitous one to the south, and then west of Nabro volcano, with two places of access on to the Tigray escarpment. A southern route traverses the natural pass in the escarpment at Desi'a (Fig. 78-79), where obsidian has been found but is undated and unprovenanced (Woldekiros 2019).

More directly, I propose a route passes the south and west of Nabro and then follows the Danakil north, parallel to the escarpment, for 60 km before then climbing west through the May Weini valley to arrive at Wakarida. Pre-Aksumite pottery styles found close to Desi'a, suggest (Woldekiros 2019) that it, and Wakarida (Benoist et al. 2020) were both routes in use (Fig. 78), although dating of the ceramics and obsidian found here would be welcome. Ceramic analysis at Wakarida indicates that it is one of the most southerly sites at which Ancient Ona pottery is found (Benoist et al. 2020) indicating contact between the two areas. It is 145km north, as the crow flies, from Wakarida to the Ancient Ona sites in Eritrea (discussed later in this chapter). Considering the presence of Ona ceramics it is all the more surprising that there is an absence of Sabaean influence at some of the *same* sites. This suggests that some sites may have been part of an exchange network that traded with sites of Ancient Ona culture but not with the Sabaeans. This, in turn, may indicate that some sites were not part of the D'mt polity (Benoist et al. 2020), which clearly, based on the evidence at Yeha, for example (Gerlach 2009), did have a relationship with the Sabaean visitors.

Despite the disparate chronologies and geographies of the sites discussed in this section, what they show in terms of early third millennium BC interconnectivity appears to presage much of what will follow in the first millennium BC. Whilst a degree of speculation is necessary in assembling the interconnectivity of the first millennium BC some of the archaeological evidence is already present both earlier and later.

Part Two

5.2 Sites with unprovenanced obsidian: Ethiopia, Eritrea and Yemen.

Figure 79. Map showing sites with unprovenanced obsidian, and volcanic sources in the region, as discussed in this chapter.

Whilst obsidian is present in archaeological contexts at first millennium BC sites in Tigray, Tihamah and Eritrea, much of it has not yet been provenanced. So whilst D'Andrea assumes the Afar-Danakil sources to be its origin (D'Andrea 2008; Zarins 1990) this is unconfirmed. So far only Nabro volcano has been confirmed as a definite source of obsidian for the sites discussed in this research. Oppenheimer et al. (2019) acknowledges that such is the similarity of the geochemical obsidian fingerprint that Nabro's volcanic partner, Mallahle, could also be a potential source, although they are almost one feature, effectively joined at the caldera. Elsewhere in the region there are known volcanic obsidian sources at Alid in the northern Danakil, Arafali (Hawakil) near the Gulf of Zula, and Ma'alalta close to the Tigray escarpment (Zarins 1990). Porc Epic**,** 500km to the south, was initially thought to be the source of the Egyptian obsidian but this is now discounted with Arafali (Bavay et al. 2000) identified as the source. In Yemen, the Dhamar-Reda volcanic field has been identified as the source of some of the obsidian found at Mersa Gawasis (1700 BC) in Egypt (Lucarini et al.2020; Khalidi et al. 2010). This is not however the source of archaeological obsidian found in the Yemen Tihamah sites as I discussed in the last chapter (Zarins 1989; Gimenez et al. 2015). So whilst this section will discuss sites with unprovenanced obsidian the five sites identified in the previous section have already established what appears to be the pattern for the routes connecting first millennium BC sites.

5.2.1 Second millennium BC

As I have presented the archaeological evidence throughout the last three chapters it has become clear that although the Pre-Aksumite is recognised as a first millennium culture there is an earlier extension of it that has now been recognised at Mezber (D'Andrea et al. 2018) extending the period by 800 years to 1600 BC. This PhD research, coeval to the new Mezber chronology, also demonstrates that there are more second millennium BC sites that that were active in regional trade, including trans-Red Sea exchanges. Obsidian is present at each of these sites which include Al-Midaman, Al-Kashawba, and Sabir in Yemen, Asa Koma in Djibouti, and Mahal Teglinos in the Gash delta which has multi-period occupation. The site of Mai Chiot, with obsidian present, part of the Ancient Ona culture in northern Eritrea, also dates to the mid-second millennium BC. The Agordat sites (Fig. 79), notably Kokan, date to the third millennium BC and connect with Mahal Teglinos (Schmidt et al. 2008b) 200km to the west, placing Agordat on the trade route that connects the Nile valley with Mahal Teglinos, the Ancient Ona culture, and Adulis, the major trade route linking the Horn of Africa with the Nile valley (Schmidt et al. 2008b). Hence the second millennium BC was indeed active.

What becomes apparent is that these sites extend the pattern already established by the sites with provenanced obsidian. Sites with unprovenanced obsidian are showing the same routes of interconnectivity because, I suggest, there is a limit to the number of routes across the challenging topography that can be taken to connect with Nabro volcano. What we lack, most significantly for this discussion, is archaeological evidence, material culture, some of form of datable artefact, actually at Nabro volcano or in the immediate vicinity. If available this would assist in confirming links with the sites discussed here which could compensate for the lack of provenanced obsidian but still affirm that connection. No archaeological fieldwork has taken place at Nabro volcano.

When transporting Nabro obsidian to sites in Pre-Aksumite Tigray the two passes through the escarpment are, evidently, the only option, based on Woldekiros fieldwork (2019) and the evidence of remote sensing.. The first is through the Desi'a pass, which then drops down into southern Tigray. A northern route then leads from the northern Danakil up through the May Weini valley in the escarpment and into the Wakarida cluster of sites, from where access to Mezber, 35km north-west, and then further north to the Ancient Ona culture is possible. The undated obsidian from excavations at Desi'a (Woldekiros 2019) could represent a first millennium BC archaeological horizon and would confirm that this route was indeed used to move between Nabro and Tigray.

In Yemen, Al-Midaman (Fig. 78) appears to be the coastal site receiving imports from Africa (Keall 1998). Sabir, Al-Midaman and Al-Kashawba all have second millennium BC archaeological evidence, with Al-Midaman specifically having obsidian provenanced from Nabro volcano. Al-Kashawba (Fig. 78) can be reached from Al-Midaman by travelling along the Wadi Zabid which extends into the central Tihamah. Exploratory excavation revealed Al-Kashawba to be a two-phase occupation with potentially major architectural features (Phillips 2006). Having travelled inland along the Wadi Zabid, a route south connects to Al-Mohandid located at the foothills of the Tihamah escarpment. Sabir, which like Al-Midaman is an important settlement at this time, is located 300km south of Al-Midaman and 25km in land from the coast. Material culture evidence here suggests that the site was a southern Red Sea entrepot receiving imports from Africa, although whether a "Sabir culture" (Vogt and Sedov 1998, 261) was as unique as its authors suggest is debatable. Whilst elements of Sabir culture are present throughout the Tihamah sites, Al-Midaman remains the most likely candidate for a coastal harbour with overland routes which could then connect to Al-Kashawba for instance. Similarly, I propose that an overland south-to-north route could have connected Sabir with Al-Mohandid, Al-Kashawba, and then Al-Midaman.

The site of Asa Koma in Djibouti (Fig. 79), almost an anomaly in this discussion due to its geographic location, has obsidian recorded there (Joussaume 1995; Khalidi 2009) and, as discussed in the Yemen chapter, has potential links with Tihamah sites. Asa Koma is considerably further south than other sites discussed here but its archaeological evidence indicates its relevance to this discussion. Assuming Nabro to be the source of the obsidian at Asa Koma (Newton et al. 2008) then a route probably extends down through the central Danakil, due-south, or alternatively follows the coastline past Assab and Beilul and round the Gulf of Tadjoura (Fig 78).

5.2.2 First millennium BC

By the time the majority of the sites dating to the first millennium BC (Fig 80) are established the routes used to connect them across the region had been in use since the second, and in some cases, the third millennium BC. The lacunae of archaeological data in the second millennium BC is indicative of the knowledge gap in this region despite the activity, at Mezber, and Mai Chiot, taking place at this time. The routes that in the second millennium BC were connecting Nabro to Tigray, Mahal Teglinos, the Nile valley, and across the Red Sea to Al-Midaman, were well established by 800 BC, as Oppenheimer et al's (2019) research indicates. What we see at this time, as I argue here, is these routes becoming entrenched as integral arteries around the region.

Figure 80. Map showing the primary first millennium BC sites in Tigray and Tihamah.

Having presented the archaeological evidence in the last three chapters, it can be seen that from Nabro, the route that leads west across the Danakil, through the Desi'a pass and into southern Tigray is extended. The new first millennium BC sites, for example Ona Adi, which are established in the region are the links in these routes. From the Desi'a pass travellers move further west to the temple at Meqaber Ge'awa. From there a major arterial route leads north, perhaps passing Wakarida, Atsibi Wemberta, and arriving in northern Tigray at Ona Adi, adjacent to the site of Mezber (Fig 78). This hub, effectively, is a junction to other prominent sites in the region. From Ona Adi a route leads west through the highlands to the temple of Yeha. From Yeha a route has already been established that connects to Mahal Teglinos 250km to the north-west, and from there with the Nile valley. From Yeha a connection is also made to Mai Adrasha a short distance west. From Ona Adi a northern route is established connecting to Matara and then further to the Ancient Ona sites of northern Eritrea. From Matara a route across the mountainous highlands extends eastwards down to the coastal plain of the Gulf of Zula to Adulis. From the Ancient Ona sites, perhaps specifically Mai Chiot, another route may have extended west to Mahal Teglinos via Agordat.

In Yemen, Al-Midaman has been used as the coastal harbour receiving obsidian, since the third millennium BC (Keall 1998). From a here a route connects 300km north to Sihi (Fig. 79), and the Farasan islands as first millennium BC evidence indicates (De Proce and Phillips 2010). From Al-Midaman a route follows the Wadi Zabid 25km inland. From there a northern route connects with the temple site of Al-Hamid, located at the foot of the Tihamah escarpment. Al-Hamid is a way station (Beeston 1995; Robin 1995; C Phillips 1997) linking the Sabaean highlands with the Red Sea coast probably at Al-Midaman.

As another anomaly, the site of Shalao, in Somaliland (Fig. 79), has to be considered due to the presence of a Sabaean inscribed grave marker (Phillips 2018; Mire 2015). Along with Asa Koma, this site potentially indicates that the trade routes of Tigray and Tihamah extended further than previously acknowledged. It might be anticipated, given its location, that Shalao connected to Asa Koma and then with the Danakil depression. Shalao is a coastal site and is located 300km directly south-east from Sabir across the Red Sea so there is potential for a direct sea crossing also. The location of Shalo and Asa Koma are an especially intriguing extension in my presentation of Pre-Aksumite-Sabaean interconnectivity, geographically beyond the normally accepted sphere for the relationship.

In summarising this section, the routes suggested for sites where obsidian can be directly provenanced, extend and embed as the first millennium BC settlements increase. The routes being used to connect the Danakil to Egypt ca 3100 BC, from Nabro to Tigray ca 850 BC, and overseas from Nabro to Al-Midaman, are established early on and remain in use for thousands of years. By the first millennium BC more sites with obsidian can be identified (chapter four) and are virtually the same routeways already in use. Hence, as populations grow and new settlements are established many of these are on, or close to, what we see in figure 76 where sites with provenanced obsidian are identified.

If, alternately, Ma'alata, Arafali or Alid were sources of obsidian (Zarins 1990) the routes used to access them would not change significantly. Ma'alata (Fig .78) is much nearer to the Desi'a pass which would then be the logical and closest route to Tigray. The Arafali or the Alid source, considering their location on the Gulf of Zula, would suggest that a Red Sea crossing to Yemen would be more likely from the Dahlak islands either directly to the As-Salif peninsula or via the Farasan islands although this would have been the longest sea crossing to make. Even if these other obsidian sources are identified in the future, the routes that I present in the maps of this chapter would not be significantly different.

The obsidian source at Porc Epic (Negash et al. 2020) would change the routes used a little in that it is 600km to the south of Mezber, therefore a longer journey would be necessary and a different route to the coast might be taken. The route would extend north-east from Porc Epic (Negash et al. 2020) potentially to Asa Koma and then connect to the coast for overseas transportation to Yemen. Alternately, overland from Porc Epic to Tigray, a route would traverse 600km potentially along the western perimeter of the Afar and into Tigray in the vicinity of Mekelle. Geographically the logical crossing to Yemen here would be via the Bab el-Mendab straits but there is no archaeological evidence on either coastline to support this route.

5.3 Hypothesised routes.

5.3.1 Travel/walking times

In assessing the hypothesies in the previous two sections, Harrower and D'Andrea's (2014) estimates of travel times, their least-cost route, is a significant benchmark to cite (Fig 81). The journey from Adulis to "the metropolis itself Axomites" (Raunig 2004, 87; Huntingford 1980) is a challenging mountainous journey, ca. 160km which can be covered in eight days, walking for 5hrs per day, a total of 41.6 hours, covering 21 km per day which, if those undertaking the journey were familiar with the topography, appears to be achievable. I am also basing this on personal experience of hiking in Cumbria, in the United Kingdom. If walking at an altitude of 3200 ft, and moving swiftly, then 25km would be a probable limit, starting at 8.00am and aiming to conclude a journey by 4:00pm. This is walking for 8 hours a day, allowing for short breaks, and carrying a small light weight rucksack with food and water. It is unknown what the quantity obsidian was, and whether this was carried with pack animals, or by individuals on foot. Moving large quantities of obsidian using pack animals would reduce the pace at which progress could be made. Conversely if the obsidian was of high value then small amounts carried by individuals would have been worthwhile journeys to make.

For comparative purposes Woldekiros (2019) suggests seven-ten days, one way, for a 76km journey on the contemporary salt trail from Atsibi Wemberta, via the Usot pass, to the Dallol salt flats, discussed further on in this chapter.

Harrower et al. (2014) suggest that most travellers did not take the least-cost route (Fig. 81) however and deviated through a less challenging exclusive highland route. This would have been beneficial as it would have been both cooler in the summer months, had greater precipitation, as well as more opportunities for trade, and security. They do not indicate travel times for this deviation but say that GIS modelling broadly supports the Periplus (Harrower et al. 2014; Huntingford 1980) description of eight days. Eight days is the same as the time suggested for the least-cost route, indicating that there is little difference between the time of the two routes regardless of which is taken. A more circuitous route with more trading opportunity therefore makes more sense. The least cost-path whilst making economic sense is not always the most logistical route to take in that it can present, as in this case, challenging highlands peaks which would slow the journey. A less direct route can be swifter, resulting in a quicker overall journey.

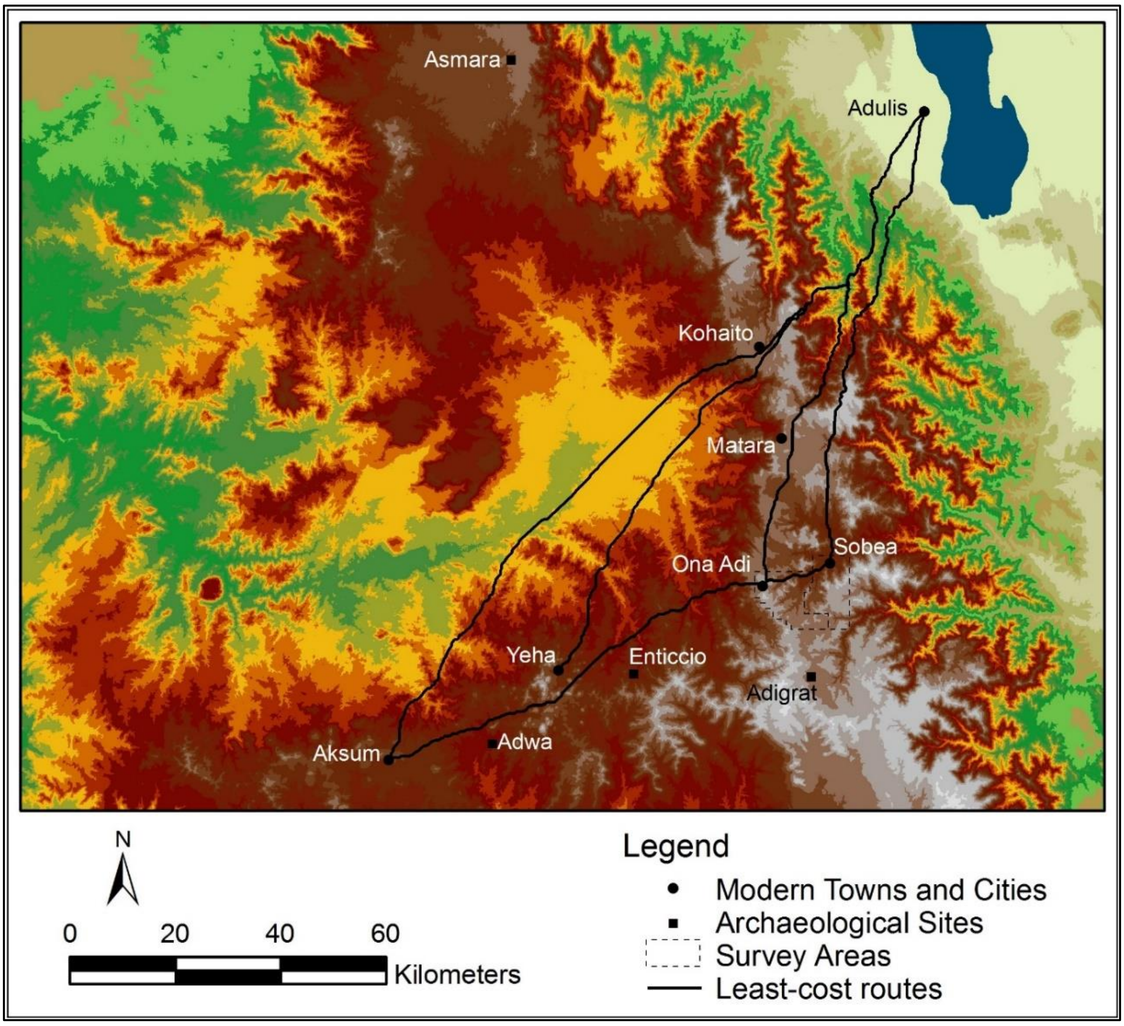


Figure 81. Least-cost path routes from Adulis to Aksum modelled with ArcGIS 9.3 software using ASTER DEM representation of topography and Tobler's Hiking Function to quantify costs of movement over terrain of differing slope (Harrower and D'Andrea 2014; D'Andrea et al. 2008)

Oppenheimer's research at Nabro found an "abundance" of obsidian lithics (Oppenhiemer et al. 2019, 4) around the volcano and within the caldera. Preliminary working was probably taking place very close to the extraction site (Biagi et al. 2017), before cores were transported elsewhere either for further knapping or to be traded onwards. Whether finds like this were possible three thousand years ago is unknown, there may have been greater quantities available then, alternately the volcano could have been exhausted millennia ago and what is visible now is of historic period procurement as we know that modern populations were living on Nabro's slopes until the 2011 eruption (Oppenheimer et al. 2019). Whilst the east side of Nabro is relatively accessible the other faces of the volcano are formidable and without easy access, hence collecting obsidian would have been a challenging task. That the worked and retouched flakes found by Oppenheimer et al. (2019) were from the surface does indicate that obsidian could be retrieved from all sides of the volcano. This might also account for the difficulty in differentiating between Nabro or Mallahle obsidian which are almost physically joined at Nabro's south-west corner. If we examine my hypothesised route from Nabro volcano to Wakarida, for example, the journey can be reconstructed using remote sensing.

5.3.2 Nabro to Wakarida/Tigray

Using Remote sensing, in this case Google Earth Pro, I suggest that the west side of the Nabro-Mallahle volcanic massif is one of the most difficult landscapes of the Danakil in which to move around. From Nabro volcano to the top of the Desi'a pass in the Tigray escarpment is the most difficult section of this journey to undertake. It is unclear where logical, or even accessible, routes around Nabro might exist, or even if there are any contemporary routes in use here. Which isn't to say that passage through this area isn't possible, it is, but not without its challenges. From the perspective of elevation, the obvious route to take is around the base of the volcanic massif nearly 30km south of the caldera. A modern settlement here indicates that the route is used across flat compacted sandy surfaces (ca. 270m asl) making for relatively swift movement. Part of the route is covered in black tephra deposits, remnants of an old lava flow, but once again it is a relatively level surface across what looks like, effectively, a rough black tarmac surface. Assuming an ancient date for this deposit then runoff from rain combined with desert winds have smoothed the surface. As one moves further south-west around the massif the tephra recedes and the route follows a former river bed. Although the distance is long and circuitous the route is relatively easy to move along. I cannot claim that a visible track or routeway is followed here but walking along the levelled riverbed would make carrying heavy loads of obsidian much easier. Gerlach (2021) has suggested that there were three moist phases during the first millennium BC, so this may have impacted the option to walk along a dried-up wadi, or alongside it. Water sources may have varied from abundant to scarce, dependent on seasonal variations.

The 2011 Nabro eruption and the subsequent lava flow to the west of Mallahle may have obliterated paths and routeways. Once again the obvious route to follow, using remote sensing, is the aforementioned dried up river bed (elevation -15m below sea level) with a rugged, if level, surface. This route is bordered by an extinct, or at least inactive, volcano and a rocky outcrop called Barowli (430m asl). These two landmarks can be passed round to the east or to the west, as either choice passes across flat low-lying landscapes. The elevation in this region of the Danakil is frequently below sea level and is one of the lowest places on earth (Fazzini et al. 2015).

To the north of Barowli a route can be taken west along the shore of Giolieti lake (-112m bsl) and the Alaita lava field before passing the south-west corner of Erta Ale volcano. From here the topography is no longer the volcanic region that has just been passed through but is not yet the mountainous escarpment leading up to the Tigray highlands. This is an undulating landscape through which numerous pathways, usually dried up river beds, can be followed. The route taken here leads to the Desi'a pass (Fig. 84) which has been in long term use as the most accessible route through the escarpment connecting the Danakil to Tigray (Woldekiros 2019). The final 30km of the journey towards the Desi'a pass is a challenging route ascending from ca. 800m to 2400m. The journey from the south-east of the Mallahle-Nabro massif would be one of the most difficult sections requiring experienced travellers with knowledge of the route to successfully complete it. The benefit of such a challenging landscape is that there are plenty of characteristic landmarks, signature landscapes (Wilkinson 2005), familiar to those making this journey regularly. The estimated travelling time from Nabro to Desi'a would take fourteen days over ca.250km of circuitous undulating ground conditions with a final sharp ascent up the escarpment.

Were the same individuals undertaking this journey all the way from Nabro to the Temple of Yeha ? Given the length of this journey, ca 500km, a suggestion of down-the-line trade is probable. Research from the contemporary salt trail (Woldekiros 2019) to be discussed later in this chapter, indicates long distances were being undertaken. But these are not in the magnitude of 500km suggesting a down-the-line model is a better fit for the longer distance from Nabro to Yeha. If so, I speculate that Desi'a, perhaps Meqaber Ge'awa, perhaps even Wakarida were staging posts along this route (Fig. 79).

When obsidian was being moved from Nabro to Tigray a more northerly route could have been taken. From the Barowli outcrop the dry riverbed to its east can be followed further north for 150km which is a significant distance but presents a journey across relatively level compacted sand and riverbed gravels. This easier route then has the option of crossing through the Lake Assale area and moving due west through a former riverbed channel. This circuitous route leads west towards the foothills of the escarpment, where a gradual ascent climbs from ca.500m up to 2400m at the site of Wakarida. The final 70km journey to Wakarida is a challenging one that winds through the mountainous escarpment, along a former well defined river channel until the top is reached (2400m). Alternatively, there is a short direct high-level narrow ridge route leading directly up to Wakarida. If movement of obsidian or other heavy resources was involved the former longer route would have been a better choice. The location of the sites suggests that the May Weini valley is the logical route between the Danakil and the Wakarida site cluster. There are no easy routes through the escarpment, whether at Desi'a, Wakarida or Atsibi, all are challenging, but one of them has to be taken in order to reach the Tigray highlands.

Availability of fresh water along the route might have been through runoff from the escarpment which would have pooled in the fissured and rocky surfaces dominating this area. Indeed, as trade and movement through this region became more frequent, cisterns may have been built, natural features enhanced, ceramic pots used, in which rain water and run-off could collect. Whether this was sufficient to last throughout the dry season would be dependent on the level of rainfall and the amount of usage. Woldekiros salt trail research (2019) (Fig. 82) presents a modern parallel for this journey with the salt trail only able to function efficiently due to the participation of stakeholders along the route providing water and supplies.

As with the least-cost route between Adulis and Aksum (Harrower and D'Andrea 2014), this is also a topographically challenging one. The route from Nabro to Desi'a, and Wakarida, viewed in remote sensing is not necessarily a least-cost route but may be the only route it was possible to take. Had the rainy season being especially abundant it would have had the twin impact of providing more water for the travellers but also turning the wadi's into flowing rivers and complicating movement across or around them.

5.3.3 The Arabian incense trail.

5.4 At the same time as journeys centred on Nabro volcano were being undertaken in Africa, in Arabia during the first millennium BC the incense trail was expanding across the region (Singer 2007). As discussed in chapter four the incense trail (Groom 1981), from the third millennium BC onwards extended throughout Arabia. Whilst originating at Mukalla in the Yemen Hadramout region (Huntingford 1980) the trail led west connecting with the Hejaz, and Sinai peninsula. With the increased use of incense and other products, the Genebtiu (Creasman and Yamamoto 2019) were delivering myrrh and other products associated with Punt to Egypt during Thutmose III reign (1479 – 1425 BC). It is unclear if these visitors, these tradesmen, were Arabian or Puntites, or perhaps both, as the latter appears to incorporate the former. In terms of distance travelled, the routes of the ancient incense trade indicate that the distances and journeys that I suggest for the obsidian trade were both possible and achievable. The incense trail was moving across much longer distances although these were desert landscapes rather than volcanic or mountainous landscapes, but travel times were probably similar. The main difference between the two is that there was probably greater infrastructure in place for the incense trail as it moved across Arabia, Mesopotamia, Egypt, and south along the coast to Somaliland (Groom 1981; Peacock and Williams 2007). Modern salt, ancient obsidian

In this section I introduce data from the contemporary salt trade (Woldekiros 2019) as a comparison for what might be expected of the ancient obsidian trade routes in the Danakil region. Deposits of rock salt dominate the Yemen As-Salif peninsula which extends into the Red Sea directly north from Al-Midaman, providing a local salt resource (Breton 2021). It is unlikely therefore that the Tihamah populations would need to export salt from the Danakil in exchange for obsidian.

Figure 82. A Danakil lowland trail inside a dry river bed. Photo, Dr, Helina Woldekiros (2014).

If obsidian research is in its infancy, then investigations into the Danakil salt resourcing is at an even earlier stage (Woldekiros 2019). Perhaps not surprisingly, given its character, the practice of the salt trade remains unchanged (D'Andrea 2005, 63). Woldekiros research (2019) into the contemporary salt trade may be a model for how the ancient obsidian trade also functioned. At the very least both are crossing the same landscape regardless of whatever the commodity is. Lake Assale is the major source of salt in the northern Danakil Depression with ancient caravan routes trading there from the 5th century CE (Woldekiros 2019). The salt trail links highland and lowland routes with the least cost paths being followed on the highland part of the journey as it is easier for pack animals and provides good water sources. The route (Fig. 81-82) covers 160km from the Tigray highlands to the Afar with 70,000 animals, carrying 10,000 to 20,000 tons of salt, making the journey annually (Woldekiros 2019, 96) with seasonal movement necessary to avoid the danger of flash floods.

Data from 19th century military use indicates that maximum loads of between 120-220kg per camel was possible covering 32-40km per day for extended periods (Sidebotham 2011). This gives a good estimation of the distances that could be traversed in the first millennium BC.

The domestication of the camel and beginning of camel caravans is uncertain, suggested to be either the second millennium BC (Maraqten 1996) with caravans of camels, donkeys, mules and horses used for trade, or the first millennium BC (Sauer at al. 1988). Surprisingly, definite evidence of when the Arabian camel was first domesticated is still unconfirmed (Uupermann 2002). Wild dromedaries have been present in Arabia since the 5th millennium BC but there is no evidence for them in large numbers. Camels in the Horn of Africa are said to have originated in Arabia transferring to Africa either via the Sinai or from the Gulf of Aden (Almathen et al. 2016). Camel numbers may have increased by the early first millennium BC but the obsidian interchange circuit itself may not have been functioning at such an operational level at this time that it could accommodate that level of trade (70,000 animals). If it were, we might expect to find greater quantities of obsidian at archaeological sites. Donkeys may have been more populous and therefore the pack animal of choice in the early first millennium BC but, but not in the numbers used in of the contemporary salt trail (Woldekiros 2019). The quantity of obsidian being transported does not seem to be of that magnitude (Table 9). It is unknown how much, or what weight, of obsidian was being moved at one time. It cannot be said, for example, that all 5000 pieces of obsidian at Al-Midaman (Keall 2000) were being transported at once. That would seem unlikely, and as Khalidi (2006) suggests, it appears that only small cores or block were being transported at any one time which would not need large numbers of pack animals.

Woldekiros (2019) identifies three major routes (Fig. 83) from the Tigray highlands that the salt caravaners take to the lowlands at Dallol: The Desi'a route (Red) (Fig. 84) used by those from central and southern Tigray linking Mekelle with Desi'a and Berhaile; the Usot route (black) for those travelling form Atsibi Wemberta at the top of the escarpment and passing through Berhaile, and the Shiket route (yellow), which is the most southernly option available, through Berhaile, very flat and favourable for camel caravans although it is known for its high temperatures. As can be seen from each of these routes (Fig 82) the village of Berhaile, as the central place for salt distribution, and Desi'a, are the nodes on which movement in this area hinges. Given its location this suggests that Berhaile may also have been a central place for the distribution of obsidian, although here it was undated and unprovenanced (Woldekiros 2019). This indicates that the route from Atsibi through the escarpment, the Usot pass, was indeed being used as I argue, contra Benoist (2020).

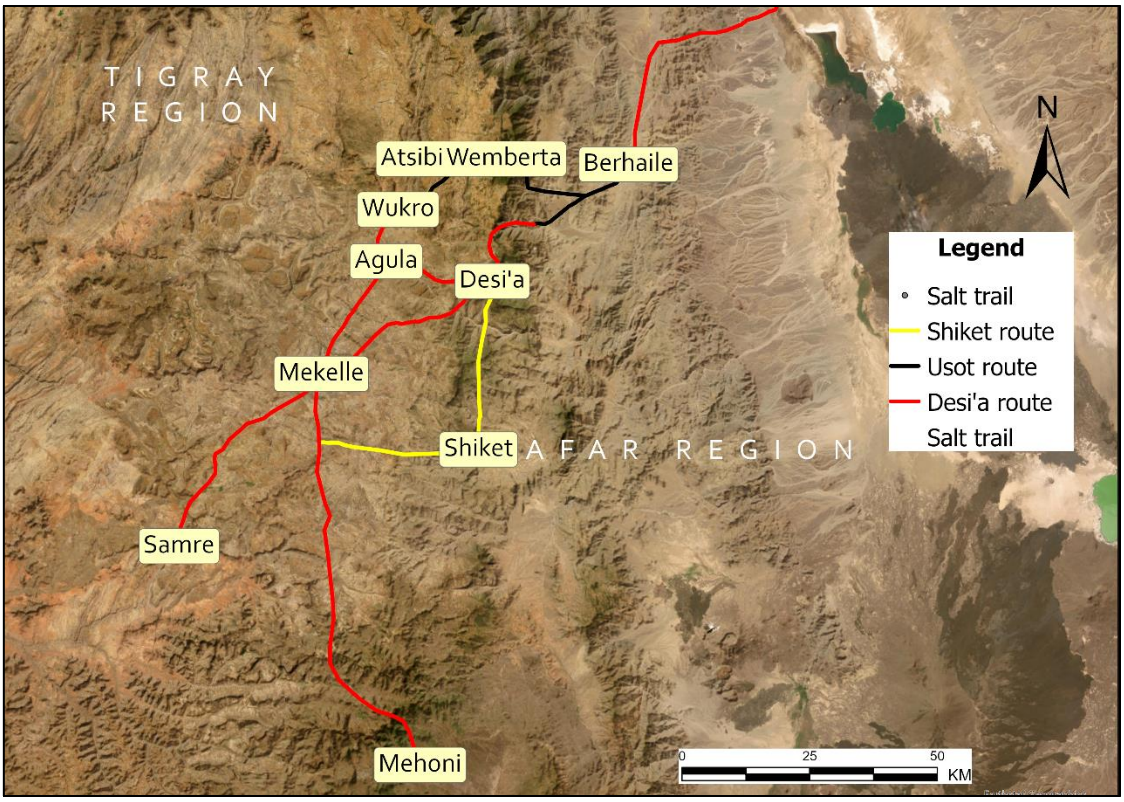


Figure 83. The major caravan routes on the Afar salt trail in Tigray, based on Woldekiros (2019).

Woldekiros (2019) demonstrated that most highland caravaners take fourteen to fifteen days to travel from their home to the salt flats, but it can take seven to ten days to traverse each way. Highland caravaners, all male, make an average of 14 trips per year to the salt flat (Fig. 83). The local trade involves a range of stakeholders participating in the salt trade: caravanners, warehouse owners, shop owners, water sack makers, coffee/tea vendors, residents, and salt producers. Lowlanders makes more trips than highlanders, 38-54 trips per year, as their proximity to the salt flats make this possible. Both the Afar and Tigray caravaners participate in the salt trade when there is no highland farming or lowland seasonal mobility, stopping during the rainy season (June-Sept). The temperature here is a constantly challenging 60^{o}C in summer and 50ºC in the winter rainy season (Bonatti et al. 1971). In winter a full day of travel is typically 20 km; however, the overnight campsites are not evenly dispersed along the route meaning the daily distance was variable.

The time to travel from Atsibi Wemberta to the salt flats at Dallol is between seven to ten days over 126km (Woldekiros 2019). This is significantly longer than the travel times suggested by Harrower and D'Andrea (2014) for the Tigray region for similar distances. We can allow that this is due to the salt routes relying on the slow movement of pack animals, plus the heavy weight of blocks of salt, although 20km per day is still suggested (Woldekiros 2019). It may be that

Harrower and D'Andrea's (2014) estimate is quite conversative, and that travelling without pack animals is most likely going to be quicker, but conversely some of the distances traversed, such as the Tigray highlands, were demanding routes for those on foot. The timing for the journeys will be reliant on the resource being carried, and whether that involved pack animals.

Woldekiros (2019) GPS points taken along the present-day caravan route confirm that modern caravaners take the least cost route from the highlands to the lowland salt flat, based on slope steepness and water sources in the highland route, although the last 7km is across an uneven wet sandy plain. I argue that, in analysing the results from the Tigray and Afar regions, most of the modern, and ancient, footpaths are similar to the least-cost paths generated by GIS modelling (Woldekiros 2019; Harrower et al. 2014). These paths pass through the Pre-Aksumite, Aksumite, and Medieval sites and towns (Woldekiros 2019) of Wekro, Quwiha, Atsibi, Agula, and Desi'a, suggesting that the towns might have been originally established as a result of the first millennium BC Pre-Aksumite obsidian trade. There are few alternative lowlands routes available, as it would have been for the ancient routes, as water sources are limited. This indicates, I suggest, that Desi'a is an important long-term settlement, and probably gradually developed overtime as an accessible transition zone (Fig. 84) between the highland and low desert.

Woldekiros (2019) excavated two ancient caravan campsites, Meda Ble'at at the town of Agula, and Ona Adi Abobay, at Desi'a. Lithics and ceramics were recovered from both sites, with obsidian present at Desi'a although the quantities are not stated (Woldekiros 2019). The site of Agula, equally important, is where the route from Desi'a (Fig. 85) arrives in southern Tigray close to the Meqaber Ge'awa temple. So, there is an archaeological presence at two of the contemporary sites that I suggest for first millennium BC routeways, and Woldekiros (2019) identifies potential Pre-Aksumite ceramics in the assemblages. The salt trail research reflects, to some degree, how the first millennium BC trade in obsidian might have occurred when considering the logistics required to carry out its extraction, trade, and movement.

Figure 84. Travelling west out of the Danakil depression up to the Tigray escapement, along the Desi'a pass, the modern and ancient route, towards Meqaber Ge'awa. Photo, Richard Lee, 2018.

5.5 Historical routes

The Tigray region of northeast Ethiopia has evidence of ancient activity extending back 3000 years, at least, with regional interconnectivity to Egypt (Bavay et al. 2000), Nubia, (J Philips 1997), and Southern Arabia (Tosi 1985, 1986) . The earliest historic sources referring to Ethiopia are by classical writers, with Pliny the Younger who mentions the Red Sea port of Adulis, ca 77AD (Munro-Hay 1991). The primary source for travel in the region is the *Periplus of the Erythraean Sea* (Huntingford 1980). The information presented there indicates that ports on both sides of the Red Sea, and the Gulf of Aden, were in close commercial contact (Fig. 85). It describes the ports on the Arabian Tihama side as being Muza (north of modern Mocha), Okalis, and Hays. The ports on the African side were named as Adulis, Avalites (modern Zayla) and Malao, or Berbera (Huntingford 1980). The coastal Tihama ports are slightly to the south of Al-Midaman, with Mocha still in existence in 2023 but no longer a major trade centre. The shortest distance across the Red Sea was said to be from Avalites “easily reached from across the sea in rafts and small boats” (Huntingford 1980, 23) although this was reliant on the vagaries of the strong currents and seasonal tides (Facey 2004). Similar trade continued for the next 500 years as evidenced in another Graeco-Egyptian work, the Christian Topography of Kosmos Indicopleustes (McCrindle

1897; Munro-Hay 1982), with the Red Sea able to "be crossed in a couple of days" (Pankhurst 2004, 20). A modern day direct-crossing is said to take seven hours (Khalidi 2006, 311), although direct crossing is rare as island trade is usually involved. A modern boat with a motor could make the crossing in 8 hours at an average speed of 13 knots (https://www.searates.com/services/distances-time/). Modern human traffic smugglers now make this journey on a regular, possibly daily, basis in quicker times with outboard motors on dinghy's.

Documentary records are extremely rare until accounts by 19th-century European explorers (Bent 1893; James 1867; Crawford 1958). What these travellers contribute is a series of maps illustrating the routes that were in use in the region. The Bent and James routes of the 1800s reflect the location of Pre-Aksumite archaeological sites, suggesting that the interconnectivity in this region has not changed significantly in 3000 years, as I demonstrate in this, and chapter 6. Crawford (1949) (Fig 85) suggests that a long-distance route from Adulis to Aksum, via Matara, passed the Debre Damo monastery leading to Yeha, although the site is not shown on the map. The site of Beta Semati, to the north of Yeha, is a location that this route might have passed through although the site dates primarily to the Aksumite period (Harrower et al. 2020). The modern road junction to Debre Damo monastery is at Bizet on the A2 road and given its location may have been the junction, or crossroads, on this route to Yeha. The total distance using the Adulis-Aksum route is 175km which corresponds with both Harrower and D'Andrea (2014), and the *Periplus* estimate, of eight days travel (Huntingford 1980).

Crawford's mapping (1958) (Fig 85) recorded the tradition of an ancient pilgrimage route from Aksum to Jerusalem passing, or perhaps starting from, the monastery, and first appearing on a Florentine map of 1454. Whether there is any truth to this or not, a suggestion that links Debre Damo to Jerusalem is an almost inevitable claim for Ethiopia's early Christianity. Debre Damo may indeed be one of, if not the, oldest Christian site in Ethiopia considering that tradition has Christianity arriving in Ethiopia from Syria-Palestine, via Egypt and Nubia, in the fourth century AD (Finneran 2007).

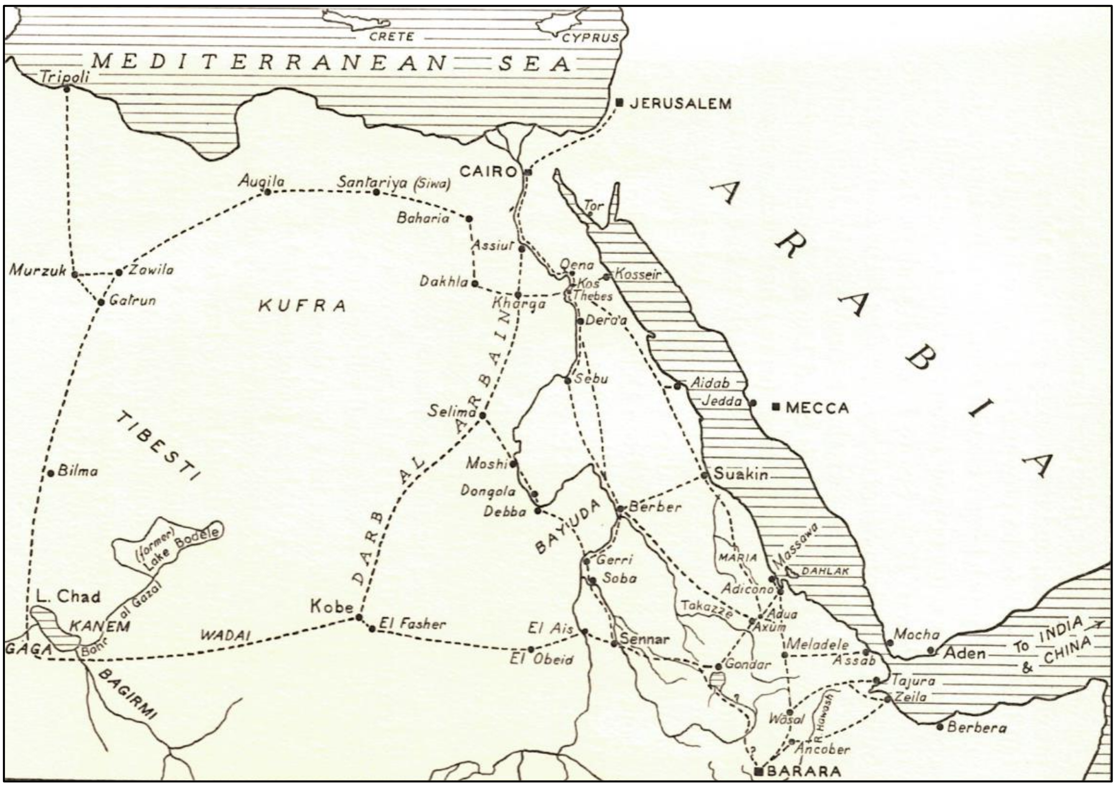


Figure 85. Crawford's map of trade routes (1958).

The first time that the Kerseber valley, initially selected as the research area for this PhD, close to Mezber and Ona Adi**,** is documented is on a Ptolemy Atlas (Fig 86) called the Egytpus Novel map 1454 (Crawford 1949). This map shows the name Debre Damo, to the west of the Kerseber valley, south of the Mareb river. Crawford (1949) considered the map to be a good approximation of Abyssinia at the time and more accurate than some later versions. Interestingly the map does not indicate the location of Yeha, which clearly existed, but does appear to show the trade routes to the east and west of Damo. The western route would have linked directly to Yeha further south. The Italian cartographer Fra Mauro produced a contemporary world map, of 1459, (Crawford 1949) however this shows nothing for the region of Tigray other than the name Hacsum, presumably Aksum, and a trade route, the so-called Great Ridgeway, leading northwards passed Debre Damo were it to be shown on the map.

Theodore Bent (1893) working with the Royal Geographical Society, produced a map of ancient trade routes (Fig 86) which indicates a route from Yeha to Adulis, crossing at the location of Debre Damo, and converging north towards Adulis. Bent (1893) suggests that from Adulis north the, predominantly, ridge-route, diverted inland to Meroe on the Nubian Nile. Both routes from Yeha are shown connecting with Qohaito**,** equidistant between Yeha and Adulis, and although Bent (1893) makes no mention of it I expect that an ancient route also extended to Asmara, the location of the Ancient Ona sites, and Kassala in the Gash Delta. In fact, logistically it would be more practical for a northern route to the Nile to begin at Qohaito rather than traversing further east to Adulis, because the route west from here is more direct than first travelling east to coastal Adulis and then returning westwards.

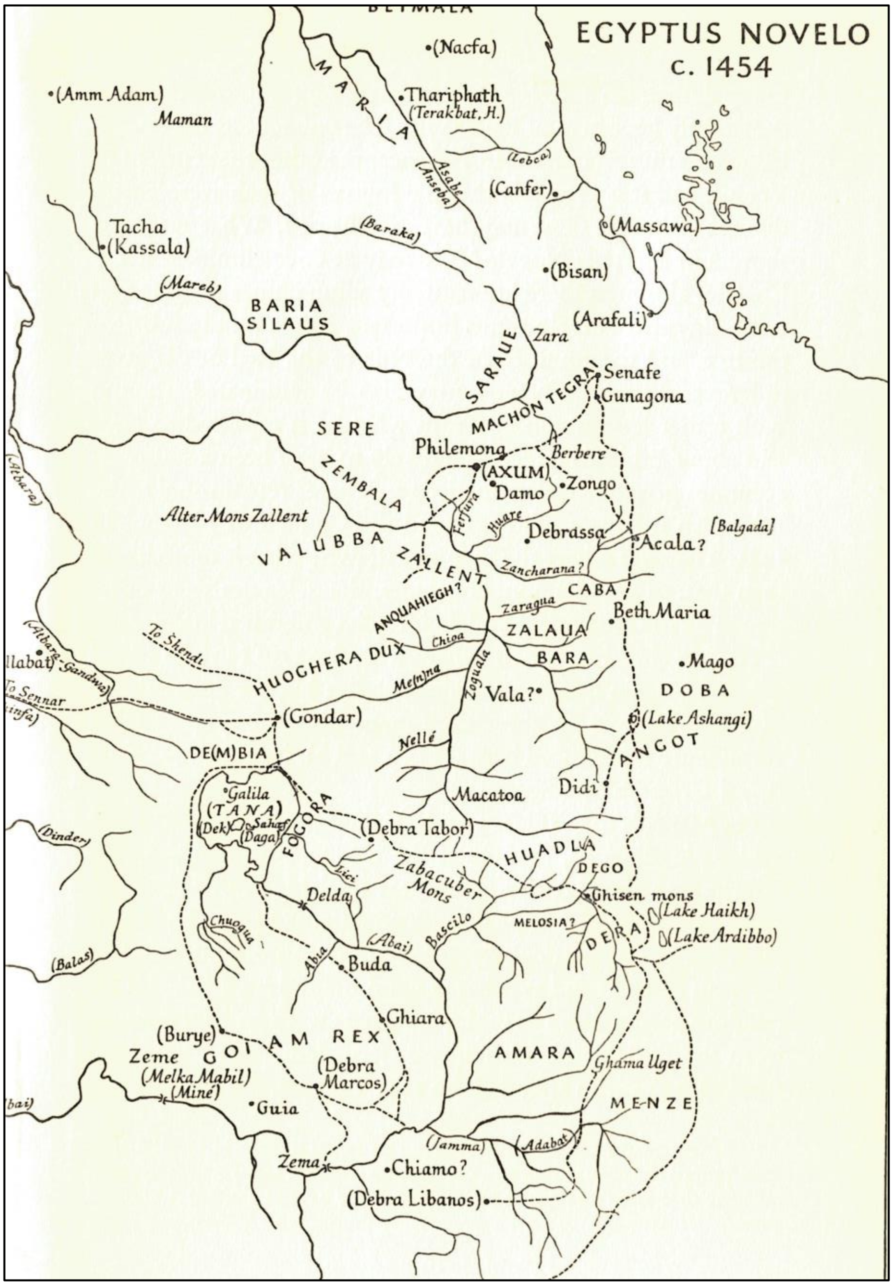


Figure 86. The Egytpus Novelo map ca 1454 (Crawford 1949) showing the location of Debre Damo monastery to the west of Kerseber valley, but without any indication of Yeha temple.

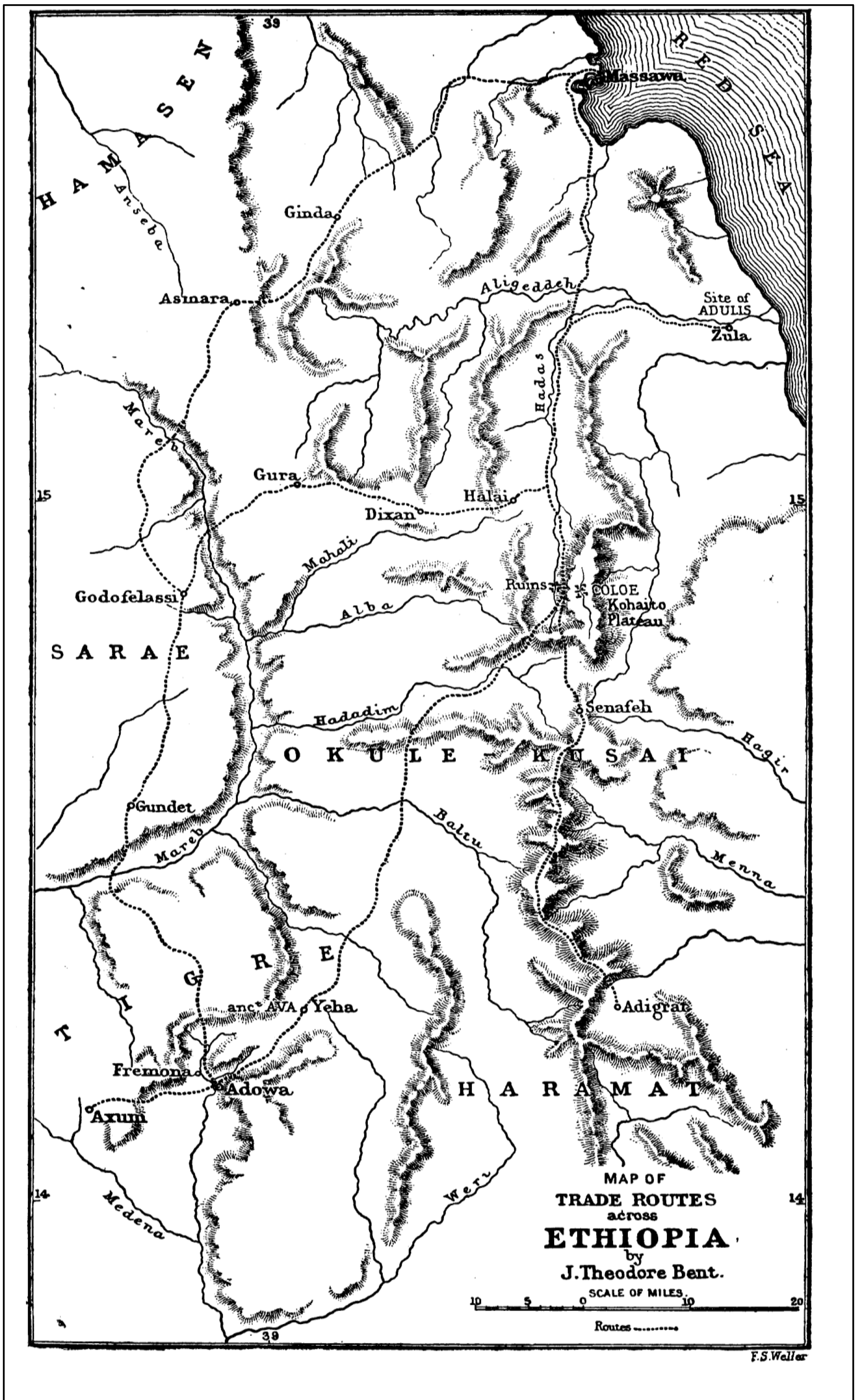


Figure 87. Theodore Bent's map of Ancient Ethiopian trade routes as discussed throughout this chapter (Bent 1893). The modern road now follows his ridge-route north from Adigrat to Matara (Senafe). The Yeha to Adulis route prefigures Harrower's (2014) least-cost route.

A particularly useful historical source of old routes is O.G.S**.** Crawford's 1958 volume which outlines the Ethiopian Itineraries of Italian traveller Alessandro Zorzi (Conti Rossini 1943). This summarises the Zorzi Itineraries with illustrated maps accompanied by detailed description of the journeys being especially useful in reconstructing known routes of trade as they were in the 15th century. Englishman and early traveller Henry Salt also made two exploratory expeditions in to Abyssinia in 1805 and 1809 including the northern Danakil and Gulf of Zula (Salt 1814).

My hypothesised routes, as suggested in this chapter (Fig. 88), are very similar to the historical sources. The historical sources do not have the detail which can be suggested by the archaeological research of the last sixty years but their broad definition reflects those outcomes. Although there is no mention of the Danakil depression, or the Afar generally, Bent's map (1893) compares with the routes suggested by Harrower and D'Andrea (2014) (Fig. 80). The regional picture that historical sources present appears to be the same one along which Pre-Aksumite sites of the first and second millennium BC are located, and trade took place.

Landscapes, particularly in this challenging region, are a composite of settlement, agriculture, existence, survival, and movement. Some parts of these landscapes would be intimately familiar to those who lived in them whilst other parts would be challenging, potentially threatening, and unfamiliar to many. Having taken into account ancient and historical routes (Fig .87) throughout the region it is congruent on this Phd research to effectively map these routes onto the modern landscape.

This map (Fig 87) showing the routes used across millennia indicates that most of the journeys made are using the same parts of the landscape. This is what my research in the preceding chapters has indicated, but overlaying all the routes in one map (Fig 88) supports this projection. This is what I would expect, when considering the challenging landscape to be moved both through and across.

5.6 Ancient and modern discussion

Figure 88. A map showing the routes used throughout Tigray across millennia. The orange route is that suggested for three thousand years ago. the maroon route is the modern tarmac road; green is the salt trail; yellow the least-cost route; blue Bent's 1893 map.

Creating the maps that I present in this, and the next chapter, illustrates better than words the proposal that I make. Ignoring the geopolitical boundaries of the area (Fig. 88), a modern road (maroon) starts in Asmara, the Eritrea capital, which extends east to Massawa and then follows the coastline south along the Red Sea coast of the Danakil depression. It then passes through the hamlets of Beilul and Assab and arrives at the Gulf of Tadjoura in Djibouti, and potentially on to Asa Koma.

From Asmara the modern A2 tarmac road stretches south past Qohaito and Matara, the (maroon) route (Fig. 87) then crosses the Eritrea-Ethiopia border into Tigray, becomes the B20 road which winds past Ona Adi, the top of the Kerseber Ridge, then continues south past Adigrat, 100km south to Mekelle with the nearby sites of Wakarida to the east, and Meqaber Ge'awa to the west. From Mekelle the road east then passes through Desi'a before descending to the floor of the Danakil depression where one road branch leads north to the salt flats at Dallol, and another branches south past the Barowli outcrop and through the Danakil towards different hamlets in the south, including Asa Koma.

From Adigrat (near Kerseber), a circuitous tarmac road leads west through the rugged Tigray highlands skirting steep sided valleys and hairpin bends, eventually passing Yeha temple and continuing further to Aksum. Between Aksum and Yeha a tarmac road branches north and can be followed 200km to Mahal Teglinos at Kassala in the Gash Delta.

From the Ona Adi area the modern (maroon) route passes through Enticcio and Bizet towards Yeha and beyond to Aksum. Alternatively the ancient (orange) route from Ona Adi passed through the Kerseber valley, passed Debre Damo monastery and across the lower hills of the west highlands.

In the south, the Desi'a pass (Fig. 88) is a hub for moving into the Danakil, and probably has been for hundreds if not thousands of years, as both the ancient and modern routes (maroon, orange), pass through the escarpment. From the bottom of the Danakil a (green) route leads north (Fig. 88) to Dallol where salt is now extracted. To the south the (orange) route leads passed Nabro volcano before connecting to coastal Assab, the crossing point for Yemen both three thousand years ago and more recently as shown on Crawford's 1958 map (Fig. 85). The modern salt route (green) also passes north from Dallol through the escarpment to Atsibi Wemberta on the edge of Tigray.

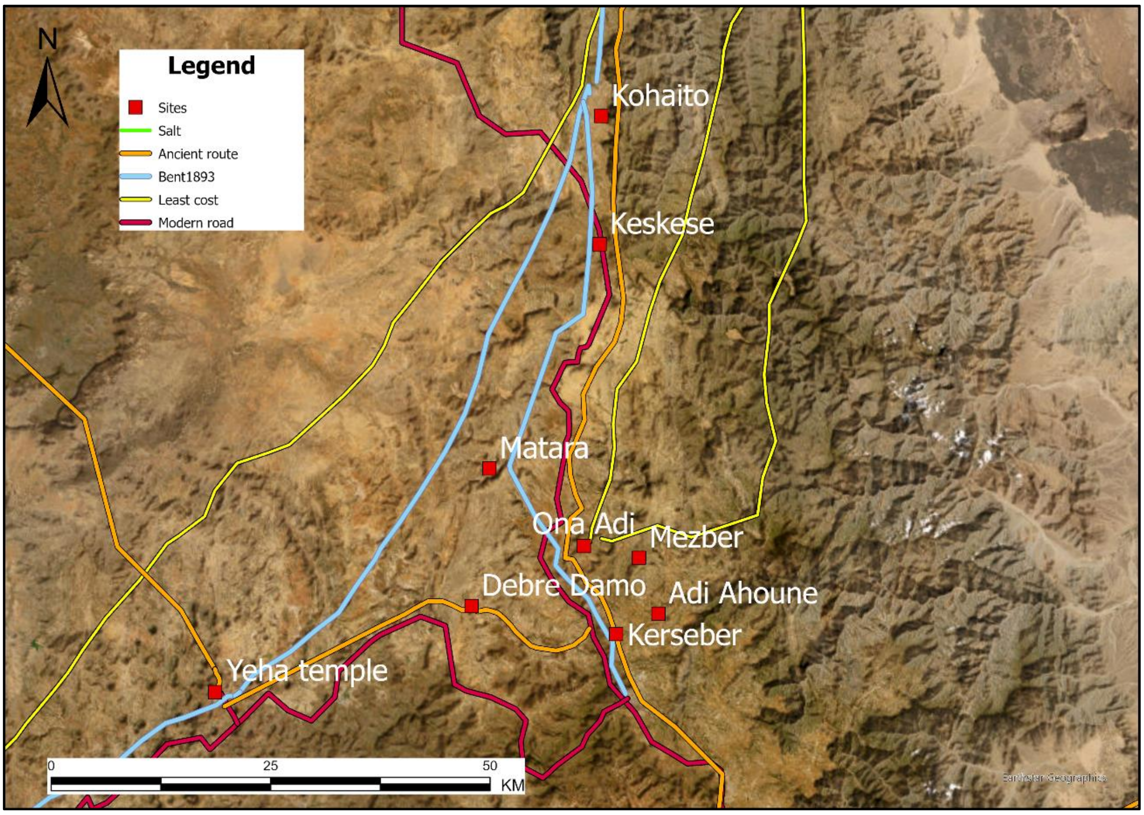


Figure 89. A close-up of the Tigray highlands routes running through it for, in some cases the last three thousand years.

The least cost (blue) route from Adulis to Yeha (Fig. 88, Fig. 89) is a direct but, as Harrower and Andrea (2014) suggest, a more circuitous route, via Ona Adi, was more popular because of further trade availability. Overland (maroon) routes extended along the Red Sea coast from Adulis and onwards to Egypt. An overland (orange) route began at Yeha, possibly even Ona Adi, and connected with Mahal Teglinos, active since the third millennium BC as the entrepot for the Nile valley. The modern (maroon) roads therefore follow the archaeological sites of the first, second and third millennium BC (Fig 89). As Bent (1893) says, even in the 1800s he was travelling along ancient routes, and the modern roads of the 21st century present tarmac surfaces linking, very presciently, to the same locations. Were the obsidian traders of three thousand years ago to make the same journeys today they would be passing along almost exactly the same landscapes, albeit on much better road surfaces, but the landscape would be familiar to them.

5.7 Summary:

The specific provenancing of obsidian at the sites of Wakarida, Al-Midaman (Oppenheimer et al. 2019) and the three Egyptian sites (Bavay et al. 2000), establishes Nabro, and the Danakil's, regional connections since 3000 BC. Following the confirmation of Nabro obsidian at those sites, I propose that we also see an early indicator of what routes the obsidian was being transported along. From Nabro volcano the route into Tigray ascends from the Danakil through the Desi'a pass and down into southern Tigray. From there it leads north, and perhaps in the Kerseber valley-Mezber region, it branches west and a route can be followed 200km to Mahal Teglinos, the entrepot between the Nile valley and Tigray. From here the Nubian site of Meroe is the logical route directly into the Nile valley to Abydos, Naqada and Hierakonpolis. An alternative scenario is a Red Sea journey which would start from Nabro, follow the Danakil desert for 90km to the Red Sea coastline where the obsidian is shipped north to Mersa Gawasis (Fig. 77) and then inland to the Nile valley.

Travelling east from Nabro, the desert track connects with the Red Sea coast where the obsidian is shipped overseas to Yemen. Two routes are possible here (Fig. 88), a journey north to Adulis (Gulf of Zula) and the Dahlak islands where a sea crossing is made either to the Farasan islands and onto the Tihamah or, more directly, across to the As-Salif peninsula. By the second millennium BC a direct sea crossing from the Danakil depression to Al-Midaman is more probable as indicated by the dating of the site there. At this time Sabir, 350km south, is also a major trading partner with Red Sea shipping and with potential connections across the Gulf of Aden to either, or both, Asa Koma and Shalao.

The increasing number of sites with unprovenanced obsidian throughout the second and first millennium BC establish themselves along the routes already functioning as a consequence of the connections to Al-Midaman, Wakarida, and the Nile valley. Although geochemical analysis has not confirmed the provenance, the obsidian at many of these sites is assumed (Oppenheimer et al 2019; Bavay et al. 2020; Gimenez et al. 2015) to be from the Danakil volcanic sources. Which, I argue here, is not an unreasonable suggestion to make. Nabro volcano has been confirmed as one source of obsidian, so there is reason to think (Zarins 1990) that it is the only source being procured.

What this outcome leaves uncertain however is how, and where, Sabir, Asa Koma, and even Shalao, connect to the activity described above. What I can say of these locations is speculative until further archaeological, or epigraphic, evidence is produced. Sabir is a crucial link in the Tihamah trade, either overland or via the Red Sea or, probably, both, but it also has potential exogenous connections with Eritrea, Egypt, Djibouti and Somaliland. It is unclear what the impact of the incense trail between the third and first millennium BC was in Africa, although fragments of incense burners are present in Tigray (Fig. 39) indicating the product was being used at Meqaber Ge'awa (Wolf and Nowotnick 2010) .

In this chapter I have has used various sources to demonstrate the routes that were in use three thousand years ago. I also investigated the incense trail (Groom 1981; Sidebotham 2011), and the contemporary salt trail (Woldekiros 2019), to understand which journeys are being taken and if they can be informative of the ancient routes. In the following chapter I will test some of the evidence discussed here and aim to establish which routes can be suggested for legitimate journeys in the first millennium BC.

The reliability of this analysis, I suggest, becomes apparent throughout this chapter as the contemporary salt trail, the modern roadways, the historical sources of Bent (1893), Crawford (1958), and Salt (1814) or the ancient routeways being considered, are largely, the same route. The modern tarmac roads throughout Tigray and Eritrea are using the routes in existence three thousand years ago, as the maps in this chapter indicate. The restricted movement through the rugged and challenging topography of Tigray, the Danakil and the Yemen Tihama, are one and the same. Routes also extended away from the region towards the Gash Delta where connections could be made with the Nile valley. The next chapter will assess some of these routes using remote sensing.

5.8 Outcomes

- The obsidian trade between Tigray, Nabro and the Red Sea coast was probably seasonal partly due to the rainy season but also due to difficult sea crossings at the same time.
- The role of the Arabian incense trail and its impact in Tigray is almost a completely unknown factor in this discussion. Its future research is essential in developing a fuller picture of the interconnecvity and economy of first millennium BC Tigray.
- The regional trade in obsidian, particularly the exchange with the Tihamah Sabaean population, has resulted in the aforementioned Afro-Arabian Interchange Circuit (Fattovich 2004), which led to the creation of lines of intercultural entanglement (Creasman and Yamamoto 2019) which is archaeologically recognisable as the Pre-Aksumite Tigray.
- Archaeological activity on the contemporary salt trade between the Danakil depression and Tigray highlands (Woldekiros 2019), suggest that the ancient route and the modern route are one and the same in many areas.
- The modern tarmac roads throughout Tigray and Eritrea mirror the routes used in the Pre-Aksumite period.
- Assab appears to have functioned as the Red Sea crossing point for three thousand years, shown on 19th century maps (Fig 84) opposite Mocha in Yemen.
- The use of phenomenological theory suggest that Nabro obsidian and potential ancestry at Yeha represent a sacred Sabaean landscape.

Chapter Six

6 Remote sensing, journeys and landscape: Tigray to Tihamah:

6.1 Introduction

In the previous chapter I proposed a number of hypotheses for movement between Nabro volcano, Tigray, and Tihamah. Nabro volcano and the Danakil region are the fulcrum for the obsidian trade of the first millennium BC. Whilst some sites have obsidian provenanced to Nabro volcano, at other sites the provenance is unconfirmed. In this chapter I will use remote sensing to demonstrate the routeways that were being used through the challenging topographies of the region. This section will investigate the interconnectivity between the sites discussed throughout this PhD, and the landscapes which shaped the limited possibilities for that movement.

6.2 Methodology

The following nine sections outline in detail the methodology that I used to create the maps that I present in chapters five and six specifically, but also elsewhere in this thesis.

a) To suggest and create the routeways and maps presented in this thesis I began with a review of site data, using published and archive data where possible, but also personal communications with former PIs where published accounts where not always available. This enabled me to present data on site chronology, period of occupation, structural style, material culture, period of abandonment, links between sites, exogenous influences, and the presence of obsidian. In this way I built up a site description for the important sites in Ethiopia and Yemen discussed in this thesis.

b) I then extracted data specifically relating to the presence, or absence, of obsidian, to create a regional picture of source, distribution and chronology. This included assessments of obsidian sourcing, and its archaeological presence in Ethiopia and Yemen as outlined in chapter 4.

c) In collating the data from all known sites, I entered the information – site name, chronology, material culture, geographic coordinates – into an MS Excel spreadsheet to create an Attribute table. Specific data, for example sites with obsidian, sites of second millennium BC date, could then be extracted into subject specific attribute tables and uploaded into ArcGIS-PRO (version 2.8) to create topic specific distribution maps.

d) At this stage visiting the sites in Ethiopia, or Yemen, would have been the optimal procedure, however the combination of the COVID-19 pandemic, the outbreak of hostilities in Tigray, and the ongoing hostilities in Yemen, meant that this was not possible.

e) An alternative option at this stage would have been to create Digital Elevation models (DEMs) and use least-cost path analysis (Hardt et al. 2023; Harrower & D'Andrea 2014). Whilst this would have been suitable for investigating specific local archaeological sites, this PhD was looking at a much larger regional scale (570km east-west), and the least-cost-path approach does not allow the incorporation of the phenomenological perspectives that are used here to inform the interpretation of landscapes.

f) Using remote sensing to replicate, an on the ground survey, was, effectively, a way to digitally walk through the landscapes. This began with sites in Tigray, Ona Adi, and Yeha, and figuratively walked from site to site through the landscape in order to create the journeys that were being undertaken three thousand years ago.

g) To do this I used Google Earth-Pro (version 1.3.35.442) because of the high resolution available, in contrast to https://earthexplorer.usgs.gov/ for example, for which the resolution was not as high. Google-Earth was accessed from March 2020 until June 2023. The Historical Imagery function was used specifically in relation to Yemen, where the clearest images available date to 2008 (prior to the current military conflict). In Ethiopia satellite imagery could be impacted by heavy seasonal cloud coverage during May-August. The resolution requirement was self-selecting in that I used what gave the clearest imagery possible. Initially this resolution was at 90km which gives a clear regional topographic image. I would then zoom-in to a site, from 2km resolution, and then focus in to 100m for close-up detail. Getting too close, which in this case I define as beyond approximately 80-60m, the image began to lose definition.

h) To create the maps in this thesis I selected the ArcGIS Pro basemap called Imagery as this option best represented the landscape and topography as it is now, and is an approximation of how it was in 900 BC. Other basemaps selections were tried-out, including Imagery with Labels, National Geographic, and Terrain with Labels, but these are too cluttered with modern city, region and country boundaries and names.

i) The routeways presented in the maps were created by examining in detail the topographic features at a specific location, for example Nabro volcano, or Al-Midaman, in Yemen. This benefitted significantly due to my direct first-hand experience of all the landscapes discussed here - the Tigray escarpment, or the slope of Danakil volcanos, or the altitude of the Wadi Siham, in Yemen, and their relationship to archaeological sites. I then quite literally joined the dots linking Nabro volcano to the Red Sea coast, or Yeha to the Tihamah escarpment, for example, to create the long-distance journeys that I then mapped here. The high resolution of Google Earth-Pro Pro meant that it was clear enough to differentiate between natural and made features (trackways) when crossing the Danakil depression, for example and useful in creating the phenomenological framework that I apply in this thesis.

j) The routes presented in the maps are not created by drawing straight lines, as they often appear when reduced in scale for this thesis, but are built up of many mini-steps linked together. The high resolution of Google Earth-Pro enabled me to figuratively walk through the routes that I suggest. It also meant that I could suggest specific sites coordinates (E13.27, N 41.87) for future ground-truthing (Chapter 8, section 8.5). This potential site became apparent when Google Earth Pro's high-quality resolution indicated that a long, accessible, sandy pathway could be taken from the coast to Nabro. When digitally walking south-east around Nabro this specific area became notable because it was relatively large and flat. It was one of very few areas of its type, and therefore an ideal space in which the placement, collection, and trade of obsidian, could take place in. It was the only suitable space amenable for encampment, or even settlement, for those involved in the procurement and exchange of obsidian.

k) This 'digital walkover' approach was only possible because of my first-hand experience of the landscapes discussed in this thesis. Without that direct experience, making phenomenological suggestions for routeways through and across the Tigray highlands, the Danakil depression, or the Yemen Tihama, would not have been feasible. This meant that I was making informed decisions for the suggestions I was deriving from remote sensing and be confident that they were achievable. The resolution available in Google Earth Pro meant that the landscape was visible enough, and features – dried up river beds rocky outcrops, volcanoes, already extent trackways - could be easily identified that remotely walking through the landscape was a viable choice.

Part one

6.3 The Red Sea to Nabro volcano

In this chapter I will investigate the contact between Africa and Arabia by creating ArcGIS Pro maps to illustrate where the movement was taking place across the region. The journeys that I propose have been created using Google Earth-PRO meaning that I was able to figuratively walk through the landscape, along the routes, to assess their viability. I have walked and sometimes driven along most of the routes that I suggest here in areas as challenging as the Danakil depression, the Tigray mountains, and the Tihamah desert. This direct personal experience, combined with the use of remote sensing, means I am confident that these journeys can be undertaken as I describe here.

The geology of southern Eritrea and the Danakil depression is known as the Danakil Terrain, composed of Quaternary igneous metamorphic rocks (Billi 2015). Although these rocks are very close to the shoreline there is usually a sandy beach, sometimes narrowing down to 10m width, that can be walked along between the rocky outcrops and the sea. The elevation of the rocky outcrops rarely exceed 50m asl, and often lower than that, so these harder surfaces can also be walked along if necessary.

The settlement of Beilul is located on the north side of a sheltered bay on the Red Sea coast, 50km south-west of the volcanic Hanish islands (Fig. 90). Although Hanish is volcanic (Gass et al. 1973), no obsidian has been provenanced from there. Archaeological attention was drawn to the village by the presence of obsidian, found there in a prehistoric context (Khalidi 2009, 2006), and also found at Assab, 45km further south (Fattovich 2012; Anfray 1970), as discussed in chapter four. No excavation has been undertaken at either of these sites but the presence of obsidian, although unprovenanced, at two sites close together on the Red Sea shoreline is indicative of a movement of the resource from the Danakil, potentially Nabro, to the coast. The coastline here is very flat and low-lying allowing for easy movement along it. The direct distance between Assab and Beylul is 45km with remote sensing indicating frequently used trackways. The route that I propose from Assab arrives on a bay with Beilul 7km to the north, at which point a sandy inlet can be crossed, hence moving between the two places is a matter of relative ease.

Walking the distance between them would be a two-day journey. Only small quantities of obsidian, quantity not given, (Khalidi 2006) were found at both places indicating either minimal trade between them, or that this all that remains of the obsidian after overseas transportation to Yemen.

6.4 Beilul to Nabro

Remote sensing suggests that the optimal route from Beilul to Nabro volcano (Fig. 90) is quite a clear choice. From Beilul the flat sandy coastline continues north for ca. 25km. The sandy coastline here is much wider, up to 5km in places, before reaching the inland metamorphic outcrops. Here either the shoreline can be followed, or a route moving inland, north-west, where the elevation rarely fluctuates more than 5m. In the rainy season this route would have barriers in the form of small, and occasionally large, inlets and tributaries flowing into the sea, which would have to be crossed somewhere between the sea and the rocky outcrops. An optimal route appears to be to walk north from Beilul, about 0.5km inland from the coastline, where the ground surface although sandy can be well compacted. After 25km a large alluvial fan (Fig. 89) is encountered created by significant amounts of water flowing down through the Quaternary igneous rocks at the edge of the Danakil depression into the Red Sea, although this fan is now primarily arid with a significantly reduced flow. Within the sandy parameters of the fan the route turns westwards after 13km gradually narrowing down to a well-defined route.

Remote sensing shows the topography here changes colour from a typical light sandy desert to a much darker hue as the landscape is dominated by the metamorphic rocks of the Danakil depression. The change of colour reflects the change in the ground conditions as the route starts to become more of a challenge. The elevation rises to ca.50m asl as the route follows former wadi tributaries between the rocky topography. Rainfall has shaped this landscape over millennia (Fazzini et al. 2015), with the increased aridity now making it amenable as a routeway between the Nabro-Mallahle volcanic Bidhu massif and the Red Sea coast. It is unclear if this route would have been navigable three thousand years ago but the higher ground presumably still would have been. Following the sandy trackway the elevation rises gradually (95m asl) but is still relatively easy to move along. If rainy season precipitation made specific areas difficult to pass through then some of the surrounding higher ground (elevation 315m asl) could also have been used although this would have made movement, particularly if pack animals were carrying obsidian, more difficult.

Figure 90. The route east from Nabro volcano to the Red Sea coast and a probable route to Yemen.

The distance between the coast and the base of Nabro volcano is ca. 65km along an east-west route that winds its way along a predominantly sandy trackway. The elevation along this track gradually ascends up to 500m at the base of Nabro. For much of the journey the rim of the Nabro caldera (1970m) the highest point in the Danakil, would have been a clear landmark visible in all directions.

The trackway here is increasingly surrounded by much more rugged territory, some of it covered in black tephra deposits. Having left the flat surfaces of the coastline, the individual making the journey now finds themselves in much more challenging, perhaps, threatening, landscape, particularly if the volcano had an active lava flow, a billowing ash cloud, or smoking tephra fields. The difference between the coastline and the volcanic landscape is a significant one for those undertaking the journey, moving from a benign, to what may have been perceived as a malign environment. After 65km, at the base of Nabro volcano, a large open area is encountered (650m asl). The location of this area (13.312642°, 41.805398°) would make it an ideal space in which to prepare and work obsidian cores, and for creating a settlement, or an encampment, that those involved with the obsidian trade could rest at or even stay at for an extended period. Archaeologically this is an area in which a camp or settlement remains could reasonably be expected to be found. From here the elevation rises sharply up to the caldera rim at almost 1970m. From Beilul a journey time of 4 days, 22km per day, seems justified as most of the route is relatively flat and accessible before coming increasingly craggy close to Nabro.

6.5 Nabro to Tigray

The journey from Nabro to Wakarida was discussed in the previous chapter (p.188) but is the first section of a route linking Nabro volcano to Tigray and its western most boundary at the Temple of Yeha. This would be a long journey passing through challenging landscapes but potentially linking most of the significant centres of the first millennium BC.

6.5.1 Desi'a to Meqaber Ge'awa

Travelling west from Desi'a pass (Fig 91) the elevation gradually drops 500m over the course of 31km. This distance could have been covered in one long day or broken into two shorter days. This then connects with a shallow ravine leading west, through Agula towards the Meqaber Ge'awa temple which would be the logical destination during the first millennium BC. This section of the journey, forested and relatively verdant (Benoist et al. 2020), must have been a sharp relief after the hyper-aridity of crossing the Danakil depression from Nabro. Trade opportunities may have favoured breaking the journey overnight in the region of Agula**,** effectively a crossroads in southern Tigray. The Meqaber Ga'ewa temple is suggested as been beyond the "conventionally recognised south-eastern borders" of D'mt (Finneran 2007, 118) however it bears most of the characteristics of what is recognised as D'mt, as discussed in chapter 2 (page 74).

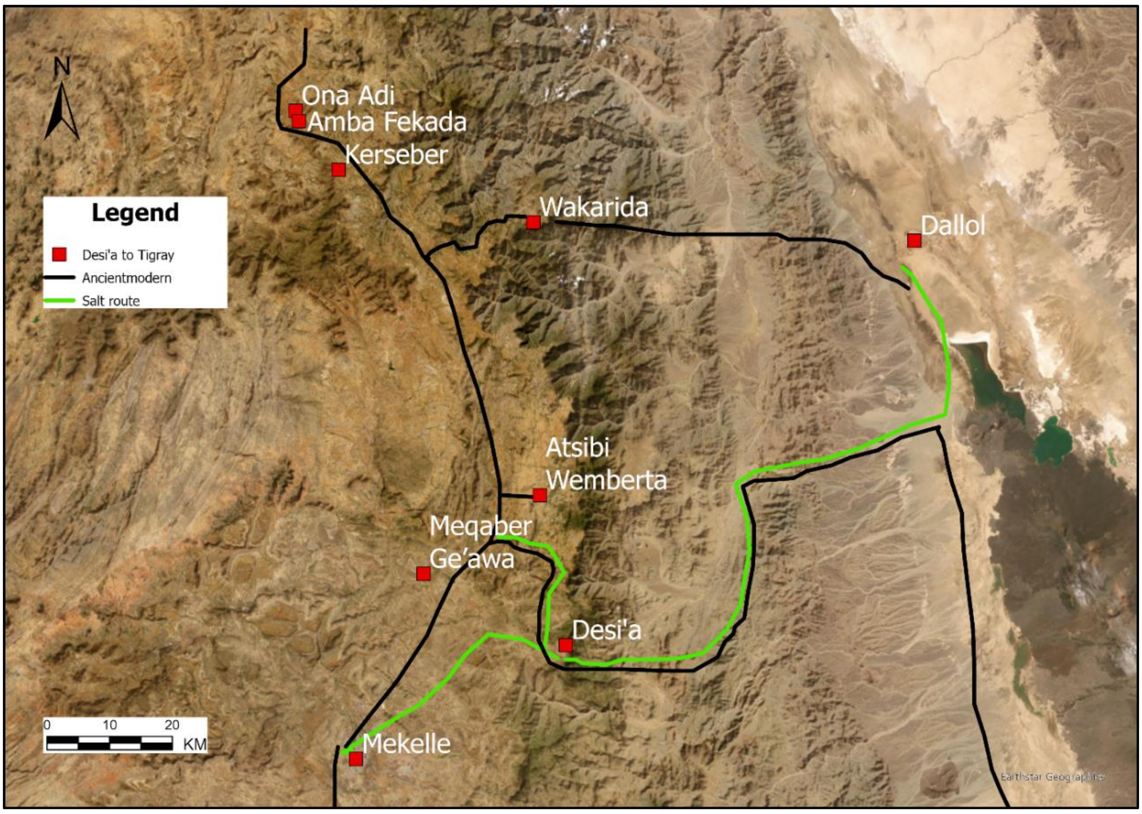


Figure 91. Routes from the Desi'a pass into Tigray. The green route is the salt trail and the modern road. The black route is the modern route and the proposed ancient route.

6.5.2 Meqaber Ge'awa to Ona Adi

Meqaber Ge'awa and Yeha exemplify the core characteristics of the Pre-Aksumite and both sites are on important parts of the route connecting the Danakil depression with the Tigray highlands.

The route from Meqaber to Ona Adi (Fig 91) is one of the easiest parts of the journey from Nabro to Yeha to undertake. The route, now the modern A8-B20 road, is a broad plateau with the Tigray escarpment to the east and is a gently undulating landscape gradually ascending 500m elevation. Historically some of this route would have been more forested than it is today, the countryside perhaps not as open, with some parts under cultivation (Benoist et al. 2020). The route leads towards the highest point of the Tigray highlands, the Amba Fekada, effectively a landmark for the sites of both Ona Adi and nearby Mezber. For the people living here and moving around their local area there is a definite sense of being at the top of the world created by the view across the mountain summits. Connah (2001) suggests Tigray is isolated, but in fact it sits at a crossroads which link most, if not all, of the first millennium BC traffic through the region. It is a hub, as indicated by the cluster of Pre-Aksumite sites here (D'Andrea et al. 2008) from which connections can be made to the other core economic and religious centres of the region, Yeha, and the Ancient Ona communities further north. On reaching Ona Adi, 80km on four-day journey from Meqaber Ge'awa, would have been, it appears, to arrive at a centre of regional trade. Long distance trade would have arrived here from the harbour at Adulis, and resources may have arrived from the Nile valley on the overland route from Mahal Teglinos.

6.5.3 Eastern Tigray to Yeha

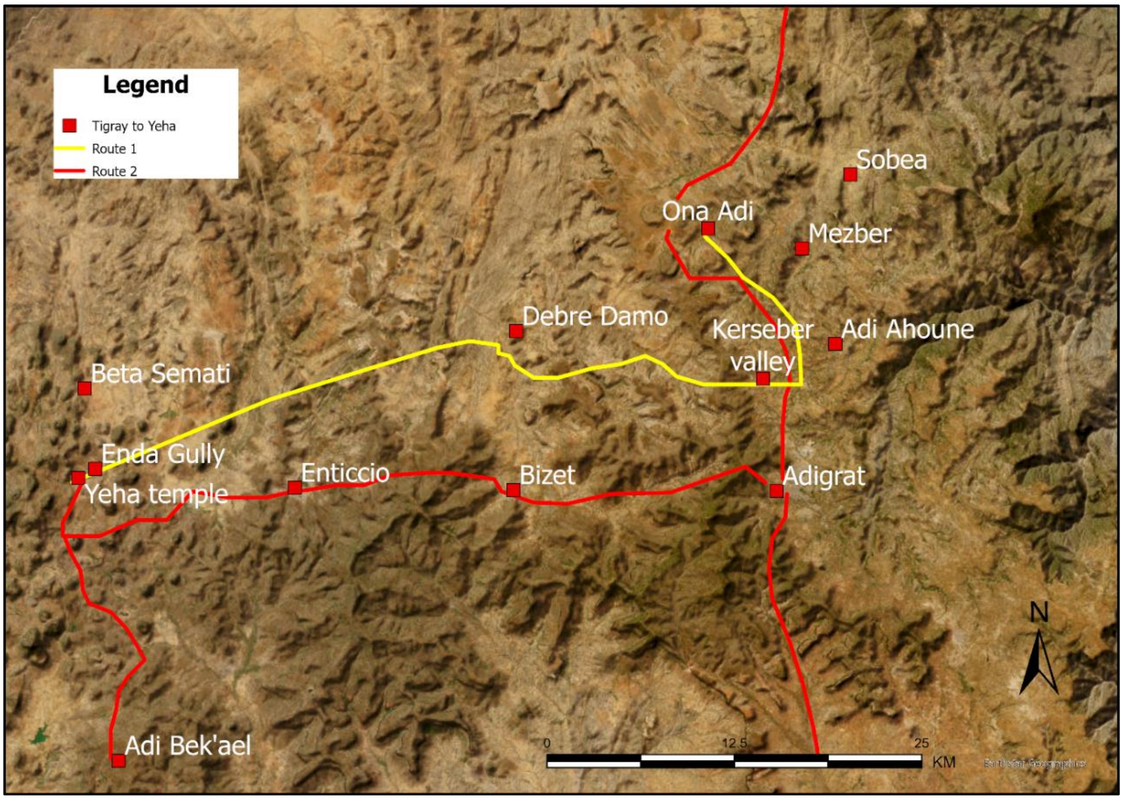


Figure 92. Map of Tigray showing two proposed routes through the region. The Red route is the mountainous highlands route, which is very similar to the modern road, whilst the yellow route is via Kerseber valley.

It is not known for certain which route connected Ona Adi and eastern Tigray, and the Temple of Yeha. There appear to be two options available (Fig 92): from Ona Adi via the Kerseber valley, or a more high-level mountainous route across the Tigray highlands. Taking the former, beginning at Ona Adi necessitated travelling south-west and descending 2-300m through the escarpment of the Kerseber ridge. Here the slope passes down through agricultural terraces and small plateaus as the route gradually descends. The Kerseber valley (Fig. 93) is a 22-mile-long, flat-bottomed sandy valley with small freshwater streams running along it. Assuming this valley to be forested and used for agriculture this could have been one of the most enjoyable and, from the point of view of amenities and trade, rewarding parts of the journey. The steep sided valley (Fig. 93) is currently a rich agricultural landscape dotted with small settlements potentially similar to how it might have been three thousand years ago. In the hot dry summer season this would have been an almost tropical environment through which to pass, whilst in the raining season the valley sides would have provided some shelter from potential inclement weather. This could have been an area of relative stability in northern Tigray, a high sided valley creating shelter, that was forested (Billi 2015), had agricultural potential, with fresh water available. This would have created a small-scale localised environment of everyday life with people living on the lower hills or sediment slopes, leaving the valley floor free for agriculture and grazing (D 'Andrea et al. 2018). A sandy trackway undulates through the valley and one can see that, even without this, routeways would still have been possible, not least in the valley bottom following the river channel.

Figure 93. Looking north to Eritrea across the east-west Kerseber valley. Photo, Richard Lee (2019).

The western end of the Kerseber valley is marked by the presence of Debre Damo monastery located high on a prominent flat-topped amba on the north side of the valley (Fig 94). The potential for ancient pre-monastic settlement here is significant (Henze 2005) but the monastery site has not been fully archaeologically investigated. The amba is and would always have been a landmark for anyone passing through the area. Here the Kerseber valley opens out into a flood plain with small run-off channels cutting linear east-west swathes through what becomes an irregular topography of low hills and ambas meaning that a suitable routeway would have to be selected from the challenging options available. In the dry summer season this would have been a relatively amenable route to navigate but in the rainy season significant rainfall would have reduced the available options due to possible flooding or heavy runoff. It is probable that this east-west route would adjoin the north-south route from Adulis to Aksum at the site of Beta

Semati (Fig. 91), 6km north of Yeha, and around which multiple pathways seem possible. The 88km route from Ona Adi to Yeha would have taken four days.

Figure 94. The Amba on which Debre Damo monastery is located (left). Photo, Richard Lee (2019).

If avoiding the Kerseber valley on this journey, the other option is to follow a highland route across the mountains. This is now a spectacular tarmac surfaced road on which to travel with hairpins bends to navigate and steep cliff faces to be avoided. I have driven along this route a number of times and it is clear that there are no other obvious alternatives and this was probably the optimal route over the highlands. Following the route using remote sensing only confirms my theory.

6.5.4 Highland route to Yeha

When starting from Ona Adi however, if taking the route along the modern road then a journey south towards Adigrat is first necessary. If we assume that this was indeed the case, and that a least cost route was not a priority, we arrive in Adigrat 15km south of Ona Adi. From here the route is a high level one across 3000m mountain peaks which have to be crossed. Whilst sources of fresh water would be readily available in the mountains for much of the year these might be harder to source during the hot dry months from January-May. The absence of modern villages in the mountains may account for this. This was, and is, a serious high level mountain route with spectacular views, river valleys, rocky outcrops, precipitous cliffs, and snowfall possible in the winter months. The 88km can be covered in four days at 22km per day.

Beyond the mountains the elevation drops 2000m in to flat valley bottoms, where modern villages Enticcio and Bizet are found, and movement is easier for 8-10 km. Using Google Earth for remote sensing to determine where ancient routes may exist, the modern road does in fact take the easiest route available and this would be, not unreasonably, where those on foot three thousand years ago might also have traversed. The latter part of this route would intersect with the western Kerseber valley as the two coalesce near to Yeha.

This is a challenging highland route and those taking it would need to be familiar with its landmarks, its signature landscape (Wilkinson 2003) signposting their route over the high mountain passes. Ground conditions however would be primarily solid stone and rocky outcrops making for relatively swift progress. Given the importance of Yeha and the predominance of sites in eastern Tigray the route between the two would have been well used and conspicuous. Regular travellers would know where suitable resting points were along the route. If carrying obsidian however this adds both to the weight an individual would be carrying and the energy they would be expending. To undertake this expedition in four days suggests that the individuals were physically very robust and able to meet the rigours of this demanding journey.

An alternative route from Adi Ahoune, 13km east of Ona Adi, passing through Enticcio and onward to Yeha, is also suggested (D'Andrea et al. 2008). Adi Ahoune is close to the edge of the escarpment separating Tigray from the Afar desert and is one of few sites in northern Tigray, the Gulo-Makeda region, that has prehistoric antecedents (chapter 2) (D'Andrea et al. 2008). The route is shown by D'Andrea et al. (2008) as passing south of Ona Adi but north of Adigrat (Fig. 93), which suggests that it passes through the Kerseber valley. The total distance from Adi Ahoune to Yeha is 68km over four days.

8km south of the modern highland Enticcio road is the site of Adi Ba'ekel located on a spur rather than a route. The site has Pre-Aksumite and Sabaean influences (Berhe 2011) (page 59) and appears to be an anomaly owing to its location away from the probable routeways in the area. Adi Ba'ekel is however the result of the only archaeological survey in this area hence it may not be as unique as it initially seems. The route from Adi Ba'ekel is an easy one to follow as it is along a flat valley bottom, an 11km 3-hour journey to Yeha. Its location does however raise the question of whether a first millennium BC route, on which Adi Ba'ekel is located, extended further south than is currently known.

6.5.5 Arriving at Yeha

When arriving at the Temple of Yeha, or the potential settlement of Enda Gully (Michels 2004), the site is surrounded by a natural ring of visually charismatic round topped mountains of phonolite plugs forming inverted cone-shaped isolated peaks and circular domes (Fig 95). This creates the effect of protecting the temple site which is located centrally within the circle of hills. Asrat (2009) argues that Yeha was chosen precisely because the phonolitic plugs act as a protective feature for the temple site rather than for its agricultural properties as Phillipson (1998) argued, although both may be accurate assessments. Passing through the mountain chain to arrive at Yeha, Asrat's (2009) suggestion of the protective nature of the mountains is keenly felt. The temple site is located in the central area of the circle of hills with long range 360° visibility available all around. The benefit of good agricultural land may also have been a factor but the safeguarding provided by the mountains would have been a priority. Arriving from the west one is met by the outline of lions head**,** a natural feature of one of the cone-shaped peaks (Fig. 95). This is a striking image that is most apparent when standing in the entrance of the Temple of Yeha where the image is visible to the west. It is tempting to see this single feature as being emblematic of the Pre-Aksumite culture, and of the D'mt polity itself. This is a striking image, clearly visible to the local population but, probably more importantly, to impress external visitors to Yeha.

Yeha presents an ideal example for the application of a phenomenology to an archaeological site (Tilley 1994) using the natural landscape (Bradley 2000) as a way to interpret what the archaeology does not reveal. The image of the lions head (Fig. 96) does occur in Pre-Aksumite iconography (Hagos 2011; Manzo 2009), and given this natural formation, one can certainly believe that it was from here that the idea was conceived. The unique cone-shaped mountains are visible for 10-15 miles or more from the temple itself (Fig. 95). Visiting the site now, through the surrounding mountains, there is a palpable sense of entering a highly important place. This would have been equally apparent in 800 BC when the emerging culture built the temple as a statement for all who visited it. The physical evidence does not indicate this importance, but by applying principles of phenomenological theory this is a way to move beyond the purely physical (Tilley 1994) and speculate about what meanings are encoded in the landscape for former populations but are now hidden or lost to us.

Figure 95. The round-topped hills around the Temple of Yeha. Photo, Richard Lee (2018).

The location of Yeha, the place itself, must have been a significant site for the temple to have been built there. It was a landscape with a significant history, and a Sabaean influence, before 800 BC (Fattovich 2009; Robin and De Maigret 1998). Visiting Yeha may have been therefore a pilgrimage as much as an economic journey hence not a purely functional one but possibly a spiritual or religious one. This is applying phenomenological theory, going beyond the evidence, to arrive at how this landscape may have been understood by those living there three thousand years ago. The Great Temple was the religious aspect of visiting Yeha whilst the economic aspect of the journey would have been visiting the settlement, potentially at Enda Gully. Suggesting Enda Gully as a settlement (Michel 2005) is certainly far from certain, pending excavation, but the non-elite would have lived close-by, and Michels presents this as a plausible location. In later times, certainly by the Aksumite period, Yeha would have found itself in the centre of the trade route from Adulis 110km to the north (Peacock and Blue 2007), and on what would, eventually, become the route to Aksum. This is another relatively easy route to navigate as it descends gradually from Yeha to Aksum over a gentle undulating topography.

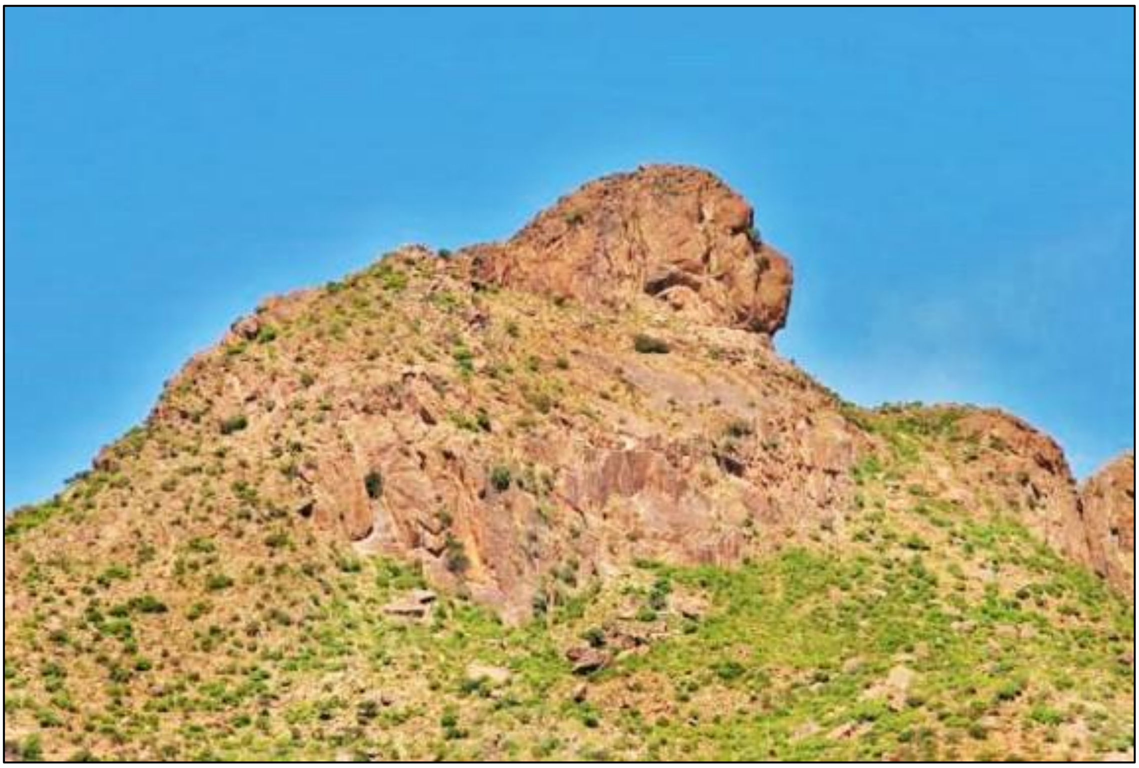


Figure 96. The mountain close to Yeha temple with a naturally shaped feature resembling a lions' head. Photo, Richard Lee, (2018).

South west of Aksum a route leads 85km to Mai Adrasha in the Shire region, a 4-day journey of moderate undertaking. Excavation here (Finneran et al. 2003) indicates a Pre-Aksumite presence but, as with Meqaber Ge'awa, it is said to be beyond the extent of D'mt's political or cultural extent (Finneran 2007). Further research is needed to clarify whether this was a legitimate Pre-Aksumite settlement or simply an outpost trading with Tigray. A routeway could have extend 265km from here to Mahal Teglinos in the north-west, where Nile valley connections were possible (Fig. 98). Although the distance is significant, a 12-day circuitous route using the flat valley bottoms connects the two areas with relative ease.

The site of Seglamen, midway between Shire and Yeha, has a Sabaean inscription dating to the early first millennium BC (Sernicola 2017), as well as architecture, a cemetery, and imported ceramics making it an almost definitive Pre-Aksumite site. Sernicola (2017) and Phillipson (2017) have argued, correctly I suggest, that Seglamen is a central node on the Red Sea interchange circuit that links Tigray with the Nile valley.

Figure 97. The view north towards Amba Fekada, location of Ona Adi, and Mezber, and beyond to Eritrea. Photo, Richard Lee (2019).

6.5.6 Ona Adi to Adulis

The site of Ona Adi (2300m asl) has a view to the west of mountain tops interspersed with steep valleys, whilst the view to the north is, if anything, even more imposing, as an arid mountain landscape stretches into Eritrea (Fig 97). This latter route has to be passed through or across, in order to reach either the coast at Adulis, or further north, to the sites of the Ancient Ona culture. The route between Adulis and Aksum is a 100km, a five-day journey, across a high-level mountain route. Harrower and D'Andrea (2014) suggest a major trajectory here with a *least cost route* (page 181) from Adulis to Ona Adi passing close to Matara.

Ona Adi is located very close to the Ethiopian-Eritrean border and the modern road continues along a level, narrow escarpment lifting it above the surrounding valleys and following the ancient route as defined by the archaeological sites of Ona Adi and Mezber. Deep valleys are east and west of the modern road which climbs to 2500m asl arriving at the small village, and archaeological site of Matara-Senafe (Schmidt et al. 2008). The topography here changes significantly to rugged mountains with the route becoming much more demanding. The parameters of the topography have defined the logical position for a modern road, broadly the same as the ancient route, through the least challenging areas although slopes, ascents, and ridges still have to be navigated. The Pre-Aksumite site of Keskese is located in a flat valley between two higher hills in the landscape but 2km directly north the route becomes more challenging with fluctuations in elevation of 100m or more. Without the modern road which occasionally skirts along ledges between valleys and low hills, this route would have presented a considerable challenge to travellers three thousand years ago.

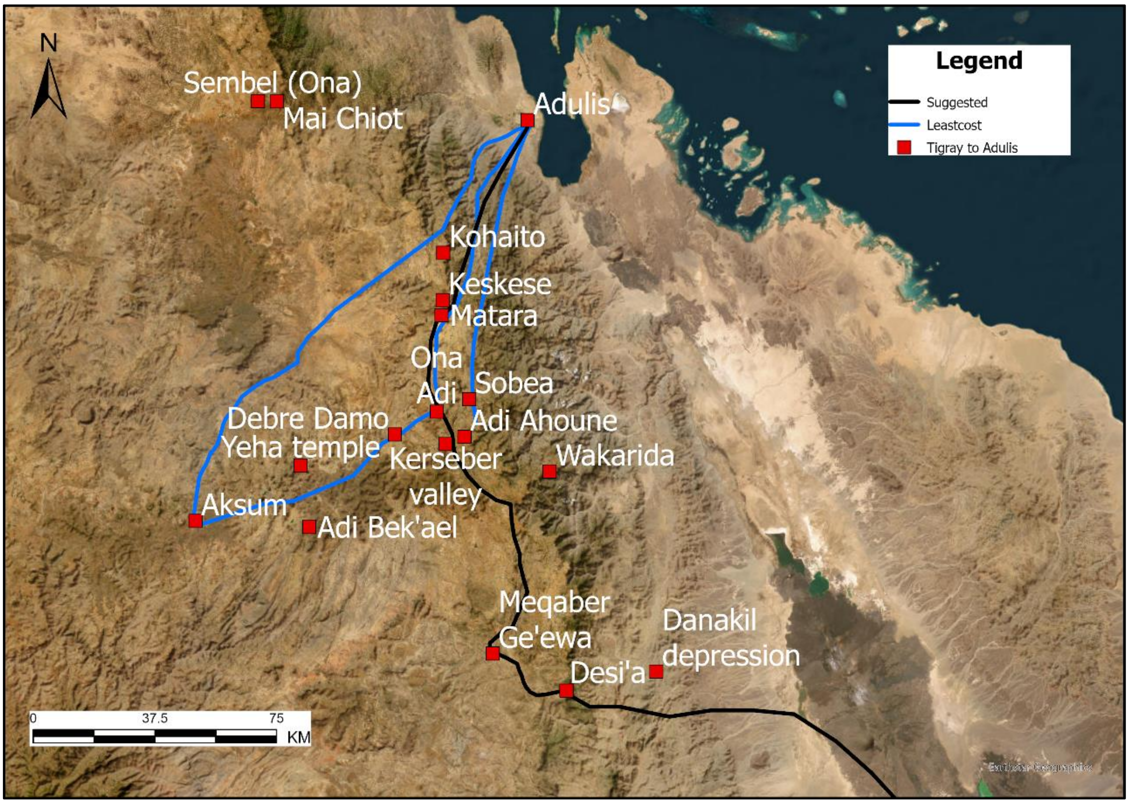


Figure 98. The blue route indicates Harrower and D'Andrea's (2014) least-cost route. The black route is that proposed for ca. 800 BC linking Ona Adi with Adulis, and the route south towards the Danakil depression and Nabro volcano.

4.5km north of Keskese (Fig. 98) the modern road veers to the north-west as the topography becomes more challenging. Continuing 15km along the ridge north of Keskese brings the traveller to the archaeological site and village of Qohaito, referred to as Koloe in the Periplus (Huntingford 1980), located on one of the higher ridges in the vicinity (2600m asl). The trackway runs alongside the east side of a ridge with a precipitous three hundred metre drop in elevation to its immediate east.

Qohaito is located near to the head of a promontory with a 5-600m rugged cliff to its east. From the north edge of the promontory a small path leads down, then along a rugged ridge, with elevations varying over 150m. The path follows similar contours for the next 6-7km. This would be a challenging route to take if one were travelling with loaded pack animals carrying obsidian, or incense, as the paths are narrow with both steep ascents and descents. From here it is ca.35km to the harbour of Adulis (Fig. 98) depending on the route taken. To continue as described along the high-level route (2100m asl) the ridge, along which the path follows, gradually descends to the lowlands ca. 200m asl. There are alternate options available here; if this was outside the rainy season for example, many of the dried-up river beds could easily be followed on foot. All routes are downhill with a clear view of Adulis in the distance. But on the return journey however all travellers leaving Adulis were faced with a gradual incline of 30km back up to the ridge at ca. 2500m asl.

Fattovich (2018) suggests, not unreasonably, that Adulis was a second millennium BC hub of Red Sea trade, connecting Arabia and Africa. It has been assumed (Fattovich 2004) that Sabaeans from Yemen were arriving in the Horn of Africa at Adulis (Manzo 2010; Peacock and Blue 2007), however excavation there has found little evidence for this. This is not to say that the evidence cannot be found but that it hasn't been so far. Considering that there is evidence of Sabaean culture in southern Tigray, at Meqaber Ge'awa, then a route there was in use, either instead of, or simultaneously, to the northern route from Adulis. From a practical point of view, I suggest that a southern route is a more likely option as Nabro obsidian was being transported across the south Danakil to the Red Sea and on to Yemen. Therefore, visitors arriving from Yemen were probably navigating through the Danakil depression and emerging in southern Tigray.

A second potential route to Adulis (Fig 98, above) may have included the village of Sobea 13 km east of Ona Adi. At 2100m asl, rising to 2300m asl, this is amongst the highest topography in the region, but the difference being it is a gradual one across the undulating landscape. Harrower and D'Andrea (2014) suggests that the route from Sobea connects with Keskese in the north and, indeed, remote sensing indicates that this route appears to present less of a challenge than the high-level route. Alternatively, from Sobea a route south can be followed 11km to the Pre-Aksumite site of Adi Ahoune (D'Andrea et al. 2008) and then, turning due-west, following a path through low lying valleys, avoiding mountain peaks, to either Ona Adi, via Mezber, or directly to Kerseber valley and onwards to Yeha. Ona Adi to Adulis via Sobea is roughly 95km, 5km less than the Ona Adi- Adulis route but with more trading opportunities.

6.6 Eritrean land routes

6.6.1 Mahal Teglinos – Agordat

Figure 99. Map showing the route from central Tigray to Mahal Teglinos and Nile valley connections.

Mahal Teglinos (Fig 99) is located on the Gash-Mareb river delta, known as the Gash river in Sudan and the Mareb river in Eritrea, where it originates and flows northwards. As a pre-eminent site of the third and second millennium BC (Manzo 2020; Fattovich 2012) and considering its location, Mahal Teglinos would have been an important entrepot of connectivity and trade for the region linking the Nile valley with the Ancient Ona sites, and south to Tigray.

Third to second millennium BC occupation is known at both Mahal Teglinos and Agordat (Brandt et al. 2008). The two locations (Fig. 98) are now linked by a modern tarmac road that dips south across a relatively flat landscape with an altitude fluctuating between 700m asl and 1000m asl. The topography here suggests that movement between the two locations, ca. 180km, could have been accommodated with relative ease in eight days. Access to freshwater would have been a necessity in this large arid landscape and although the levels in the Gash and Mareb rivers, bookending the journey, are now often in drought, this was not always so (Fazzini et al. 2015).

Another route extends in a northward arc from Mahal Teglinos to Agordat although for much of its distance, particularly closer to Mahal Teglinos, it is now just a well-used trackway. This route winds through the desert along mostly very flat surfaces at an altitude of 6-800m asl. Remote sensing suggests that both of these routes could have been used, although the central desert area was avoided because the topography was unnecessarily challenging and could easily be bypassed to both north and south.

6.6.2 Agordat to the Ancient Ona sites

Travelling the 115km east from Agordat (Fattovich 2012; Brandt et al. 2008) to the Ancient Ona sites of Sembel, Mai Hutsa, and Mai Chiot is a 5.5-day journey (Fig. 99) facilitated by the linear U-shaped Barka river valley connecting the two areas. The Ancient Ona sites are clustered together on a plateau at an elevation of 2,325 m asl, the Eritrean highlands and now the location of the Eritrean capital Asmara. The Asmara plateau, the Hamasien region, is “a major crossroads…..of cultural interaction” but lacks “substantive evidence” (Schmidt et al. 2008b, 113) with most of the aforementioned sites now buried below the urban expansion of Asmara. The route connecting the Ona sites with Tigray was well used if the quantities of Ona ceramics at Pre-Aksumite sites as far south as Wakarida (Benoist et al. 2020) and Atsibi are any indication. This suggests a route connected the Ancient Ona sites with Qohaito, Ona Adi and then Wakarida or Atsibi, and potentially the Danakil depression from there (Fig. 99). Hence significant trade was moving between southern Tigray, Meqaber Ge’awa, for example, through Ona Adi, or Mezber, to Matara, before connecting to the Ancient Ona culture 100km north (Fig. 99).

6.6.3 Ancient Ona sites to Adulis

To travel from the Ancient Ona sites in northern Eritrea south east to Adulis the journey (Fig. 99) is not long, a 78km three-day journey, but the distance as-the-crow-flies is challenging. This is due to the topography which presents a cluster of mountains and hills, peaking at 2325m asl, effectively blocking a direct route. To take this journey in 2023, requires travelling from Asmara north to Massawa and then south again along the coast to Adulis, now eight miles inland, and the Gulf of Zula which is 210km making it 130km further than a direct route. A direct as-the-crow-flies route can be undertaken, as remote sensing indicates, but involves navigating through a highly circuitous and time-consuming series of tracks that wind through the hills and wadi’s of the central massif. It is debatable which of these routes would be either the easiest or the quickest, with only ground truthing able to differentiate between them.

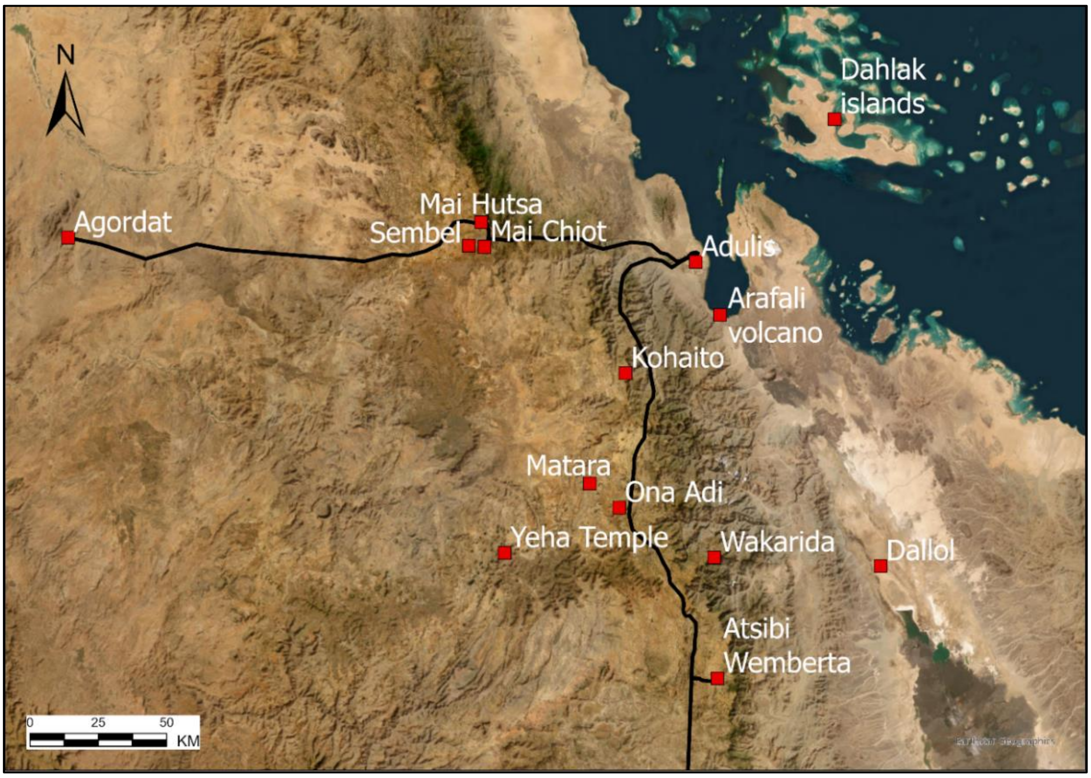


Figure 100. A map indicating where the route linking Adulis with the Ancient Ona sites in Agordat, and the journey south into Tigray.

Whether a route links the Ancient Ona sites with Qohaito is questionable due to the challenge of the topography. At 75km as-the-crow-flies, as with the Ona-Adulis connection, the distance isn't long, but it is a prolonged circuitous route. This does mean that the journey from Tigray, from Ona Adi to the Ancient Ona sites, is a considerable distance that has to go via Adulis, then a significant distance north and then south again, which totals approximately 230km of 11 days travel. The direct journey, if it is undertaken, is approximately 110km from Ona Adi to the Ancient Ona sites, less than half the distance but on a difficult route. Travelling to Adulis however is to arrive at the most important trading centre in the Horn of Africa (Raunig 2004), in the first millennium BC, therefore the longer journey would be worth the effort, and would facilitate food, water and rest.

6.6.4 Adulis to the Dahlak islands

Any maritime activity to or from Adulis navigates close to the Dahlak islands (Fig 100), referred to as Alalaiou in the Periplus (Huntingford 1980, 90). Therefore it is no surprise that obsidian is reported there (Finneran 2005) even if it is not an actual source, the nearest source possibly being Arafali volcano (Fig. 9), (Zarins 1990), the distance between the two is 55km. Fattovich (2004) suggests the islands were part of the second millennium BC obsidian circuit, with maritime trade initially taking place as early as the Neolithic (Sahle and Beyin 2017). Having said that, it is not strictly necessary to use the Dahlak islands for sea crossings whether visiting the Tihamah, directly across the Red Sea, or Egypt for example. The presence of the Wiltonian lithic industry on the Dahlak islands (Giumlia-Mair et al. 2000) suggests that obsidian could be expected to be traded or exchanged with the people living there. The Dahlak islands have been suggested (Fattovich 2018) as the location of The Tale of the Shipwrecked Sailor, a piece of Egyptian Middle Kingdom (2055-1650 BC) known in association with Punt literature (Creasman and Yamamoto 2019; J Phillips 1997).

Significantly in this discussion, and discussed in chapter two, is the absence of South Arabian evidence at Adulis (Fattovich 2012, 31) and similarly at the Ona sites in northern Eritrea. With the collective evidence for Sabaeans in the Horn of Africa, these are two locations one might, not unreasonably given their coastal location, expect to find South Arabian influence. But, so far, that archaeological evidence is missing apart from a possible Haddas River valley inscription (Fattovich 2004). No Sabaean evidence is known at the Dahlak islands either. This might simply be due to a lack of archaeological excavation at some of these sites, or limited excavation at the Ancient Ona sites for example. But it may also be due to the Ancient Ona culture not trading with sites that have affiliations with the incoming Sabaeans, or vice-versa. Some of the Tigray sites may have been aligned with D'mt, whilst others, Wakarida for example (Benoist et al. 2020) may not have been. The fact of greater Sabeaen influence in the south might indicate the routes that the Sabaeans were using to visit Tigray, hence the absence of evidence in the north. This is an unresolved issue within this discussion, and the Pre-Aksumite discipline itself. But one which can, in some instances at least, for example at Adulis, be potentially resolved with further excavation of the earliest contexts at the site.

Part two

6.7 Crossing the Red Sea

The relatively short distance across the Red Sea – 25km at its shortest point at Bab el-Mandeb or 125km from Beilul - is a voyage that was made “regularly at the time” (Khalidi 2009, 232), since the sixth millennium BC. Whilst the Red Sea crossing (Fig. 101) would have been challenging due to the strong sea currents (Facey 2004), the presence of Nabro obsidian in Yemen at Al-Midaman (Oppenheimer et al. 2019) indicates that it was taking place.

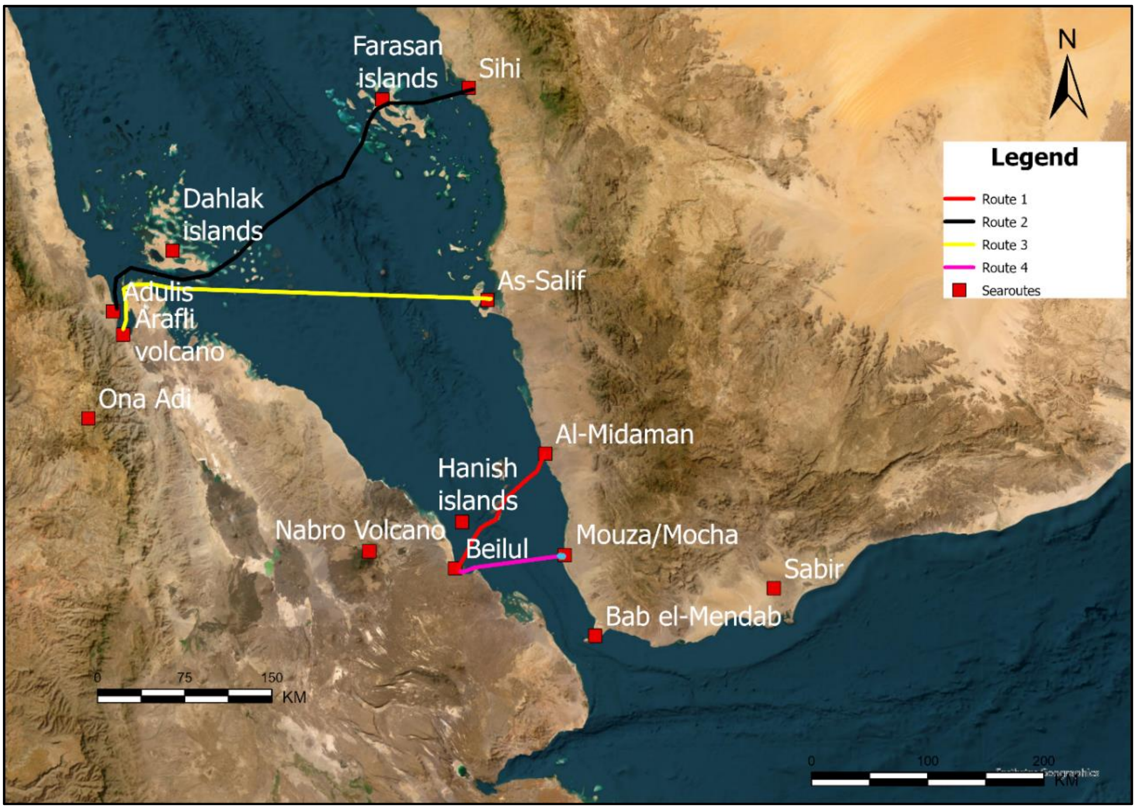


Figure 101. A map showing the possible routes for crossing the Red Sea between Africa and Arabia as discussed in this chapter.

6.7.1 As-Salif peninsula

A c14 date of 5000 BC (Tosi 1986) has been recorded for the presence of obsidian on the As-Salif peninsula (Wadi Surdud). Where the obsidian was being brought ashore if it was crossing Red Sea (Fig 100) however, is uncertain. It might have been from the Dahlak islands to the Farasan islands and then south along the coastline to As-Salif. A crossing from Beilul to Al-Midaman was probable in the second and first millennium BC although it is unclear whether this route was in use earlier. The presence of shell middens on the As-Salif peninsula (Tosi 1985, 1986) indicates an occupation there.

As-Salif peninsula, which I have driven along, is characterised primarily by its flat, level topography and its salt flats which served the Tihamah during the Medieval period (Breton 2021). One would anticipate that the salt resource at As -Salif *was also* mined during the earlier prehistoric periods facilitating settlement on the Tihamah. Breton (2021) suggests that the movement of salt from the peninsula into highland Yemen would have passed through the sites of Waqir and Al-Hamid when travelling along the Wadi Siham (chapter 3). Wadi Siham does indeed provide access to the highlands, although no analysis of salt at Al-Hamid as been undertaken.

6.7.2 Beilul to Al-Midaman

Maritime travel on the Red Sea is, and was, defined by strong sea currents, the khamsin winds (April-June) monsoonal rains, and the movement of the Intertropical Converge Zone (ITCZ) which define the seasonal sailing options (Facey 2004).

Crossing the Red Sea to Yemen from the Eritrean coastal village of Assab (Fig. 101) is the most direct option. This places the Hanish islands closest to the African coast when crossing the Red Sea to or from Al-Midaman (Fig 101). As I have previously suggested, Al-Midaman appears to be the arrival point on the Yemen Tihamah based on the significant amounts of obsidian found at the site (Oppenheimer et al. 2015; Keall 2004), 2km from the current coastline, in quantities which haven't been found anywhere else on the Tihamah (Table 9). Obsidian is found near the mouths of deltas and along the Tihamah coastal littoral suggesting that it is arriving by sea, with the quantities declining nearer to the western escarpment (Khalidi 2007). Indeed the megalithic stones at Al-Midaman may also have been sourced here on the African coast (Keall 2004). Mocha/Mouza (Fig. 101) would have been the main port for the historic periods on the Tihamah but its earlier archaeological history is unknown.

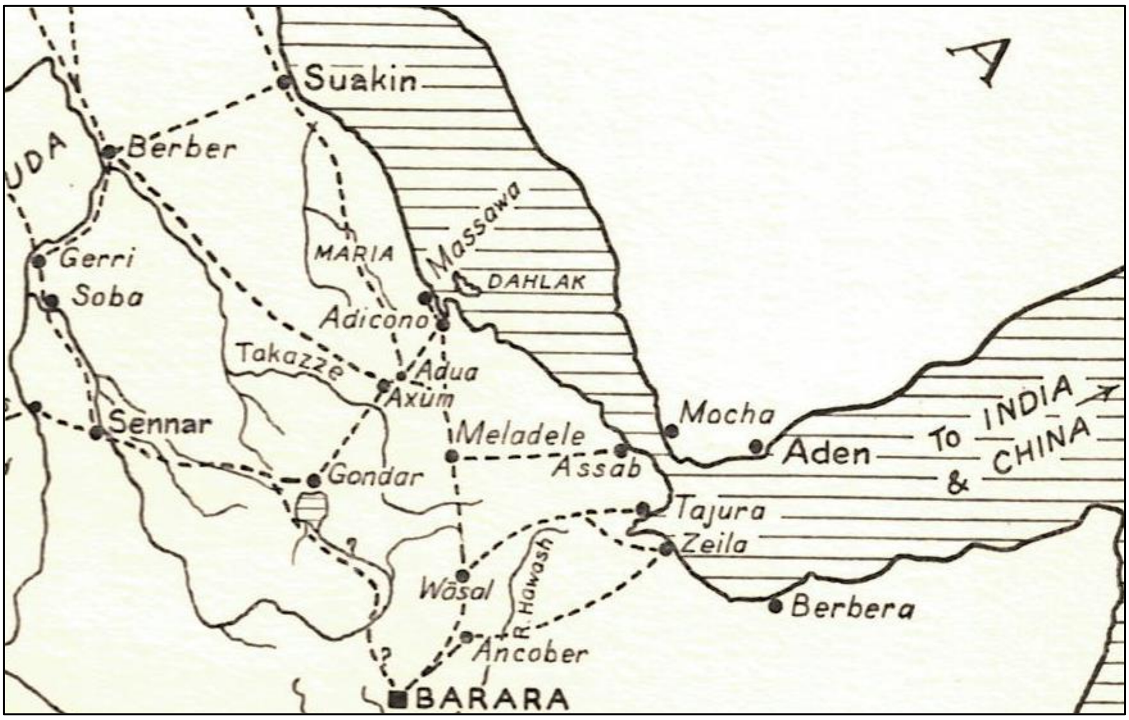


Figure 102. A detail from a map of trade routes in north-east Africa, ca. 1500 AD, showing the journey between Mekele (Meladele) through the Danakil to Assab and Mocha, and also from the Aksum-Yeha region to the Nile valley at Berber (Crawford 1958).

6.7.3 Sea Crossings

Broadly speaking January is one of the few good times to sail north on the Red Sea, whilst July is specifically not a good time to sail north (Peacock and Williams 2007; Facey 2004). The 126km from Beilul to Al-Midaman can be covered in three days sailing (Facey 2004), or as quickly as seven hours non-stop (Khalidi 2006a; 2006b), assuming a good crossing. A three-day crossing suggests breaking the journey at one of the Hanish islands which seems both logical and possible (Fig. 101). Continuous sailing without stopping is possible, but not really necessary, it would partly depend on the number of people available to sail, and sometimes row, the boat. The size of craft used to cross the sea isn't known but which Facey (2014) considered a dangerous undertaking, lives and craft would be lost on occasion, due to bad sea conditions, inexperienced sailors or both. The challenging sea conditions are impacted by Afar desert winds, a further result of the ITCZ (Fazzini at al. 2015), which from March and September blows to the south, and between September and March blows east–west (Facey 2004) and impacting north-south sailing channels along the Red Sea coast.

Because the Red Sea is a relatively narrow stretch of water the sea current and winds are often fierce creating perilous sailing conditions (Facey 2004). Sailing north at any time of the year is difficult and experienced sailors would stay close to the coastline avoiding the open seas. Sailing south is generally much easier and quicker. Sailing north-east via the Hanish islands mitigates some of the navigational difficulties but would still require an experienced pilot, who needs to avoid the reefs and sandbanks along the Arabian coastline. Most of the journey is in a north-east direction, against the wind, with the first section from Beilul difficult, perhaps necessitating rowing.

The sea crossing would have begun in the sheltered Beilul bay before gradually moving into open water. Beginning the sea crossing from Beilul has the advantage of navigating via the Hanish islands (Fig. 102) which can provide landfall in case of inclement seas. Approximately a dozen islands, or in some cases small rocky outcrops, begin 26km from the African coast and these are found in a linear trajectory when sailing north-east towards Al-Midaman. 85km of the sea crossing can be made in close proximity to one of the Hanish islands, hence avoiding the open sea for most of the distance.

The direction to Al-Midaman is due north-east which means the logical route is to sail to either the north or the south side of the Hanish islands (Fig. 102). The first of the seven outliers of the Hanish cluster is a tiny rocky outcrop, barely big enough to land on, but could be used to navigate by whilst sailing towards the bigger islands. Another six small outcrops are encountered whilst sailing eastwards, the biggest being 0.5km in length, before arriving at Al-anīsh al-Kabir (Great Anīsh), 18km in length with sandy beaches where going ashore is possible. Another 13km of sailing takes one to Al-anish al-Saghir (Little Anish) 17km in length and again with sandy beaches to go ashore at if necessary. From here the longest stretch of open sea, 34km, has to be crossed before the low-lying sandy shoreline of the Tihamah is reached. If starting the crossing further south from Assab (Fig. 102), but using the same route, this would extend the distance by 65km although logic would suggest first navigating north, close to the coast line, before turning east towards the Hanish islands.

6.7.4 Tihamah

In contrast to the Tihamah's north-south trajectory, the wadis Zabid and Siham flow down from the escarpment cutting east to west swathes through the landscape which would have to be navigated during rainy or monsoonal seasons. Chains of low sand dunes cover parts of the Tihamah (Fig. 103) but can be navigated round. The flora is primarily acacia, described as scrub and small bushes by the national agency of Yemen, the Survey Authority of Sanaa (YSA 2023).

Figure 103. A map of the main sites in the Yemen Tihamah and the routes that connected them.

The coastline at Al-Midaman is low-lying, flat, and sandy, facilitating easy landing and without the sebakh encountered further north around Hodeida. Indeed, the wadi Zabid empties into the sea at exactly this point, and whilst the wadi could not be sailed along it does provide an inland route 2km to Al-Midaman, which I have driven along. The entire Tihamah (Fig. 102) is extremely flat in this area with only sand dunes to hinder movement across the landscape. From the settlement the wadi leads inland for 25km before arriving at the modern city of Zabid (Fig. 103)**,** dating to 600 AD (Keall 1993), which given its location and the history of this coastline is certainly possible. As with the Temple of Yeha, however, the Great Mosque of Zabid marks an already significant place in the landscape. From Al-Midaman to Zabid is a little over one day's journey across low undulating topography and sand-dunes, the elevation rising very gradually over 25km from 6-7m at the coast to 100m in central Zabid.

In 2023 a tarmac road runs the full length of the central Tihamah linking Sabir with As-Salif in the north. In the south a road leads from the escarpment foothills to Mocha, where a road closely follows the coastline to Bab-el Mandeb before turning east along the Gulf of Aden towards Sabir. The coastline of Mocha is an interesting region with almost no archaeological survey undertaken there, however a small pre-Islamic inscription was found there, alongside the example at Al-Hamid, one of the few in the area (Phillips and Beeston 2005).

In the central Tihamah is the site of Al-Kashawba aka the Gas Station (Fig. 103), a two-phase site dated to both the first and second millennium BC thereby creating a broader long-term narrative for it than some Tihamah sites and also, therefore, being part of an older local exchange network. Obsidian, potentially from the Danakil, was found at Al-Kashawba, confirmed by Philip's (2007) excavation and Khalidi's survey (2006), suggesting that a route from Al-Midaman may have been in use for its transportation. The mudbrick walls encountered during our 2006 excavation (Phillips 2007) excavation were at a depth of 3m buried below layers of stratification including redeposited mudbrick, an ashy-lens, and the cut of a pit through the deposits, before bedrock was reached. The depth indicated in this part of the site, at least, there has been a significant build-up of deposits, therefore being able to identify an ancient route way on the modern ground surface is something of a futile task. The sites themselves and the relatively unchanged Wadi Zabid however demonstrates the route inland from the coast.

Travelling from Al-Kashawba to the temple site of Al-Hamid (800 BC) (Fig. 103, 104) means a direct north route is taken following the eastern periphery of the central Tihamah, through the acacia and low-level scrub. This route is at a relatively continuous altitude of ca. 115m asl for 86km until the Wadi Siham is reached and the raised slopes of the foothills present extensive views across the western Tihamah. From al-Hamid (270 asl), the local administrative or agricultural centre, the route along the wadi can be followed as it curves upwards into the escarpment and eventually onto the highlands.

Travelling from the coast at Al-Midaman to Al-Hamid, most likely visiting Al-Kashawba on the route (Fig. 104) is 125km, approximately, so 21km per day, at 5-hours walking per day, six days, based once again on Harrower's times for Tigray (Harrower et al. 2014). This route is a very flat landscape that does not encounter an uphill slope until the last 15km of the journey along the Wadi Siham where the elevation rises from ca. 115m to 270m asl, although most of the journey will be along compacted sandy surfaces occasionally interrupted by wadi's and alluvial fans.

6.7.5 Coastal Tihamah

To travel from al-Midaman north to the As-Salif peninsula is a choice between two routes (Fig 104, below). One route is as described above but instead of branching east to Al-Hamid, the route turns west towards the coast. From there a narrow route leads onto the peninsula, a maximum journey of 35km although this is an indirect way to travel between al-Midaman and as-Salif. A more direct route would be to follow the coastline from al-Midaman, ca. 140km away, although the present coastline has seen various changes since 800 BC (Khalidi 2006a; Tosi 1985). Along the coastline are areas of swamp, sebakh and sand dunes which need to be navigated around. A number of small lagoon-like features adjoin the coast would have made ideal places for anchorage or fishing for anyone landing on this part of the shoreline. In total the coastal route from Al-Midaman to As-Salif is a distance of 150km, with only 20 km difference, between it and the inland route.

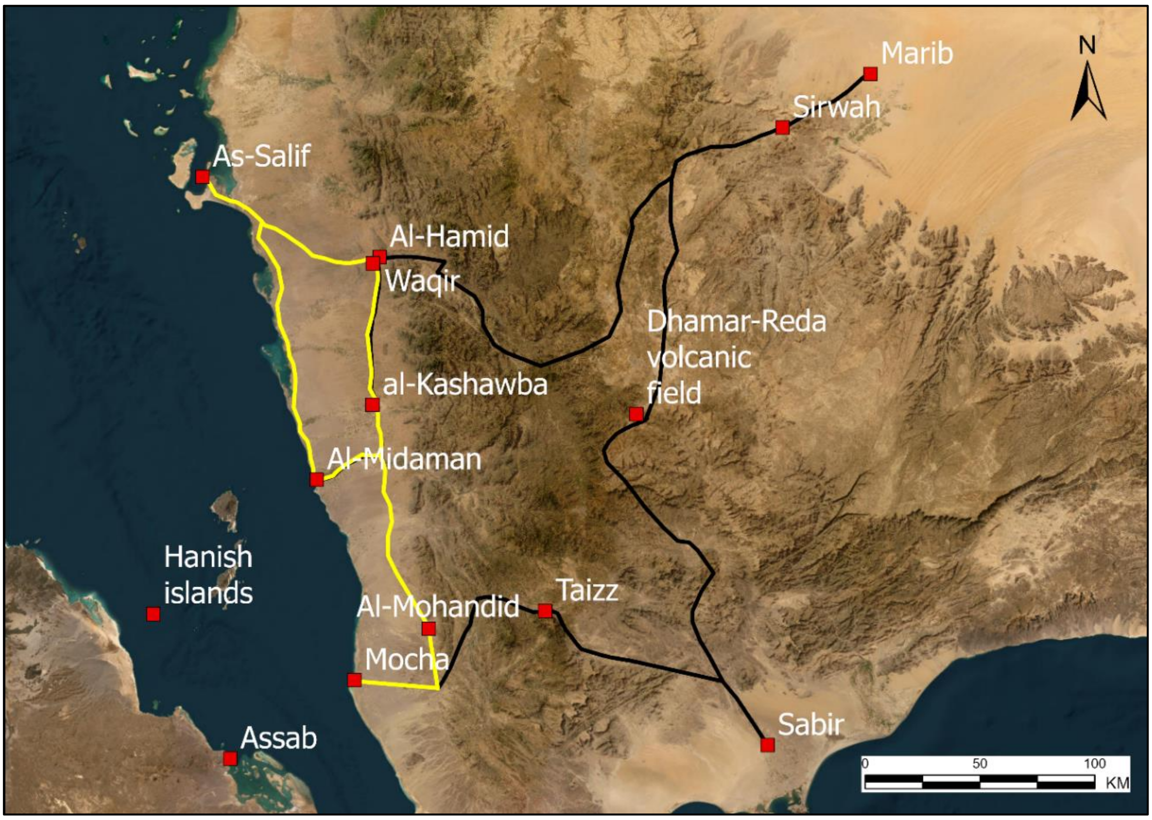


Figure 104. The yellow route links the coastal sites along the Tihamah whilst the black route links the Kingdom of Saba with the Tihamah, and Sabir, via the central plain.

If travelling south from al-Midaman there is once again the choice of a coastal route or an inland one which would probably be decided by the destination. If travelling 76km south to Al-Mohandid close to the foothills of the escarpment (Fig. 10), then a direct inland route is the most logical, and which I have taken. Departing from al-Midaman the route passes along the 25km to central Tihamah then turns south following the periphery of the desert and the foothills of the escarpment. Al-Mohandid is 31km inland from the coastline, which maybe significant given its designation as a cultural anomaly on the Tihamah (Khalidi 2006; Phillips 1999). Given the site's potential exogenous influences, and a second millennium BC date, it may also have been more closely associated with Sabir (Vogt and Sedov 1998) rather than the northern Tihamah sites.

6.7.6 Sabir

The inland route connecting to Sabir, potentially via the Tai'zz mountains (Fig 103, above), gradually ascends 70km from the Tihamah zig-zagging up through rocky outcrops to Tai'zz (1300m asl) dominated by 3000m Jebel Saber. From the modern city of Tai'zz however there is a long slow descent 115km across undulating but not challenging landscape to Sabir, north of the city of Aden. A total 185km would take ca. 30 miles per day at six hours per day. This journey extends the travel time suggested by Harrower et al. (2014) and it would be interesting to test it to compare the actual difference. I have driven the route in three hours.

The archaeological finds at Sabir (Vogt and Sedov 1998) indicate second millennium BC links with Nubia, the Ancient Ona culture and the Yemen Tihamah sites. Whether the Yemen obsidian source at Dhamar-Reda near the Isbil volcano contributes to this second millennium BC interchange circuit with Sabir is unknown but it is certainly possible given it relative proximity (Fig. 105). Obsidian from the Dhamar-Reda Isbil source has been geochemically identified in Egypt at Mersa Gawasis (Luccarini et al. 2020) in the second millennium BC (chapter four), indicating this volcanic source was being accessed. But as Khalidi's (2010) analysis indicates (chapter four, page p.142) this obsidian is only found on sites to the north of the Tihamah, or overseas as we see in this example in Egypt. The present-day journey from Sabir to the Dhamar-Reda volcanic source is 200km north (Fig. 104), via a tarmac road linking both locations in five hours

6.7.7 Asa Koma (Republic of Djibouti)

This site in the southern Afar desert (Fig. 105) (Manzo 2010), an extremely remote location on a basaltic hilltop, has been radiocarbon-dated to 3900-3630 cal bp (1950-1680 BC) and 5570±35 bp (4461-4345 BC) (Newton et al. 2008). Ceramic evidence from the second millennium BC has parallels with the phase 1 ceramics from Sabir-Ma'layba (Manzo 2010; Raunig and Wenig 2005). What is described as "local obsidian" (Newton et al. 2008, 89) from a tomb was also found here although it is not clear on what basis Newton et al. classify this obsidian and local source. The site is 60km inland from the Red Sea, which is not a long distance, but is a topographically difficult one, and 200km southwest from Assab, and Beilul, hence quite distant for much of this discussion. Activity in the second millennium BC was taking place in the Horn of Africa as highlighted by the new Mezber Pre-Aksumite chronology (D'Andrea et al. 2018).

A direct sea crossing from Africa to the Gulf of Aden (Fig. 105) was possible although given the strong currents at this location (Facey 2004) quite challenging. A probable route considering the difficult seas currents, would be sailing along the coastline to Bab-el Mandeb and then north-east along the Gulf of Aden and inland Sabir. As discussed earlier, connections between Asa Koma and Shalao (Phillips 2018) are also probable.

Figure 105. A map of the Gulf of Aden showing Shalao and Asa Koma, as discussed in this section, and their relation to the sites in Yemen and Eritrea.

6.7.8 Adulis to Egypt

The landscape along the coastline north of Adulis, as seen with remote sensing, is almost completely flat and low-lying (6m asl) for hundreds of miles with very little modern occupation, but also without any challenging topography to contend with. From Adulis moving north along the coast the small villages of Suakin, Erkowit (Bashir 2017; Wahida 2003) (Fig. 106) and eventually the Egyptian border town of Berenike is reached, the latter being especially active during the Roman period. There is a notable absence of archaeological sites along this coastline, hence it would have been a difficult journey for travellers to make without opportunities for trade, raising the question of whether the route would have been feasible. Zarins (1996) favoured a sea rather than an overland route and, if the Adulis-Suakin-Egypt coastline is the journey, he may well be right. But this doesn't consider the overland route via Mahal Teglinos (Fig. 106). Given its pre-eminence as a second millennium BC trade centre (Manzo 2020), an overland route connecting with the Nile valley could well have passed through here.

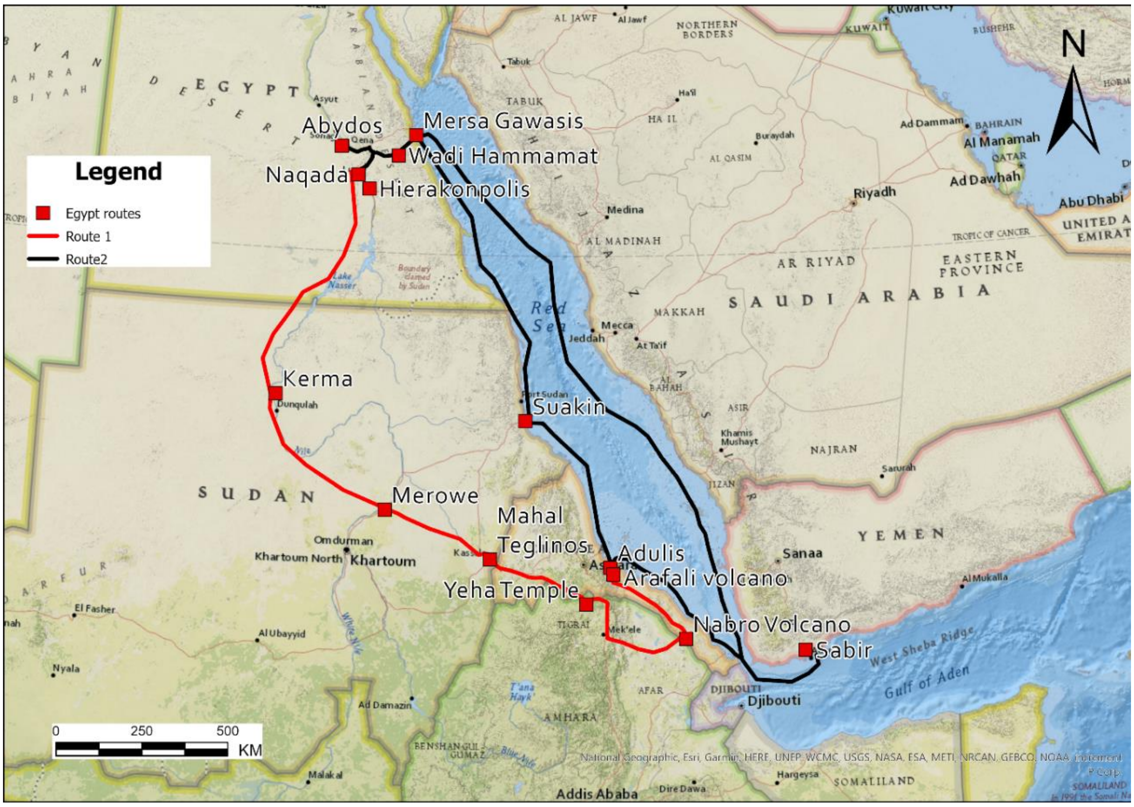


Figure 106. Two of the proposed routes used between Tigray, Tihamah and Egypt, an overland route (1) in red, and a sea route (2).

The Egyptians had been undertaking regular expeditions to the Red Sea coast from the Nile valley since Naqada I (3900-3500 BC) (Zarins 1996; Kaiser 1961). The evidence cited for Egypt's relationship with Punt perhaps tells us more than it has usually been taken to indicate when closely examined. The hieroglyphics at Queen Hatshepsut's Theban mortuary temple presenting Punt are well attested to and relatively uniformly interpreted (Kitchen 1993; Fattovich 2018). Further Puntite evidence however is apparent in a visit made *to* Egypt *by* visitors, the aforementioned Genebtiu (chapter three, page 117) from Punt, in a reversal of the better-known Egyptian trade journey. Under the reign of Tuthmosis III (1430-1420 BC) Theban Tomb 143 (J Phillips 1997; Kitchen 1993) depicts visitors from Punt arriving in a series of boats (Fig 107, below). Two large raft-like boats are manned by at least four sailors, each raft complete with one black triangular sail supported by a single mast and steered by a single oar at the stern (J Phillips 1997). These appear to be quite small vessels which may have been practical on the river Nile but perhaps inadequate, or unsafe, for the Red Sea.

We are not always able to take the Egyptian hieroglyphs at face value however due to the proclivity of the Egyptians to exaggerate, or otherwise enhance, what is depicted, or simply to portray propaganda (Simpson 1982). This image (Fig. 107) was created specifically to fit the scale of the hieroglyphic register as is clear when we compare the scale of the boat and its passenger with the scale of the other individuals shown on the rest of the register. There is no doubt that the entire register has been scaled so that the numerous impressions can all be seen simultaneously. Still, even in relative terms, the vessel must be quite small, perhaps measuring 15ft in length although we can only estimate the width as it is not shown, perhaps 8ft, approximately the size of the present-day Egyptian felucca. With 4 or 5 people, as depicted, this is not a vessel for a long-distance voyage unless it was safe to sail very close to the shoreline to minimise rough seas. This sounds problematic as having personally travelled along Egypt's Red Sea coastline it is rough at the best of times. With this image however the question then arises that if the travellers from Punt had a sailing vessel which could reach Egypt, where were they sailing from? If they are sailing from the Arabian coast, perhaps Sabir (Fig. 106), they could also sail across the Red Sea to visit the Eritrean coast, perhaps at Adulis, to trade obsidian. Navigating via the Hanish island is the safest option, if not shortest, for crossing between African and Arabia. They could also sail, I suggest, from near to Sabir via the Babel-Mandab straits, 25km to the African coast (Fig. 106), but there is no archaeological evidence on either coast to support this argument.

At the Sethos I temple in Abydos (1290 BC) an inscription records a visit of traders from Punt which refers to boats 100 cubits long, equating to 180ft, (Kitchen 1993) laden with myrrh from "God's Land" (Shaw and Nicholson 2008, 258) an epithet used by the Egyptians when referring to Punt. This is a substantial sized vessel, which if accurate, could be a sea-going vessel. This is significantly larger than the smaller vessels referred to at Theban Tomb 43 (Fig. 107) and would be capable of sailing from Punt to Egypt or, an even shorter journey, from Arabia or Punt, to Adulis, or Beilul (Fig. 107). No image of the vessel is shown; therefore we have no way of knowing whether the stated size of 100 cubits is accurate. The nature of Egyptian hieroglyphic representation (Shaw and Nicholson 2008, 146) means however that even if an image were available we could not rely on it being an accurate depiction of the vessel's true size. In contrast the Solar barque buried at the Giza pyramids is 142ft in length (Ward 2000), whilst the ships shown in the reliefs of Hatshepsut's temple are estimated to be 60-75ft in length (Ward 2000). These sizes suggest that some exaggeration is perhaps shown in the boats depicted at Abydos. But it does present us with some visual evidence of what type of craft may have been in use.

As in other chapters of this PhD the elusive location of Punt is present, again alluding to regional activity in the second millennium BC. Although Punt (Fig 108, below) is not a central issue in this research it is one that, taking the regional picture into account, cannot simply be dismissed. Its presence hovers in the background of this thesis discussion. As Keall (2004) suggests perhaps some Tihamah origins may be found here.

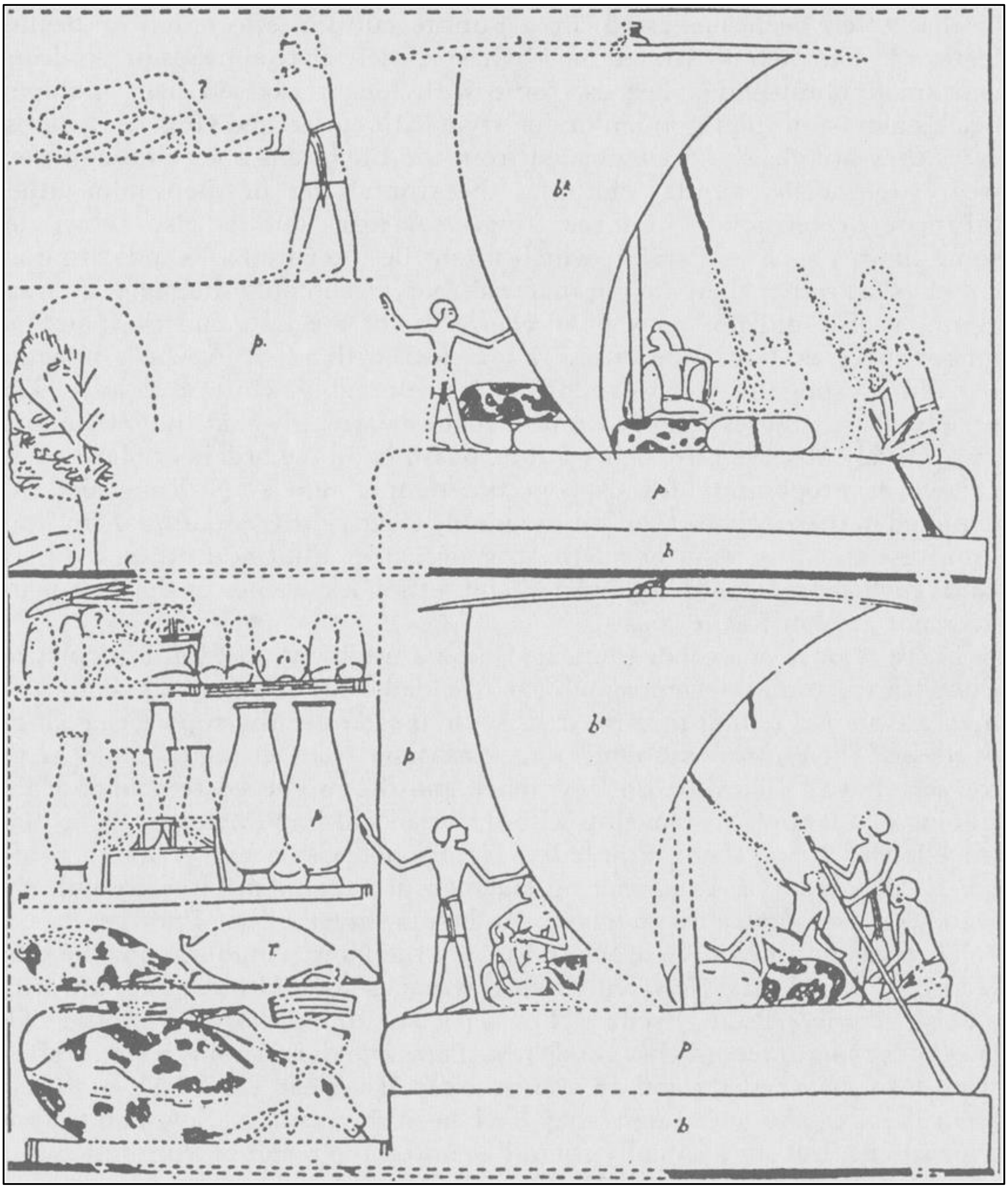


Figure 107. A wall scene in TT 43 (Tomb of Min) at Thebes showing Puntites arriving by boat. The letters signify the painted colours. From T. Save-Soderbergh, 1946, The Navy of the Eighteenth Egyptian Dynasty (Uppsala and Leipzig) (J Phillips 1997).

Figure 108. A hypothetical map of the cities of Punt.

6.7.9 Desert routes

The desert routes through Egypt from the Red Sea can be attested to from the earliest of times with petroglyphs, graffiti, and prehistoric rock art (Sidebotham 2011) indicating routes through the most challenging and inhospitable desert. These markings are frequently found in shaded places, most likely resting places on well used routes. The Wadi Hammamat became, and still remains, a primary routeway from the Nile valley, at Thebes, to the Red Sea harbour of Mersa Gawasis (Fig. 106) from as early as the Naqada I period (Kaiser 1961), and more regularly during the Old Kingdom and Middle Kingdom, due to its abundant mineral and hard stone resources leading to large scale quarrying (Bloxam 2015). One of the earliest known Egyptian maps, now in the Turin Museum, Italy, shows the Wadi Hammamat, depicting the gold sources and mining opportunities in the wadi (Harrel and Brown 1992).

The presence of obsidian at the town of Coptos at the west end of the wadi is indicative of the route being used to travel from the Red Sea to Abydos and Naqada where obsidian was found in late predynastic burials (Aston et al. 2000). The Wadi Hammamat is famously attested to as part of the route used by the expedition to Punt as recorded in the Theban funerary temple of Queen Hatshepsut, at Deir el-Bahri (Kitchen 2004). The journey begins at Thebes before moving overland to Mersa Gawasis (Luccarini et al. 2018; Manzo 2012) on the Red Sea, then south, sailing close to the Arabian coast due to strong currents (Facey 2004), and onwards to the Horn of Africa (Fattovich 2018; Kitchen 1993). Ceramics from Sabir found in a New Kingdom context at Mersa Gawasis (Manzo 2012) suggest that the Egyptians were sailing by the coast of Yemen on their return journey from Punt (Fattovich 2018) but there is still an absence of Egyptian evidence on the Tihamah coast. Obsidian provenanced from Yemen's Dhamar-Reda volcanic field (page 141) is also found at Mersa Gawasis (Luccarini et al. 2020).

Geographically therefore "Punt would be the way Egyptians described it" (Keall 2004, 53) but with cultural links further south, especially on the Arabian Tihamah which, as part of Punt (Fig. 108), was the source of Egyptian incense (Creasman and Yamamoto 2019). The incense here may, however, have already been imported from Asa Koma in Djibouti (Joussaume 1995). Given the distance and the history of this coast regarding sailing trips to Punt it would seem logical that trade between Adulis and Egypt was by boat. As noted however navigating north along the Red Sea is and was a challenging undertaking (Facey 2004), but one which the Egyptians had evidently mastered.

Journey	**Distance**	**Travel time**
Adulis- Aksum (Least cost)	175km	8 days (Casson 1989, 53). 175km 8 days, 5hrs per day, (Harrower and D'Andrea 2014)
Adulis-Addi Ahoune-Aksum	206km	3 days (Raunig 2004)
Adulis to Qohaito	60km	3 days (Raunig 2004)
Aden to Massawa	750km	12 days sailing, slow
Africa to Arabia, Beilul-Midaman.	126km	3 days sailing. (Facey 2004).
Beilul to Nabro	90km	Land – 4 days, 22km per day.
Nabro to Desi'a.	300km	14 days
Nabro to Wakarida	220km	10.5 days
Atsibi Wemberta to Meqaber Ge'awa	28km	1 day
Atsibi Wemberta to Dallol	76km	4 days
Desi'a to Meqaber	31m	10 hours
Meqaber to Ona Adi	80	13 hours 4 days
Ona Adi to Yeha, via Kerseber	55km	2.5 days

Ona Adi to Yeah via mountains	87km	4 days
Ona Adi to Adulis	100km	5 days
Adi Ahoune -Yeha	68km	3 days
Yeha to Mai Adrasha	85km	4 days
Mai Adrasha to Mahal Teglinos	265km	12
Yeha to Nabro	520km	24
Yeha to Beta Semati	11km	1.5 hrs, good path (Harrower 2020).
Mahal Teglinos – Agordat	180km	8 days
Agordat to Ancient Ona sites	115km	5.5 days
Ancient Ona sites to Adulis	75km	3 days

Table 11. A summary of the travel distances and times for the journeys that I suggest in this chapter. Where travel times do not have a citation I have estimated them based on Harrower and D'Andrea 2014.

6.8 Conclusion

The movement that is visible at this time is driven to a significant degree by the procurement and exchange of obsidian, dating to 3000 BC in Egypt and 5000 BC in Yemen and predating the trade of Arabian incense (Singer 2007). Connah is wrong in his assessment of Tigray being isolated (2001), despite geographical appearances to the contrary. Tigray, partly as a consequence of the obsidian, and much later, potentially, incense, trade was in fact a busy regional crossroads, as indicated in table 10 (page 241). Sabaean's were arriving from the east, trade from the Ancient Ona culture was arriving from the north. There is some evidence for links with Nubia and the Nile valley, all of which contribute to the emergence of the Pre-Aksumite in 800 BC at the crossroads that are Tigray. Economically and culturally therefore Tigray was not isolated. The populations of the Horn of Africa and the Red Sea regions were arriving in Tigray and contributing to its development, and with the evidence of the second millennium BC, slow though it is to emerge, suggesting that more activity was taking place earlier than the archaeological record currently indicates.

The routeways that I propose during this chapter, identified by the presence of obsidian, indicate which journeys were being made during the first, but also the second, if not the third, millennium BC. The combination of Sabaean material culture and obsidian are frequently found at the same sites, and are often both absent at other sites suggesting, as discussed above (page 225), a dichotomy in the fealties of trade or local political affiliations and allegiances.

Considering the evidence for the Ancient Ona culture in southern Tigray (Benoist et al. 2020) it is all the more surprising that there are absences of Sabaean influence at some of the *same* sites. This might be attributable to political tensions between different settlements, or potentially that some settlements were not involved in the obsidian trade or at least the down-the-line aspect of it. It may be that the trade was direct, and therefore, bypassed some settlements on its way to other places in Tigray. Despite this there is more evidence for Sabaeans in Tigray, and connected to the Danakil obsidian sources, than there is further north in Adulis and the Gulf of Zula.

Obsidian was not the single contributory factor in shaping the social complexity of the first millennium BC, I suggest, but it is the most archaeologically identifiable. It may have been the rarest of the resources used in Tigray and therefore perhaps the most valuable precisely because of its unique source. Obsidian was highly valued, although its value is unknown, by the populations on the Yemen Tihamah who were receiving significant quantities transported across the Red Sea. In return a cultural transfer (Gerlach 2009) was taking place with Sabaean ingenuity assisting in the creation of built structures, the Great Temple of Yeha, and the Meqaber Ge'awa temple. So, these twin agents, obsidian and Sabaean influence, were creating physical routeways across the Horn of Africa but particularly from the Red Sea coast to the Danakil depression and into the Tigray highlands. The economic and cultural stimulus from this interconnectivity gave rise to the growth of social complexity that shaped the region.

Whilst I agree that we will likely never know precisely the most commonly travelled routes (Harrower and D'Andrea 2014), there is scope for identifying some of them. I have attempted to do that throughout this chapter, based partly on direct experience of the sites and locations, but backed-up using remote sensing (Googe Earth Pro). I am confident that in using this combined approach the routes and journeys that I suggest here can be physically undertaken. The routes through the region were long distance and were in use for millennia before the Pre-Aksumite. Tigray is a regional hub, a crossroads, from which movement extends outwards (Table 10) connecting with the Ancient Ona culture in the north, Mahal Teglinos in the north-west with its links to the Nile valley. It connects to the Danakil depression, sometimes via the Meqaber Ge'awa temple, through the escarpment, to Nabro volcano, and routes which then connect with the Red Sea coast and links to the Yemen Tihamah. Some of these are long distances journeys hence specific individuals may have only been undertaking part of them.

In such formidable mountainous, or desert, topographies can we expect ancient trackways to still be visible when they are likely to be ephemeral, at best? The natural development of a three-thousand-year-old landscape, even if minimal, will eradicate anything without any structural integrity to it. Modern roads do follow many of the ancient routes as I show in (Fig. 88) simply due to a lack of other suitable options. Similarly, the contemporary salt trade (Woldekiros 2019) follows some of the former obsidian trade routes as discussed in the last two chapters. This also applies to boundaries, whether political or personal, local or regional, water sources, well/springs, agricultural, economic, religious, and land ownership. Boundaries existed within all of the landscapes discussed but identifying where they were is not now easy. Some of the ancient pre-first millennium BC trackways have, simply by their existence, created boundaries if we are able to recognise them. As populations expanded these boundaries became more entrenched impacting on methods of trade, and whether this was direct or down-the-line.

Both a practical and a sacred perception of the landscape, accessed by phenomenology, existed simultaneously, potentially further blurring those boundaries. The location of contemporary churches in Tigray (Henze 2005), the monastery of Debre Damo for example, may be built on sites with a special importance within the landscape, with ancestral histories and myths. Modern churches in the Kerseber valley (page 214**)** are notable for the scatters of Pre-Aksumite ceramics around them (Henze 2005), as our 2019 reconnaissance survey indicated, creating a connection with the ancient past. Cemeteries, the burial of significant individuals, specific topographic features, special trees, myth, memory, all combine to create ancient landscapes and boundaries (Tilley 2006). All are connected by routeways or paths, for which it is the challenge of archaeology to identify by understanding the landscapes of Tigray and Tihamah.

Ground truthing of these proposals is of course necessary but was precluded by the COVID-19 pandemic, and the military conflict in Tigray. At such a time as it is possible, I plan a program of fieldwork and ground-truthing to test the theories proposed in this chapter.

6.9 Outcomes

- The modern tarmac routes in many places discussed in this chapter, indeed throughout this PhD, follow very closely the routes that were in use three thousand years ago as the maps I have produced in this chapter indicate.
- The “least-cost” route is often not the most obvious route being taken (Harrower and D’Andrea 2014) if a more beneficial, and easier, option, is available.
- Remote sensing is used as a guide for the identification of archaeological sites and potential routeways but ground-truthing is essential to confirm my suggestions. Further fieldwork walking along some of the routes discussed here is required to demonstrate realistic journey times.

- The Tigray climate was probably wetter three thousand years ago than it currently is (Terwilliger et al. 2010, hence impacting, at least seasonally, the accessibility of some of the routes suggested in this chapter.
- I propose that the modern salt trail has echoes of how the ancient obsidian trade would have functioned. The commodity is different but the landscape, the routes used, and the mode of transport are very similar.
- Meqaber Ge'awa must have been a part of D'mt. It is a logical node on the route that visiting Sabean travellers would have used, arriving from the Danakil and linking to Nabro volcano and the Tigray highlands.
- Adulis was probably a second millennium BC hub of Red Sea trade (D'Andrea et al. 2004), but further excavation is required to confirm this.
- The outcome of the trade in obsidian, the culture transfer between Tihamah and Tigray, the interregional relationships engendered through this interconnecvity are factors of the Afro-Arabian Interchange Circuit as suggested by Fattovich (2004).

Chapter Seven

7 A Red Sea meshwork; going beyond the evidence.

This short chapter considers theoretical approaches to landscape and movement as it was presented in the previous two chapters. The chapter is organised in two subsections discussing how we can understand people's use and movement through the Tigray and Tihamah landscapes.

The places that become archaeological sites are, in the first instant, chosen for specific reasons. The locations of sites are not random choices, they are selected because of having a good water source, perhaps the mountains offer protection, the site may be located on a trade route, or there may be a history of ancestry (see p.171) in the area. All of these factors apply to both Tigray and the Tihamah, where the trade of obsidian derives from, is a part of the landscape, and shapes the movement and human activity that the archaeology records.

As an archaeologist, understanding the uses and movement across a topography requires an awareness of landscape archaeology which has been developed particularly in relation to British and European Prehistory (Bruck 2005; Bradley 2000; Tilley 1994). This might seem a contradictory approach but is the one best suited to landscapes of the Horn of Africa and South Arabia where landscape archaeology has so far had very little application (Wynne-Jones 2015). This is partly due to phenomenology, a component of landscape theory, being out of academic favour over the last two decades (Johnson 2012; Bruck 2005). But it is also due to the relatively sporadic fieldwork undertaken in some countries and the lack of opportunity, or desire, to pursue a theoretical path (McIntosh 2008). Much of the field archaeology in the Horn of Africa, and South Arabia, is of a processual model with the style of archaeological excavation being a traditional one.

African researchers tend to dismiss western "sequential research typologies" (McIntosh 2008, 85), with the continent pursuing its own path, but its archaeology still remaining largely unknown by most researchers beyond the continent. In fact, argues Macintosh (2008), African archaeologists favour landscapes as "layered social and symbolic transformations, as holistic, deep-time fields of multiple perceptions" (2008, 85) which takes them, theoretically speaking, into a phenomenological arena without actually using the term. I actively use phenomenology throughout this thesis to understand what is not always apparent from the physical remains of a site.

The landscape of Pre-Aksumite Tigray is one of its defining characteristics. Tigray is a mountainous and challenging region to live in and travel through. Modern roads have made access easier, they may even follow the ancient routeways in some instances, but in the first millennium BC it involved finding the easiest and most navigable route possible, some of which might have been in use for hundreds of years, if not longer. Whilst there was movement of people through Tigray prior to the first millennium BC (Fattovich 1990b) this was not on the scale seen along the Nile valley for example, this latter being a considerably easier area for settlement and mobility. What appears to change this, as I have suggested throughout this thesis, is the growth of the obsidian exchange network ca. 800 BC (Khalidi 2009). As the exchange mechanism of obsidian becomes better understood so too does our comprehension of how people were using the landscape. The high altitudes of the Tigray highlands are side-by-side with the extreme environments of the Danakil depression which are contrastingly flat and with some of the lowest altitudes, and highest temperatures, anywhere in the world (Fazzini et al. 2015). The procurement of obsidian originated in, and was moved through, this demanding landscape. Hence movement and mobility start to become a defining factor in understanding the region and the emerging social complexity of the early first millennium BC. In the context of this Phd this is the physical undertaking of moving a heavy weight from its source to its destination across a challenging topography. Applying principles of, phenomenology**,** is a way to figuratively walk through this landscape.

Because of the interregional obsidian trade, people's movement through the landscapes of Tigray and Tihamah, is a central theme of this PhD. The presence of obsidian at archaeological sites goes some way to indicating where journeys were being taken, and how difficult they would have been. The use of remote sensing, as discussed in chapter six, helps define the routes that these journeys took, but this is built upon my direct experience of walking and travelling through all of the landscapes discussed here, and without which I could not arrive at these conclusions.

The archaeological sites in this thesis, analysed phenomenologically, began as natural landscapes, without monuments (Bradley 2000). By 800 BC structures begin to appear at each end of the trade route between Tigray (Yeha) and Tihamah (Al-Hamid), and in-between at Meqaber Ge'awa. The Ethiopian Temple of Yeha marks the most western point of this trade route whilst the temple at Al-Hamid appears to mark its eastern most point in Yemen (Fig. 109).

What ensues during the first millennium BC, between all of the regions involved in the cultural and economic exchanges, is a "meshwork" (Ingold 2011, 79; Hunter 2019). This is the "patterns of connectivity between people, places and ideas" (Bell 2020, 25) which in Tigray, created the obsidian exchange network specifically, contributing to the Pre-Aksumite economy and culture: it is a Pre-Aksumite meshwork that we see in Tigray.

Figure 109. Regional map indicating the main routes in use during the first millennium BC.

Landscapes are “as much the work of mind and memory as the topography which is created by layers of rock” (Bell 2020, 10). Bell is a bold advocate of phenomenology (Tilley 1994) and that by applying the theory to landscape and movement, as in this thesis, we can indeed go “beyond the evidence” (Bender 1998, 7) and, in doing so, create an analytical environment in which movement can be explored. Aldred (2020) discusses similar theoretical territory in a quite different, but complementary, way to Bell, focusing more on the archaeological record as a way of understanding movement and the processes that the archaeological record goes through by the time we have excavated and interacted with it ourselves.

7.1 Regional movement and natural landscapes

Fattovich (2012) suggests that D’mt develops as a result of the long-term historical processes resulting from interconnecvity between the Mediterranean and the Indian ocean, hence via Egypt and Arabia. The Horn of Africa is drawn into the long-distance interaction of the region at a “macro-scale” (Fattovich 2012, 34) as a consequence of the following circumstances:

A) shifts from Africa land routes (4^{th}-3^{rd} millennium BC) to

B) Red Sea maritime routes (2^{nd} millennium BC) to

C) Arabian land routes (late 2^{nd} millennium -1^{st} millennium BC), then to

D) Red Sea maritime routes connected to Indian ocean maritime routes (late 1^{st} millennium BC-early first millennium CE.

Fattovich's (2012) categorisation applies to the broadest period under discussion in this thesis, 5000-400 BC, but two specific strands apply to the Pre-Aksumite, points C and D, the shift between land and maritime routes. In this discussion, therefore, the interaction between Egypt, the Horn of Africa and South Arabia, is defined by the obsidian trade, some of which would have been sea-borne. The Arabian land route, the incense trail, connects South Arabia to the Levant, Sinai, and Egypt (Sidebotham 2011; Groom 1981). By the first millennium BC however, both the overland and the sea route would be in use concurrently with the growth of regional trade. Therefore the development that Fattovich proposes, above, is not as well defined as he suggests.

The movement of a resource, across challenging and demanding landscape, is at the core of this study of how the procurement of obsidian developed by, and during, the Pre-Aksumite. Nabro volcano is at the centre of the first millennium BC landscape, and the interchange network. The ancient Tigray landscapes are a creation defined by people, their past actions, events, rituals, myths, processional ways, transition points, places, water sources, many of which are not now easily identifiable. From a phenomenological perspective, attempting to interpret the natural landscape (Bradley 2000) is a core element of understanding Tigray. It is a theoretical framework for extrapolating from the evidence and attempting to see the sites and the landscape through the eyes of the people residing there in 800 BC.

When visiting Yeha temple, the surrounding landscape is such an imposing one that it is difficult not to think that the location was chosen because of its unique round-topped mountain setting (Asrat 2009). Here a significant natural landscape has been transformed by an imposing monument which has then become a central place of importance (Bradley 2000). The prominence of Yeha created a central place in Tigray and for its polity, D'mt, around which the growth and development of the Pre-Aksumite coalesced.

The landscapes of Tigray, and the Danakil impacted those living and working there, defining both their working and domestic lives. Chapters five and six investigated the impact of the landscape on ancient populations and shown that over the last three thousand years people have been, in many cases, using the same routeways. Yeha and Nabro, two of the most important places in the region, created an axis around which trade activity, the economy, and the political system developed. This is also borne out by the evidence of exogenous populations, specifically the Sabaeans, and the Ancient Ona to a lesser degree, and the interconnectivity that they established with Tigray.

Although he is primarily discussing European landscapes Bradley (2000, 106) highlights the ways in which natural landscapes are characterised by the creation of monuments built on them:

a) It transforms a place with an established significance and then transforms the way the location is experienced.
b) The change impacts the scale of a place and makes it much more visible within the landscape, potentially visible from other places or other monuments.
c) It can invest significant natural places with additional layers of symbolism.
d) The monument assumes the significance that had previously belonged to natural places.

This is what we see taking place at Yeha, Meqaber Ge'awa, Al-Midaman, Al-Mohandid, even at Nabro volcano. All of these are places of significance that have had, with the exception of Nabro, monuments constructed at them. The value of obsidian however locates Nabro, a significant natural monument in its own right, as an important centre of the exchange network, connected to the sites receiving obsidian.

7.2 The Importance of Place

All of Bradley's (2000) characteristics listed above can be identified at Yeha. The importance of the *place* led to the construction of the three structures which now constitute Yeha - the Temple, the Grat Be'al Gebri palace, and the Southern Tombs at Da'ero Mikael (Fattovich 2009). The pre-temple deposits, dated to 850 BC with Sabaean ceramics (Fattovich 1990a), attest to the earliest date the site was occupied (Robin and de Maigret 1998; Fattovich 2009). What the initial Sabaean connection to Yeha was is unclear, whether there was trade in obsidian, or perhaps incense. But a trade route, linking Yeha, Tigray, and Tihamah, is at the core of first millennium BC interconnectivity.

The locations of Yeha, Meqaber Ge'awa, and Al-Hamid, three temples sites, are landscapes of memory (Ashmore and Knapp 1999). The location is held in association, potentially, with being sacred to an event or a memory linked with a deity (Dallas 2020) or an ancestor. Or, from a more functional perspective, through trade purposes. Yeha may have been where the Pre-Aksumite was established, hence the mountains, the high places, the natural landscapes, became mythical, perhaps religious places (Bradley 2000) associated with origin myths. If so it makes sense that Yeha's significance should lead to it becoming the capital of the proposed D'mt polity (Michels 2005; Fattovich 1990a).

A *place* within a landscape is how we often refer to and understand somewhere that we are discussing or have visited. It is, however, to apply phenomenological reasoning, places that create landscapes (Tilley 1996; Ingold 2000). Human beings perform activities that reproduce and express their sense of place and their understanding of who and what they are. Place then creates space, whereby individuals' activities create places that are familiar and where "space comes to have meaning through practice" (Wynne-Jones 2015, 59; Deverenski 2002). For example Yeha, and Meqaber Ge'awa, are places with temples and, subsequently, significant activity. Nabro volcano may have been a place of special significance (Oppenheimer et al. 2019), because of the resource that was produced there, hence the creation of the Tigray to Tihamah axis, focussed on this unique resource.

Yeha, and Meqaber Ge'awa, temples are examples of "the architecture of power" (Fattovich 2014, 96) whereby the elite build structures to implement their ideology. This in turn helps transform power into institutional authority, represented as D'mt, and at Yeha might indicate that the leaders wanted to establish a well-defined social space by isolating themselves within the ring of mountains surrounding the temple (Asrat 2009). Tilley (1994) suggests that an already encultured natural landscape is refashioned by monumental construction, whilst Bradley (2000, 152) argues that some original importance is always retained, that the finished work, in this case Yeha, celebrates a shared body of knowledge that may be fundamental to local identities. Both of these ideas are manifest at Yeha although we do not fully comprehend what the local identity actually is. Three thousand years ago both of these temples may have been perceived as part of a sacred landscape, and related to Nabro as the source of obsidian, a precious artefact representing the appropriation of nature (Pikirayi 213), and with links to the ancestral world (see p.171).

To extend that analogy further, phenomenologically, Pre-Aksumite "space and time comes together in place" (Casey 1996, 51); places that are "lines" (Ingold 2000, 233) creating a way of life, of movement across the landscape. For the purpose of this thesis, Yeha is the centre of that phenomenological approach, for which not all the evidence is visible. The lines are those of the trade, of the individuals, transporting the obsidian between places, between temples, between ideologies, represented by Yeha, Meqaber Ge'awa, Al-Hamid, Al-Midaman, and Nabro volcano.

The concept of signature landscapes (Wilkinson 2003) is useful in identifying the Tigray, and Danakil, landscapes. The signatures of the Tihamah, Tigray or the Afar (Fig. 108), are distinctive whether they are desert, highland, volcanic or coastal. Obsidian is, therefore, the signature of the Afar, the source of the artefact that is being procured and exchanged. The entire route from Yeha to Al-Hamid, temple to temple, was a signature landscape, the signature being the obsidian, the agent, that can be accounted for at each stage of the journey.

Long distance trade routes, for example the Silk route, represent movement on a huge scale where spaces are “perceived, encountered, remembered and made meaningful” (Franklin 2020, 854) through the embodied experience of people in motion. Trade and exchange in Tigray, as in Asia, was “mediated by construction of and movement through these landscapes” (Franklin 2020, 854). Hence movement, perception and memory, the signature landscapes, were guiding principles of mobility, learned by those undertaking the journey or passed on by those already familiar with them. Individuals familiar with the route and the landscape would carry their own mind-maps created by, and following, the signature of the obsidian from Nabro. The guiding principle in this movement would have been visual, embodied ways, where smells, tastes, textures, and temperatures would have contributed to perceptions of the landscape (Franklin 2020). Once again this is a phenomenological approach to the landscape (Tilley 1994) that helps us see beyond just the archaeological remains. This would be especially so when crossing the Danakil depression, with the strong smell of sulphur at the hydrothermal springs (Fig. 110, 111), and the salt flats of Dallol. An individual travelling from Yeha to Nabro, or along the Silk route, would experience a succession of landscapes which are in turn “layered” (Franklin 2020, 853) in the memory deepening the temporality of the landscape for those moving through them.

Figure 110. An example of the signature landscapes of the Danakil depression. Photo, Richard Lee (2018).

The regional movement would have created places, a nexus, for trade and exchange. The places where the meetings occurred, for example at Ona Adi, Yeha, Al-Hamid, or Al-Midaman, the crossing places of long-established, distant routes, are likely to have accrued a special status through time (Leary and Bell 2020). For those visiting the actual sources of obsidian, the locations may have been seen as sacred or liminal spaces (Walsh and Mocci 2011) perhaps imbued with supernatural powers (Benoist et al. 2020; Pikirayi 2013). The obsidian at archaeological sites mark the route along which the material was moved, which would be “small local and regional circuits embedded one into the other” (Sernicola and Phillipson 2011), hence down-the-line, rather than direct, trade, with, as Dumitri (2020) notes, an absence of elite control for the network.

Figure 111. The vivid colours and smells of the hydrothermal vents in the Danakil depression. Photo, Richard Lee (2018).

Moving through Tigray there is no shortage of characteristic amba's and mountaintops best exemplified by the unique dome-like hills surrounding Yeha, or the high peak of Amba Fekada, near to Ona Adi. Indeed, from the summits of these mountain-tops, long distances can be viewed so navigating from mountain to mountain was possible. As archaeologists we cannot expect to fully understand past routeways just by looking at site plans, maps, aerial photographs, and via remote sensing. A fuller understanding comes from the three-dimensional experience of actually walking the routes (Bell 2020; Stilgoe 2015; McFarlane 2012). By walking from Nabro to Yeha, or Beilul, for example, we can recreate, to some degree, the movement of those before us, the ancestors (Bradley 2000) and apply a physical experience to the phenomenological theory.

Movement had a significant impact on the societies through which it passed, on the individuals that were involved, and the consequences for all of the economic and cultural development. The people moving across these landscapes created an "Intercultural Entanglement" (Creasman and Yamamoto 2019, 361) and an "Afro-Arabian interchange circuit" (Fattovich 2004, 71). These are terms that I cite here to explain the movement and activity occurring three thousand plus years ago.

Chapter Eight

8 Conclusions and outcomes

> "We shall not cease from exploration
> And the end of all our exploring
> Will be to arrive where we started
> And know the place for the first time."
>
> TS Eliot – Four Quartets, 1943

This PhD investigated the role of obsidian and its impact on the relationship between Ethiopian Tigray and the Yemen Tihamah, and the degree to which it influenced the emerging social complexity of the first millennium BC.

Both archaeological, and obsidian, research in Tigray and Tihamah currently parallel one another with similar levels of development, knowledge gaps, and many questions still outstanding. The three strands of this research coalesce to provide new insights to the first millennium BC archaeology of Ethiopia, Yemen and, by extension, the Horn of Africa. The conclusions of this research contribute and advance the existing narrative of the Pre-Aksumite.

8.1 The Pre-Aksumite Tigray

Archaeological sites on both sides of the Red Sea are linked by the movement of people and the exchange of obsidian that, together, are defining characteristics of the Pre-Aksumite. A "culture transfer" (Gerlach 2009, 259) takes place across the Red Sea shaping the social complexity of Tigray. Phillipson (2013, 3) suggests that "Yeha can safely be described as Sabaean in style", indicative of cultural transfer at its most influential. Therefore Tigray's relationship with Southern Arabia, and obsidian, is a significant component of the equation that constitutes the Pre-Aksumite.

Many of the core tenets by which we understand the first millennium BC over the last 60 years are now questioned (Gerlach 2012; Fattovich 2009; Phillipson 2000) : what is meant by, and defines the Pre-Aksumite. The same discussion can be applied to the Yemen Tihamah: what is meant by the term Sabaean and how it is applied in the context of the Tihamah ? The Pre-Aksumite is understood by the material culture of the archaeological sites that are chronologically identified as before the Aksumite culture (after 400 BC). Phillipson (2013) and Fattovich (2004) suggest a Pre-Aksumite culture does not exist, and what has been found, archaeologically, is too diverse for that singular categorisation. The term is a temporary substitution, effectively, for a culture that we don't, in fact, recognise. An outcome of this PhD research is that the Pre-Aksumite (800-400 BC) is a broader entity than previously recognised and that it, and therefore D'mt, extended beyond the spatial and temporal limits currently recognised for it (Anfray 1968; Fattovich 1990a; Phillipson 1998). Whilst obsidian is a highly significant component of the first millennium Pre-Aksumite, D'Andrea et al's (2018) extended chronology (1600 -800 BC) presents eight hundred years with which we are not archaeologically conversant. If this is still the Pre-Aksumite, as per D'Andrea's continued use of the terminology, then there is still much to learn about this period of time.

As an example of this, the sites of Meqaber Ge'awa, Adi Ba'ekel, and Mai Adrasha, are all beyond what have been the perceived boundaries of D'mt (Wolf and Nowotnick 2010). I propose that having a similar material culture, and chronology, so far as a Pre-Aksumite culture can be said to have existed both it, and D'mts, geographic extent was indeed greater than previously recognised.

The Mezber chronology (D'Andrea et al. 2018) extends the Pre-Aksumite by 800 years moving its beginning to 1600 BC). D'Andrea's revised chronology retained, however, the same terminology but divided it across a longer period of time. This is a development that defines, I suggest, a perhaps more realistic parameter for the Pre-Aksumite, considering the diverse and sometimes contradictory evidence available. Hence, as I also conclude in this PhD, there was greater activity taking place during the second millennium BC, as D'Andrea et al's (2018) Mezber chronology indicates. The more fieldwork that is undertaken in Tigray, the more this second millennium BC anomaly arises hence, I suggest ,that it is not, in fact, an anomaly but a pattern, and that the second millennium BC was more populous and active than has previously been understood. This is less surprising than it may once have seemed especially considering the regional activity in Nubia, Yemen, Egypt, and the Red Sea maritime trade (Phillips 1997, 1995). I propose that D'Andrea et al.'s (2018) Mezber chronology could potentially be applied to the whole Tigray Pre-Aksumite area, not just Mezber, and that the regional chronology could be extended to 1600 BC. With this extended chronology we can see the full Pre-Aksumite sequence, and how it, in turn, reframes many of the questions arising in Pre-Aksumite studies.

The Sabaeans became a strong presence in Ethiopia as indicated by the ceramics and inscriptions found in Tigray (Phillipson 2009b). Where they were in Tigray however is a broader issue and one that throws up unexpected anomalies. The archaeological evidence, primarily in the form of ceramics and inscriptions, indicates their presence in Yeha, Meqaber Ge'awa, Seglamen, 'Abiy 'Adi, Hawelti and Melazo, Keskese, Adi Ba'ekel, and Qohaito (discussed in chapter two). Characteristic Sabaean ceramic incense burners have been found at Mezber, Meqaber Ge'awa, Melazo, Yeha, Addi Galamo, Matara, and Addi Gerameten (Fattovich 1990a; D'Andrea 2009; Wolf and Nowotnick 2010) (chapter two) indicating the distinctive Sabeaen presence. However, there is an absence of Sabaean evidence at Wakarida, Beta Giyorgis, Kidrane Mehret, Ona Adi, Adulis, and the Ancient Ona sites in Eritrea (discussed in chapter two). This is surprising as most of these sites are located on what appears to be the logical route that visitors from Yemen would take if they were travelling to Tigray.

As I discuss in chapter two the Sabaean presence, and absence, in Tigray is parallel to the presence of obsidian at many of the same sites indicative of the connection between them. The Sabaean absence can be attributed to a number of factors; the most obvious is that the Sabaeans were entering Tigray via the southern route from the Danakil depression, and not via Adulis, hence the absence of archaeological evidence there. Potentially there may have been political boundaries, perhaps relating to the emergence of D'mt, which created restrictions on who could interact with the Sabeaen visitors. Some areas or settlements may not have been a part of the exchange network. It may also have been due to restrictions on who was able to access the obsidian source at Nabro volcano.

Although the knowledge gap of obsidian provenancing is narrowing, many question remain of how the resource was being procured and who had access to it. The Sabaean evidence at Yeha raises the important question, as I have proposed throughout this thesis, of why were they present at this significant site in western Tigray, and what does the Temple signify to them? His is one of the central questions arising in this Phd. An earlier structure pre-dating the temple (Fattovich 2004; Robin and De Maigret 1998) also had Sabaean ceramic evidence. Yeha could have been built on the route of an already existing second millennium BC trade route, linking to the Horn of Africa, and the Nile valley, which the Sabaeans were hoping to connect with. The location of the temple may also have implications for Sabaean origin myths and ancestry, which are question still without answers.

Sites across the region dated to the second millennium BC include Adi Ahoune, Mai Chiot, Mezber, Asa Koma, Sabir, Agordat, and Mahal Teglinos, indicative of an active second millennium BC. Significantly, the date of these sites corresponds to the extended Mezber Pre-Aksumite chronology (D'Andrea et al. 2018) with which the sites can be identified via ceramics and dating. The Sabaean presence at Yeha is now central in the new chronology. A non-elite Yeha settlement, at Enda Gully (Michels 2005), so far unexcavated, could provide informative data on the function and character of this potential trade hub.

8.2 Yemen Tihamah

The fieldwork that I was involved with in Yemen has been an essential contribution to this research. It would have been almost impossible to have had a meaningful discussion of the relationship between Tigray and Tihamah without the experience of fieldwork on the Yemen Tihamah.

The Sabaean culture of the Tihamah plays a significant role in Tigray, but its definition, like that of the Pre-Aksumite, is still far from certain with many questions regarding its first millennium BC history. The term Sabaean is only applicable on the Tihamah from the early first millennium BC with either the arrival of Sabaeans from the Kingdom of Saba, or the willingness of the Tihamah tribes (Carl Phillips personal communication 30th January 2023) to absorb elements of Sabaean culture, hegemony even, into their local culture. Although the name Sabaean is related to the Kingdom of Saba, it was the people of the Tihamah (Sabaean influenced) who were interacting with Tigray.

There is no evidence of cultures from the Horn of Africa penetrating beyond the Yemen Tihamah escarpment and north to the Kingdom of Saba. As discussed however, (chapter three) an African influence is evident at Sabir (Vogt and Sedov 1998), where obsidian is also present, so it could, theoretically, be traders from Sabir arriving in Tigray. But neither the inhabitants of Tigray or Tihamah see the Red Sea, or the Danakil desert, as an insurmountable barrier, as the first millennium BC trans-Red Sea mercantile enterprise I discuss here indicates.

There is also the question of second millennium BC Tihamah activity, represented at Al-Midaman, Sabir, and Al-Kashawba, and the presence of African obsidian (Khalidi 2006). That the obsidian at Al-Midaman has been provenanced to Nabro volcano (Oppenheimer at al. 2019) is significant in establishing a journey across the Red Sea. Research in the Tihamah has identified Al-Hamid, Waqir, Al-Kashawba, and Al-Mohandid (Phillips 2007, 2006), as the key archaeological sites of the first millennium BC. Within this group Al-Mohandid is a stylistic anomaly (2006, 246), architecturally unlike the other sites and potentially with connections to Sabir (Vogt and Sedov 1998), and with both sites having possible exogenous links to Asa Koma in southern Djibouti (Khalidi 2009). As I have indicated**,** Asa Koma is evidence for greater second millennium BC interconnectivity, extending the obsidian exchange network into geographic regions that are not normally associated with the Pre-Aksumite.

By the early first millennium BC the Arabian incense trail was active across north Yemen with connections extending to Mesopotamia and the Levant (Potts 1988). Whether the incense trail then crossed the Red Sea into Tigray is still unknown (Gerlach 2012). Nevertheless, considering the evidence for Sabaean ceramic incense burners (Phillips 2007, 1997) at Tigray sites (Wolf and Nowotnick 2010), we can speculate that the trail did eventually extend to Tigray, connecting Meqaber Ge'awa to Yeha and then to the Mahal Teglinos (Manzo 2012) and eventually connected to the Nile valley.

One of the primary characteristics of the first millennium BC Tihamah, is the temple at Al-Hamid, and potentially another one at Waqir (Phillips 1997), as direct precedents for the temples at Yeha and Meqaber Ge'awa. Stylistically and architecturally these temples probably take their origins from Sabaean culture, but were locally built, although this is uncertain (Durrani 2005). The Sabaean cultural transfer is clearly evident in Tigray, but an African culture is apparent in Tihamah with Al-Midaman being African influenced (Keall 2004) and Sabir being "An African-inspired culture on Yemeni soil" (Vogt and Sedov 1998, 267). As I have already proposed, both Tigray and Tihama are part of an "Afro-Arabian cultural interchange circuit " (Fattovich 2004, 71) a term which neatly summarises the activity that I discuss here. So, whilst the cultural transfer is not as overt in Tihamah as it is in Tigray, it is still recognisable.

8.3 Obsidian

It was the specific identification of Nabro volcano (Oppenheimer et al. 2019), as the source of the obsidian found at Wakarida in Tigray and at Al-Midaman on the Tihamah, that enabled distribution of the resource to be recorded, indicating the extent of the trade. Nabro volcano becomes a central place for the occupants of Tigray and Tihamah with movement between the two areas focussing on the procurement of obsidian. This Phd proposes that the obsidian trade is a core element in the growth of social complexity in the greater Red Sea exchange network. Whilst other items were traded – animals, food, oils, – these are not immediately recognisable in archaeological contexts, whereas obsidian is one of the most visible aspects of the first millennium BC economy (Khalidi et al. 2012).

Nabro volcano is a distinctive landmark in an already unique desert creating a signature landscape (Wilkinson 2004) which can be understood through the distribution of obsidian. Obsidian from Africa is first attested to on the Tihamah, on the As-Salif peninsula at 5000 BC (Tosi 1986). This is a tantalisingly early date and one that then leaves a gap of 2000 years before the next known example of Danakil sourced obsidian, in Egypt, at 3100 BC, although the specific source is uncertain (Aston et al. 2000; Bavay et al. 2000). The next date for Danakil obsidian is at Mahal Teglinos at 2700 BC which is on the route to the Nile valley, and midway between the source and the destination. The trade of obsidian to Yemen is primarily evidenced at Al-Midaman, late third or early second millennium BC (Giumlia-Mair et al. 2000; Keall 2005). It then occurs later at first millennium BC sites also (Khalidi 2006) but further research is needed to identify the source.

Considering the volcanic source, and its unique physical appearance, it is understandable how obsidian came to be such a prized and useful artefact. The value of the artefact is as equally related to its unusual provenance (Bradley 2000), as the appearance of the artefact itself, as evidenced by the chunk of obsidian placed as a foundation deposit below a megalith at Al-Midaman (Giumlia-Mair et al. 2000). Yemeni obsidian could have been sourced at Dhamar-Reda (Wilkinson 1999) but a preference for the Nabro source was made and an exchange network established across the Red Sea. We have more artefactual evidence for Sabaeans in Africa, in the form of ceramics and culture, than we do for Africans travelling to Arabia at this time. We do know however that Nabro obsidian had been arriving at Al-Midaman since the third millennium BC (Oppenheimer et al. 2019). This is evidence that the inhabitants of Tigray were aware of its existence, its uses, and value, well before the Pre-Aksumite.

Geochemical analysis of the obsidian, using the LA-ICP-MS method (chapter four page 144) from the Egyptian harbour of Mersa Gawasis, in second millennium BC archaeological contexts (Luccarini et al. 2020), identified sources in Yemen (Dhamar-Reda) and Eritrea (Arafali). This provides further evidence for activity pre-dating the first millennium BC. This is a significant step however in populating the preceding millennium. As with much obsidian sourcing however, identification is not 100% certain (Luccarini et al. 2020). It indicates that the Dhamar-Reda source was being accessed and transported overseas, even if unused on the Tihamah barely 200km away (Khalidi et al. 2010). Perhaps political differences or tribal boundaries prevented the source from being accessed. By what mechanism Dhamar-Reda obsidian is transported to Egypt is not known. Sabir is the nearest site to the Dhamar-Reda source, although the obsidian at Sabir has not itself been provenanced. Further obsidian research might yet identify the Dhamar-Reda source in use on the Tihamah. Could Dhamar-Reda obsidian be transported through Sabir yet not be used on other Tihamah sites ? There is not an answer to this currently, and only further obsidian provenancing can answer it. The 200km from Dhamar-Reda to Sabir would not have been a difficult journey to undertake three thousand years ago, and a modern road now follows the route.

That the Nabro sourced obsidian has been provenanced at two sites at the centre of this PhD research (Oppenheimer et al. 2019) suggests that more could yet be identified. Khalidi suggests that the majority of Tihamah obsidian originates outside Arabia (2006) however not all known samples have been geochemically tested, so this is only speculation. The provenancing of obsidian, whichever method is used however, is not 100% accurate, particularly if there are multiple sources close to one another as Oppenheimer et al. (2019) note at Nabro-Mallahle, in the Danakil range.

8.4 Remote sensing, routeways and movement

In first millennium BC Tigray, the main elements of the emerging Pre-Aksumite culture are the acquisition of obsidian and the influence of the Sabaean culture, two directly related occurrences of interconnectivity. Having mapped the routes that I suggest are in use for the obsidian trade (chapter six), it becomes increasingly clear that the old routes have often become the modern routes. Research into the contemporary salt trade in the Danakil depression (Woldekiros 2019) suggests that the routes in use were the same ones used three thousand years ago (Fig. 89), particularly the route via the Desi'a pass (Fig. 86). In the absence of fieldwork, Remote sensing facilitates the opportunity to walk along the routes to investigate what was and was not possible. This is a challenging landscape, and in fact only a limited number of routes were actually possible, as indicated in chapters 5 and 6.

As I mapped the obsidian at archaeological sites, the routes being used start to become apparent. To establish the full extent of the route being used however, Remote sensing is necessary for being able to make informed suggestions. The maps that I present throughout this PhD indicating the sources and the archaeological sites where obsidian is present, are created with a high degree of certainty that the routes suggested could be, and were, used. One of the outcomes of creating the maps is that it not only demonstrates where people were travelling to, and the landscapes that they moved through, but it also demonstrates how they were undertaking these journeys. Ground truthing of these routes is necessary however to establish the reliability of the suggestions made by Remote sensing. The maps that I present in this PhD, and my suggested outcomes for those journeys, relied heavily on my direct firsthand experience of the landscapes of Tigray, the Danakil, and the Tihamah. Without that direct fieldwork experience the suggestions that I propose, both archaeological and phenomenological, would not have been credible, however I am confident that my routes and the journeys can be undertaken.

My mapping, as indicated on fig. 106 and 109, demonstrates a regional super highway, effectively, with Nabro volcano at its centre. A route links Al-Hamid temple on the Yemen Tihamah with the Temple of Yeha in Tigray, with Nabro almost equidistant between them. Mahal Teglinos is a further step west that links Tigray with the Nile valley. Remote sensing can indicate which parts of the journey were difficult and which were easier, which are more likely to have been favoured and allow us to target important areas for research in the future.

All of the sites discussed throughout this PhD are linked by this regional exchange network. These sites are the hubs of the first and second millennium BC exchange network in which trade in obsidian, but also other goods and the movement people, revolved. But it is only by mapping these routes, linking sites where Danakil obsidian is present, that these connections and the journeys undertaken can be suggested. In return, because these are the routes along which obsidian had been moved for thousands of years, it allows us to understand how long-distance trade, and barriers to it, impacted the cultures and economy of Tigray.

In many parts of the Danakil depression, however, routeways were clearly identifiable using remote sensing as they were mostly on sandy or compacted hamada surfaces which leave clear traces of movement. Sometimes these were well worn trackways and sometimes the routes followed wadi's or dry riverbeds. Despite the challenging topography of this area, the resolution of Google Earth-Pro is good enough to remotely walk through the landscape and to see what movement and journeys were possible.

Where a modern road exists now in Tigray, I propose that it is following an ancient route (Fig. 86, 87) partly because there is often little choice of where to go in the Tigray highlands. Archaeological fieldwork has shown that in such remote areas once trackways are established they can remain visible for thousands of years (Bloxam and Storemyr 2002), even if unused. Remote sensing indicates quite clearly which areas of the Danakil desert are in use and which perhaps cannot be used.

Using Remote sensing it was possible to identify specific areas in which future fieldwork could be directed. Quite specifically I suggest the east side of Nabro volcano (E 13.27, N 41.87). This would be an ideal place in which obsidian retrieved from the volcano could be brought to, perhaps worked, before its transportation elsewhere. There is the potential there to locate a settlement, or even temporary camp sites, for those involved in the procurement and trade. It is possible therefore to find artefacts that could assist with attributing chronology or identity of the site. Future excavation here has significant potential for developing knowledge of the Nabro obsidian trade further.

The mapping in this Phd supports what Fattovich (2004, 71) called the "Afro-Arabian Interchange Circuit", known earlier as the Tihamah Cultural Complex, with obsidian central to the circuit that was being created. This in turn created "intercultural entanglement" (Creasman and Yamamoto

2019, 347), effectively Ingold's "meshwork" (2011, 79) summarising first and second millennium BC interconnectivity. The first millennium BC Pre-Aksumite region was a crossroads of mercantile business and, therefore, less isolated than has been suggested (Connah 2003). All of the terms that I cite here and good descriptors for what transpired here 3-4 thousand years ago.

8.5 Suggested avenues for future research:

This research has drawn together disparate elements from both sides of the Red Sea enabling insights that otherwise would not have been achievable by investigating just one of these regions, for example Tigray. I make recommendations addressing the issues discussed here and a future research agenda that can be pursued. None of these suggestions are isolated points, each one is dynamic, informative to the others, and all can contribute to a more precise definition of the Pre-Aksumite, its character, chronology and its place in the region.

Ethiopia: In Tigray, to continue the work begun in the Kerseber valley to examine the sites identified during our 2019 reconnaissance survey. This will archaeologically test them to establish a chronology, the presence of obsidian, and/or a Sabaean influence. This would start with the villages of Adi Keharis, and Meateo Medharne Alem, both locations of modern churches with ancient pottery scatters on the ground surface around them, sites with a potentially much older history. As indicated in this PhD the Kerseber valley was probably a route used throughout history to link eastern Tigray, with the Yeha Temple, and, later, Aksum. In terms of regional connections this valley has high archaeological potential.

- To undertake ground truthing in the Danakil depression of the routes suggested in chapter six to assess their veracity. An optimal place to begin this research is the east side of Nabro volcano (E 13.27, N 41.87) where obsidian may have been collected and worked, at a workshop or settlement, before being before being transported east or west. Fieldwork here could begin with a walkover survey to assess the area, record the archaeological evidence, followed by excavation to test the findings.
- Excavation at Beilul, on the Red Sea coast, has the potential to be informative of both chronology and culture with both Pre-Aksumite and Sabaean data being retrieved. As the closest known site to Nabro volcano, examples of obsidian may also be expected here.
- The site of Enda Gully, near to Yeha, identified by Michels (2005), is a high priority for excavation. Not just to understand the site itself but for what it may subsequently tell us

about the Temple of Yeha, the Pre-Aksumite chronology, and the Sabaean presence there.

- **Yemen:** further excavation at Al-Kashawba is essential to define its role on the Tihamah and how it connects with other sites in the area, for example Waqir, and Al-Midaman. The initial excavation results here (Phillips 2007) provided a tantalising glimpse of what may be a site of great importance for the Tihamah.
- Excavation at the site of the standing stones at Al-Mohandid (Phillips 2000a) to investigate its date and cultural identity, would be the first at the site, and highly informative for Tihamah archaeological research.
- Excavation at Asa Koma (Manzo 2010), in Eritrea, has high potential to illuminate the second millennium BC relationship with both Pre-Aksumite Tigray, and the Tihamah sites of Sabir, and potentially Al-Mohandid.

Excavation at Shalao in Somaliland (Phillips 2018) could yield potentially significant results and provide links with first millennium BC Tihamah sites.

In both regions it is to be expected that there will be damage, and potentially looting, to sites caused by the long running war in Yemen, and the more wilful destruction of the current Tigray conflict. Some sites may have been ploughed out, as is already reported at Al-Kashawba in Yemen which is now reduced in size due to agricultural intensification. Anyone of these suggestions will be a significant undertaking in the current geo-political climate. Each one in its own right has the potential to be informative for all of the reasons outlined here.

8.6 Final Phd outcomes

The outcome of this Phd research can be summarised as follows:

- Drawing together the archaeology and obsidian of Tigray and Tihamah has indicated that there was considerably more second millennium BC activity.
- The broad regional view highlights the interconnectivity between Tigray, the Danakil depression, and Tihamah in a way not otherwise possible.
- Mapping the obsidian trail across Ethiopia, the Danakil, and Tihamah this has indicated which routes were used for this journey that had been operating since 5000 BC.
- The Sabaean culture transfer into Tigray was a significant one with a major impact that began in the second millennium BC.
- This research has highlighted that D’mt was probably a larger polity than previously understood, as shown by the Pre-Aksumite characteristics present at Meqaber Ge’awa.

- The mapping carried out for this PhD indicates that the old routes, and the new roads, are, very often, one and the same.
- Obsidian, and the Sabaean culture, were both significant components of first millennium BC Tigray and are inseparable in that regard.
- Obsidian was a major driver of the emerging social complexity of the early first millennium BC Pre-Aksumite.
- Phenomenologically, both Nabro volcano and Yeha temple, are part of a sacred landscape connected with Sabaean ancestry.

9 Conclusion

For the first time this research integrates evidence for the prehistoric landscapes of both Tigray and the Tihama to overcome the narrow divisions that have previously existed (Phillipson 2009, 258). This PhD bridges two elusive cultures across the Red Sea, what they contribute to one another, and how that defines each of them, in terms of the obsidian exchange network.

By discussing the role of obsidian in the African-Arabian relationship I have demonstrated that obsidian did play a significant role within the emerging social complexity of the time. To what degree this is so is emphasized by its increasing presence in the archaeological sites discussed here. Whilst quantities of obsidian vary (Table 9) it is frequently present at archaeological sites across Tigray, and in the Tihamah. Clearly there was a reciprocal relationship being conducted across the Red Sea.

The value of remote sensing to identify the routeways being used across the region has been successful in creating direct links between sites indicating where people moved between them. The remote sensing was reliant however on my direct firsthand experience of the sites and landscapes of Ethiopia and Yemen, and from which I was able to apply phenomenological theory to this thesis. By defining Sabaean characteristics – ceramics, inscriptions – that are present in Tigray, another framework is created that shows zones of interaction between the two cultures. Mapping and re-creating ancient trade routes was assisted by the presence of obsidian recorded at archaeological sites. But it is also a matter of speculating where routes could potentially be within this challenging environment because obsidian was not present on all the routes used for trade purposes. In some cases, the route through southern Eritrea into the Tigray mountains, for example, is clear because there are only a number of options, one of which may be a least-cost route (Harrower, D'Andrea 2014). The Periplus of the Erythraean Sea (Casson 1989) recorded movement along the same routes extending back over thousands of years. Some of the routes in use now were also demonstrably in use when early European visitors (Bent 1893; James 1867; Crawford 1958) passed through the area.

In 2023 many of the questions arising in Pre-Aksumite archaeology are frustrated, I suggest, by the models proposed for its initial definition (Anfray 1968; Fattovich 1990a). There has been a reluctance to move away from these models which has resulted in a static paradigm that is only now being questioned. It is fortunate that this PhD research coincides with the proposal for a new Pre-Aksumite Mezber chronology (D’Andrea et al. 2018) because this presents an opportunity to re-formulate questions that can lead to a more accurate definition of the Pre-Aksumite. One of the central outcomes of this PhD suggests that some of the answers being sought for the early first millennium BC can, potentially, be found in the preceding millennium. This is currently an even more elusive period of time, but one that may eventually illuminate our understanding of the first millennium BC, and develop a new narrative enhancing that of the last 60 years. The archaeological sites that are known in this former period of prehistory (Anfray 1968, 1967) present tantalising clues about what may have taken place in Tigray, but some speculation and phenomenology “going beyond the evidence” (Bender 1988, 7) is also necessary if we are able to construct a new narrative.

The mapping that I present of the obsidian, and the routes of its transportation indicates that the Pre-Aksumite D’mt polity was potentially geographically larger than previously understood. This can be seen at the sites of Meqaber Ge’awa, Adi Ba’ekel, and perhaps Mai Adrasha, all characteristic of the Pre-Aksumite D’mt, but being geographically distant from what it is recognised to be. The three strands of Pre-Aksumite culture, the Tihamah Sabaean influence, and obsidian, illustrate that it was this interconnectivity across the Red Sea, an Afro-Arabian Interchange circuit, that shaped and characterised the first millennium BC.

10 Bibliography

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